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

Safety Evaluation

Related to the Subsequent License Renewal of Point Beach Nuclear Plant, Units 1 and 2

Docket Nos. 50-266 and 50-301

NextEra Energy Point Beach, LLC

Revision 1

Issued: May 2022

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 Point Beach Nuclear Plant, Units 1 and 2 (Point Beach or PBN) subsequent license renewal application (SLRA).

Point Beach is located in northeastern Manitowoc County, WI. Each unit consists of a Westinghouse two-loop pressurized water reactor with a licensed thermal power of 1,800 megawatts thermal (MWt). The NRC issued the initial operating licenses on October 5, 1970, for Unit 1, and March 8, 1973, for Unit 2. The NRC issued renewed operating licenses for both Point Beach units on December 22, 2005.

NextEra Energy Point Beach, LLC (NextEra or the applicant), by letter dated November 16, 2020 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML20329A292), as supplemented, submitted an application for subsequent license renewal for Point Beach. NextEra requested renewal for a period of 20 years beyond the current expiration at midnight on October 5, 2030, for Unit 1 (Renewed Facility Operating License No. DPR-24), and at midnight on March 8, 2033, for Unit 2 (Renewed Facility Operating License No. DPR-27).

This SE documents the NRC staff’s technical review of the information submitted by NextEra through January 6, 2022. On the basis of the review of the SLRA, the NRC staff determined that NextEra has met the requirements of Title 10 of the *Code of Federal Regulations* Section 54.29(a).

TABLE OF CONTENTS

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

ACRS	Advisory Committee on Reactor Safeguards
AC	alternating current
ACI	American Concrete Institute
ACSR	aluminum conductor steel reinforced
ADAMS	Agencywide Documents Access and Management System
AEA	Atomic Energy Act
AERM	aging effect requiring management
AISC	American Institute of Steel Construction
AMP	aging management program
AMR	aging management review
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
B&W	Babcock & Wilcox
B&WOG	Babcock & Wilcox Owners Group
BMI	bottom mounted instrumentation
BSW	biological shield walls
BWR	boiling water reactor
°C	degrees Celsius
CASS	cast austenitic stainless steel
CC	component cooling
CCW	component cooling water
CLB	current licensing basis
CP	cathodic protection
CRD	control rod drive
CRDM	control rod drive mechanism

CRG	control rod guide
CRGT	control rod guide tube
CSE	copper sulfate reference electrode
CSS	containment spray system
CST	condensate storage tank
CVCS	chemical and volume control system
CVN	charpy v-notch
DBE	design basis event
DMW	dissimilar metal welds
DOE	U.S. Department of Energy
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
ESF	engineered safety features
°F	degrees Fahrenheit
FAC	flow-accelerated corrosion
FCG	fatigue crack growth
GALL	Generic Aging Lessons Learned
GALL-SLR	*Generic Aging Lessons Learned for Subsequent License Renewal Report (NUREG-2191)*
GEIS	Generic Environmental Impact Statement
gpm	gallons-per-minute
HAZ	heat affected zone
HELB	high-energy line break
HS	high strength
HSS	heating steam system

HVAC	heating, ventilation, and air conditioning
I&C	instrumentation and control
IAEA	International Atomic Energy Agency
IASCC	irradiation-assisted stress corrosion cracking
IGSCC	intergranular stress corrosion cracking
IN	information notice
INPO	Institute of Nuclear Power Operations
IPA	integrated plant assessment
IR	interaction ratios
ISG	interim staff guidance
ISI	inservice inspection
K_{IC}	fracture toughness
K_{IR}	fracture toughness curves
ksi	kilopounds per square inch
LBB	leak-before-break
LOCA	loss-of-coolant accident
LRA	license renewal application
LTOP	low temperature overpressure protection
LWR	light water reactor
MC	metallic containment
MCM	million circular mils
MIC	microbiologically induced corrosion
MIRVP	master integrated reactor vessel program
MRV	minimum required values
n/cm^2	neutrons per square centimeter
NAMS	Nuclear Asset Management Suite
NDE	non-destructive examination
NEE	NextEra Energy
NEI	Nuclear Energy Institute

NEPA	National Environmental Policy Act
NRC	Nuclear Regulatory Commission
NSAL	nuclear safety advisory letter
NSPC	nuclear safety performance criteria
NSR	nonsafety-related
OE	operating experience
PBN	Point Beach Nuclear Plant
PMRQ	preventive maintenance request
PNNL	Pacific Northwest National Laboratory
PORV	power operated relief valve
PSW	primary and biological shield walls
PT	liquid penetrant
PTLR	pressure-temperature limits report
PTS	pressurized thermal shock
PWR	pressurized water reactor
PWROG	Pressurized-Water Reactor Owners Group
PWSCC	primary water stress corrosion cracking
QA	quality assurance
RAI	request of additional information
RCI	request for confirmation of information
RCL	reactor coolant line
RCP	reactor coolant pump
RCS	reactor coolant system
RHR	residual heat removal
RIVE	radiation induced volumetric expansion
RMI	reflective metal insulation
RMWT	reactor makeup water tank
RPV	reactor pressure vessel
RT	radiographic testing
RV	reactor vessel

RVI	reactor vessel internal
RWST	refueling water storage tanks
SBO	station blackout
SC	structures and components
SCC	stress corrosion cracking
SE	safety evaluation
SER	safety evaluation report
SF	spent fuel
SG	steam generator
SI	safety injection
SIA	Structural Integrity Associates
SIF	stress intensity factor
SLR	subsequent license renewal
SLRA	subsequent license renewal application
SPEO	subsequent period of extended operation
SR	safety-related
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)*
SSC	structures, systems, and components
TLAA	Time-Limited Aging Analysis
TS	technical specifications
UFSAR	Updated Final Safety Analysis Report
USE	upper-shelf energy
V&V	validation and verification
WCAP	Westinghouse Commercial Atomic Power

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 Point Beach Nuclear Plant, Units 1 and 2 (Point Beach or PBN), as filed by NextEra Energy Point Beach, LLC (NextEra or the applicant), by letter dated November 16, 2020 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML20329A292), as supplemented by letters dated April 21, 2021 (ADAMS Accession No. ML21111A155), May 6, 2021 (ADAMS Accession No. ML21126A239), May 27, 2021 (ADAMS Accession No. ML21147A115), July 8, 2021 (ADAMS Accession No. ML21189A173), July 8, 2021 (ADAMS Accession No. ML21189A174), July 26, 2021 (ADAMS Accession No. ML21207A066), August 11, 2021 (ADAMS Accession No. ML21223A308), August 25, 2021 (ADAMS Accession No. ML21237A055), August 30, 2021 (ADAMS Accession No. ML21242A230), September 10, 2021 (ADAMS Accession No. ML21253A138), September 10, 2021 (ADAMS Accession No. ML21253A140), September 13, 2021 (ADAMS Accession No. ML21256A129),September 16, 2021 (ADAMS Accession No. ML21259A153), September 20, 2021 (ADAMS Accession No. ML21263A052), October 1, 2021 (ADAMS Accession No. ML21274A053), October 25, 2021 (ADAMS Accession No. ML21298A090), November 3, 2021 (ADAMS Accession No. ML21307A286), November 4, 2021 (ADAMS Accession No. ML21308A282), November 4, 2021 (ADAMS Accession No. ML21308A283), November 23, 2021 (ADAMS Accession No. ML21327A077), November 30, 2021 (ADAMS Accession No. ML21334A293), December 9, 2021 (ADAMS Accession No. ML21343A294), January 6, 2022 (ADAMS Accession No. ML22006A074), and January 6, 2022 (ADAMS Accession No. ML222006A046).

NextEra's application seeks to renew Point Beach Renewed Facility Operating License Nos. DPR-24 and DPR-27 for an additional 20 years beyond the current expiration dates of October 5, 2030, for Unit 1, and March 8, 2033, for Unit 2. The NRC staff performed a safety review of NextEra'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."

Point Beach is located in northeastern Manitowoc County, WI. Each unit consists of a Westinghouse two-loop pressurized-water reactor with a licensed thermal power of 1,800 megawatts thermal (MWt). The NRC issued the initial operating licenses on October 5, 1970, for Unit 1, and March 8, 1973, for Unit 2. The NRC issued renewed operating licenses for both Point Beach units on December 22, 2005. The Point Beach updated final safety analysis report (UFSAR) describes the plant and the site (ADAMS Package Accession No. ML21102A337).

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 Point Beach subsequent license renewal (SLR) is based on NextEra'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). NextEra 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 information submitted through January 6, 2022.

The public may view the SLRA, as well as materials related to the SLR review, on the NRC website at http://www.nrc.gov .

This SE summarizes the results of the NRC staff's safety review of the SLRA and describes the technical details that 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), issued July 2017 (ADAMS Accession No. ML17188A158).

SE Sections 2 through 4 address the NRC staff's evaluation of SLR issues considered during its review of the application. SE Section 5 discusses the role of the Advisory Committee on Reactor Safeguards (ACRS). The conclusions of this SE are in Section 6.

SE Appendix A, "License Renewal Commitments," contains a table showing NextEra's commitments for subsequent renewal of the operating licenses. SE Appendix B, "Chronology," contains a chronology of the principal correspondence between the NRC 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 of 1954, as amended (AEA), and NRC regulations, the NRC 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 NRC issues renewed licenses only after it determines that a nuclear facility can operate safely to the end of the proposed period of extended operation. There are no limitations in the AEA or NRC regulations limiting the number of times that a license may be renewed.

As described in 10 CFR Part 54, the focus of the NRC 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 the proposed 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

The NRC and the U.S. Department of Energy (DOE) held two international conferences, in 2008 and 2011, on reactor operations beyond 60 years to identify the most significant issues that would need to be addressed for SLR. In 2011, the NRC also began collecting information to support the development of guidance documents for operation during the subsequent period of extended operation and to support a revision of 10 CFR Part 54, if needed.

During 2011 through 2013, the NRC 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 AMPs have been implemented at plants during the period of extended operation and the degradation that has been identified by the AMPs. A summary of the NRC 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 Nuclear Power Plant and Nine Mile Point Nuclear Station, Unit 1" (ADAMS Accession No. 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" (ADAMS Accession No. 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" (ADAMS Accession No. 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 (ADAMS Accession No. ML16194A124).

Also, on May 9, 2012 (ADAMS Accession No. ML12159A174), and subsequently on November 1, 13, and 14, 2012, the NRC staff met with interested stakeholders to hear and learn the stakeholders' concerns and recommendations for operation from 60 to 80 years. The staff's resolution of these public comments is available in an NRC staff memorandum from William F. Burton, Sr., to Steven D. Bloom, dated September 12, 2016 (ADAMS Accession No. ML16194A222).

In May 2012, the NRC and the DOE also 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 that would need to be addressed to provide assurance for safe operation beyond 60 years.

The NRC 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 NRC 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) the IAEA "International Generic Ageing Lessons Learned Programme," (iii) the Organization for Economic Co-operation and Development (OECD)/NEA "Component Operational Experience, Degradation, and Ageing Programme" database, and (iv) the OECD/NEA "Cable Ageing Data and Knowledge" database.

By letter dated August 6, 2014 (ADAMS Accession No. ML14253A104), NEI documented the industry's views and recommendations for updating NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report" (ADAMS Accession No. ML103490041), and NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (ADAMS Accession No. ML103490036), to support SLR.

The NRC, in cooperation with the DOE, completed the Expanded Materials Degradation Assessment (EMDA) in October 2014 (ADAMS Accession Nos. 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 NRC 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, and to identify 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) in 2016. The final guidance documents were published in July 2017 (ADAMS Accession Nos. 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 NRC 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” (ADAMS Accession No. ML14050A306). In the Commission’s staff requirements memorandum (SRM) on SECY-14-0016 (ADAMS Accession No. 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 NRC 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. Thus, the SLR guidance documents provide a sound basis for development of applicant programs to manage the effects of aging associated with the relevant technical issues and for the NRC 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:

(1) 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), as well as a few other safety-related issues, during the period of extended operation.

(2) 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:

(3) Safety-related systems, structures, and components which are those relied upon to remain functional during and following design basis events (as defined in 10 CFR 50.49 (b)(1)) to ensure the following functions—

  (i) The integrity of the reactor coolant pressure boundary.

  (ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or

  (iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in § 50.34(a)(1), § 50.67(b)(2), or § 100.11 of [10 CFR Chapter I], as applicable.

(4) 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].

(5) 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 SLRA, NextEra stated that it used the process defined in the GALL-SLR Report, which summarizes NRC 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 nuclear power plant 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). In December 1996, the NRC staff revised these regulations to facilitate the environmental review for license renewal. The staff prepared the “Generic Environmental Impact Statement for License Renewal of Nuclear Plants” (GEIS) to document its evaluation of possible environmental impacts associated with nuclear power plant license renewals. For certain types of environmental impacts, the GEIS contains generic impact findings that apply to all nuclear power plants (or distinct subsets of plants). These generic findings are codified in Appendix B, “Environmental Effect of Renewing the Operating License of a Nuclear Power Plant,” to Subpart A, “National Environmental Policy Act—Regulations Implementing Section 102(2),” of 10 CFR Part 51. Under 10 CFR 51.53(a) and 10 CFR 51.53(c)(3)(i), a license renewal applicant may incorporate these generic findings in its environmental report and an applicant’s environmental report need not contain an analysis of the impacts of the generic (i.e., Category 1) issues listed in Appendix B to 10 CFR Part 51, Subpart A. In accordance with 10 CFR 51.53(c)(3)(ii), an environmental report must include analyses of the environmental impacts that must be evaluated on a plant-specific basis (i.e., Category 2 issues) identified in Appendix B to 10 CFR Part 51, Subpart A.

In June 2013, the NRC staff issued a final rule (78 Federal Register (FR) 37281–37324 and 78 FR 46255) revising 10 CFR Part 51 to update the potential environmental impacts associated with the renewal of an operating license for a nuclear power reactor for an additional 20 years. The NRC issued Revision 1 to the GEIS (at 78 FR 37325) concurrently with the final rule. The revised GEIS specifically supports the revised list of environmental issues identified in the final rule. Revision 1 to the GEIS and Revision 1 to the 2013 final rule reflect lessons learned and knowledge gained during previous license renewal environmental reviews.

In accordance with NEPA and 10 CFR Part 51, the NRC staff reviewed the Point Beach plant-specific environmental impacts of SLR, including any new and significant information that was not considered in the GEIS. As part of its scoping process, the staff held a public scoping meeting on November 4, 2020, via webinar, to assist the staff in identifying plant-specific environmental issues (ADAMS Accession No. ML20302A036). The staff issued an environmental scoping summary report on June 30, 2021, which included the comments received during the scoping process and the staff's responses to those comments (ADAMS Accession No. ML21181A127).

The NRC staff issued its draft plant-specific supplement to the GEIS (Supplement 23, Second Renewal) in November 2021 (ADAMS Accession No. ML21306A226). Draft, plant-specific GEIS Supplement 23—Second Renewal, documents the results of the staff's environmental review and makes a preliminary recommendation on the license renewal action based on environmental considerations. A public webinar was held on this document on December 8, 2021. After considering comments on the draft GEIS Supplement, the staff will publish the final, plant-specific GEIS Supplement 23—Second Renewal, separately from this report.

1.3 Principal Review Matters

Part 54 of 10 CFR describes the requirements for renewal of operating licenses for nuclear power plants. The NRC 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 NextEra 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 NextEra submitted the required information.

Section 54.19(b) 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, NextEra stated in SLRA Section 1.1.9:

> 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 No. B-41 for PBN Units 1 and 2 states, in Article VII, that the agreement shall terminate at the time of expiration of that license specified in Item 3 of the attachment to the agreement, which is the last to expire. Item 3 of the attachment to the indemnity agreement, as revised by Amendment No. 14, lists DPR 24 and DPR 27 as the applicable license numbers. Should the license numbers be changed upon issuance of the subsequent renewed licenses, [NextEra] requests that conforming changes be made to Item 3 of the Attachment, and any other sections of the indemnity agreement as appropriate.

The NRC staff intends to maintain the original license numbers upon issuance of the subsequent renewed licenses, if approved. 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 NRC 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 NRC 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 November 30, 2021, NextEra submitted an SLRA update that summarizes the CLB changes that have occurred during the staff’s review of the SLRA (ADAMS Accession No. ML21334A293). 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, NextEra states that no TS changes are necessary for issuance of the subsequent renewed operating licenses. The NRC staff finds that this statement adequately addresses the 10 CFR 54.22 requirements.

The NRC 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 NRC 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 NRC 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 (ADAMS Accession No. ML20181A395)	Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance	SE Sections 3.0.3.1.5, 3.0.3.1.6, 3.0.3.1.9, 3.0.3.2.39
SLR-ISG-2021-02-MECHANICAL (ADAMS Accession No. ML20181A434)	Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance	SE Sections 3.0.3.2.6, 3.0.3.2.15, 3.0.3.2.29
SLR-ISG-2021-03-STRUCTURES (ADAMS Accession No. ML20181A381)	Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance	SE Sections 3.0.3.2.30, 3.0.3.2.36
SLR-ISG-2021-01-PWRVI (ADAMS Accession No. ML20217L203)	Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized-Water Reactors	SE Section 3.0.3.2.10

1.5 Summary of Open Items

An item is considered open if, in the NRC 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 NextEra submitted through January 6, 2022, the staff identified no open items.

1.6 Summary of Confirmatory Items

An item is considered confirmatory if, in the NRC 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 NextEra submitted through January 6, 2022, the staff finds that no confirmatory items exist that require a formal response from NextEra.

1.7 Summary of Proposed License Conditions

After reviewing the SLRA, including additional information NextEra submitted through January 6, 2022, the NRC staff identified two proposed license conditions.

The first license condition requires NextEra, following the NRC staff's issuance of the subsequent renewed operating licenses, 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 regulation, 10 CFR 50.71(e), requires nuclear power plant 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." NextEra may make changes to the programs and activities described in the UFSAR update and supplement provided that NextEra 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 regulation.

The second license condition requires NextEra to complete future activities described in the UFSAR supplement before the beginning of the subsequent period of extended operation. NextEra 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, as delineated in 10 CFR 54.4, “Scope.” The IPA must identify and list those structures and components (SCs) included in the SSCs that are subject to an aging management review (AMR). Section 54.21 of 10 CFR further requires that an SLRA describe and justify the methods used to identify the SSCs within the scope of subsequent license renewal 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 AMR 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” (NEI 17-01) (Agencywide Documents Access and Management System (ADAMS) Accession No. 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 (ADAMS Accession No. ML20017A265)

SLRA Section 2.1, “Scoping and Screening Methodology,” describes the methodology used by NextEra Energy Point Beach, LLC (NextEra or the applicant) for Point Beach Nuclear Plant, Units 1 and 2 (Point Beach or PBN) to identify the SSCs within the scope of subsequent license renewal (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 that 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 NRC 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 subsequent license renewal 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 subsequent license renewal 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 PBN Units 1 and 2 and related docketed regulatory correspondence
    - NUREG-1839, "Safety Evaluation Report Related to the License Renewal of the Point Beach Nuclear Plant, Units 1 and 2" (ADAMS Accession No. ML053420129)
    - NRC safety evaluation reports (SERs) including NRC staff review of PBN licensing submittals; some of these documents may contain licensee commitments
    - licensing correspondence including relief requests, licensee event reports, and responses to NRC communications such as NRC bulletins, generic letters, or enforcement actions
    - engineering evaluations, calculations, and design change packages, which can provide additional information about the requirements of characteristics associated with the evaluated SSCs

2.1.3.1.2 *Staff Evaluation*

Section 54.3, "Definitions," of 10 CFR defines CLB as the set of NRC requirements applicable to a specific plant and a licensee'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 licensee’s commitments remaining in effect that were made in docketed licensing correspondence such as licensee responses to NRC bulletins, generic letters, and enforcement actions, as well as licensee commitments documented in NRC safety evaluations or licensee event reports.

The NRC 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 subsequent license renewal and SCs subject to an AMR. The staff determined that the documentation sources provided sufficient information to ensure that the applicant identified SSCs to be included within the scope of subsequent license renewal 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, therefore, is acceptable.

2.1.4 Plant Systems, Structures, and Components Scoping Methodology

SLRA Section 2.1.4, “Scoping Methodology,” states that the scoping process is the systematic process used to identify the SSCs within the scope of the Rule. The applicant initially performed the scoping process at the system and structure level, in accordance with the scoping criteria identified in 10 CFR 54.4(a). The applicant identified system and structure functions and intended functions 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 it used to identify SSCs that are included within the scope of subsequent license renewal, 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 states, in part:

> At PBN, the safety-related components are identified in [the plant component database called the Nuclear Asset Management Suite (NAMS)]. The safety-related classification in NAMS was populated using a controlled procedure that is consistent with the … 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.
>
> Safety-related classifications for systems and structures are based on system and structure descriptions and analysis in the UFSAR. Safety-related structures are those structures listed in the UFSAR and classified as Class I. Systems and structures identified as safety-related in the UFSAR meet the criteria of 10 CFR 54.4(a)(1) and are included within the scope of [subsequent license renewal (SLR)]. Safety-related components in NAMS were also reviewed, and the systems and structures that 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, [design basis accidents (DBAs)], external events, and natural phenomena as described in the CLB, 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 NRC staff reviewed the applicant's basis documents that describe design basis conditions in the CLB and address DBEs as defined in 10 CFR 50.49(b)(1). The UFSAR and basis documents discuss events, such as internal and external flooding, tornados, and missiles. The staff determined that 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 finds that 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 its review of the SLRA and the UFSAR, the NRC staff finds that 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 subsequent license renewal is in accordance with the requirements of 10 CFR 54.4(a)(1) and, therefore, is 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 subsequent license renewal, 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 that 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 may have the potential to 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 PBN CLB, such as cranes, high-energy line break pipe whip restraints, internally-generated missile barriers, and flood mitigation features, that were included within the scope of subsequent license renewal 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." As such, five nonsafety-related SSCs were included within the scope of SLR per 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 apply to the identification of the first seismic or equivalent anchor at PBN:
>
> - A seismic anchor is defined as a device or structure that ensures that 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 that 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 nonsafety-related piping and associated structures and components attached to 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) are used to define end points for the portion of NSR [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 NSR 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 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 NSR piping, such as a drain pipe that ends at an open floor drain.

(d) For NSR piping runs that are connected at both ends to SR piping, include the entire run of NSR 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, PBN follows the same approach accepted by the NRC for the original license renewal regarding nonsafety-related SSCs that are directly connected to SR SSCs (typically piping systems). Specifically, PBN has included all the connected nonsafety-related 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. Note that these piping segments are not uniquely identified on the [SLR boundary drawings]. The aging effects for directly connected NSR piping are managed using the same programs that manage the SR piping. The associated NSR 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.

<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 that Have the Potential to Affect Safety-Related SSCs through Spatial Interactions," discusses the evaluation of nonsafety-related SSCs that 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:

> [The applicant's] methodology invokes a plant "spaces" approach that assumes a spatial interaction can occur if safety-related and nonsafety-related SSCs are located within the same space. For this process, a space is defined by the room in which the safety-related and nonsafety-related components are located. This … methodology evaluated the effect of sprays and leaks on mechanical and electrical safety-related SSCs, with no limitation on duration of the sprays/leaks.

SLRA Section 2.1.4.2.3 further discusses several exceptions to the spaces approach, where the nonsafety-related SCs located within a space are not included within the scope of subsequent license renewal. The exceptions included:

- Nonsafety-related SCs located in containment whose failure would not impact the ability of safety-related SCs qualified for post-accident conditions (spray or steam) to perform intended functions.
- Nonsafety-related SCs in spaces that did not contain any safety-related SSCs.
- Nonsafety-related SCs that did not contain liquid or steam.

- Nonsafety-related abandoned SCs that had been verified to be drained.
- Nonsafety-related SCs that are unpressurized and that are not located directly above safety-related SCCs (the nonsafety-related SCs can only drip, and not spray).
- Nonsafety-related SCs in large, open areas that have been evaluated and where it was determined that the failure could not affect safety-related SSCs (e.g., this exception would include items such as the presence of structures located between the nonsafety-related SCs and the safety-related SSCs that would prevent interaction).

2.1.4.2.2 Staff Evaluation

The NRC staff reviewed SLRA Sections 2.1.4.2, 2.1.4.2.1, 2.1.4.2.2, and 2.1.4.2.3, 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 NRC staff reviewed SLRA Section 2.1.4.2.1, which describes nonsafety-related, non-plant 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 and were included within the scope of subsequent license renewal in accordance with 10 CFR 54.4(a)(2). The staff confirmed that the applicant had reviewed the UFSAR, piping and instrument diagrams (P&IDs), 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 that the applicant identified the nonsafety-related SSCs that perform or support a safety function and included those SSCs within the scope of subsequent license renewal in accordance with 10 CFR 54.4(a)(2).

The NRC 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 subsequent license renewal in accordance with 10 CFR 54.4(a)(2). The staff confirmed that the applicant reviewed the UFSAR, P&IDs, 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 that 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 subsequent license renewal in accordance with 10 CFR 54.4(a)(2).

The NRC staff finds that the applicant's methodology for identifying nonsafety-related SSCs that perform or support a safety function for inclusion within the scope of subsequent license renewal 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 NRC 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 subsequent license renewal in accordance with 10 CFR 54.4(a)(2).

The NRC 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 subsequent license renewal: 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).

The NRC staff finds that the applicant's methodology for identifying and including nonsafety-related SSCs directly connected to safety-related SSCs within the scope of subsequent license renewal 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 NRC 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 subsequent license renewal in accordance with 10 CFR 54.4(a)(2).

The NRC staff determined that the applicant used a spaces approach and evaluated spaces to identify 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 in the SLRA as a structure or a portion of 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 subsequent license renewal in accordance with 10 CFR 54.4(a)(2).

The NRC staff determined that the applicant took some exceptions to the spaces approach and evaluated the impacts of the failure of nonsafety-related SSCs and the impacts of leakage or spray on safety-related SSCs. The staff determined that the applicant's evaluation provided a basis—safety-related SSCs were qualified for a loss-of-coolant accident environment that bounded the potential impacts of failed nonsafety-related SSCs—for not including the nonsafety-related SSCs within the scope of subsequent license renewal. In addition, the applicant performed additional evaluations of specific configurations including the absence of safety-related SSCs within a space. The applicant also took an exception to the spaces approach for nonsafety-related SCs that had been placed into an abandoned state and verified to be drained and unpressurized; or those located in large areas where it had been evaluated that failure of the nonsafety-related SCs could not impact safety-related SSCs. The staff reviewed the basis for the applicant's exception to the spaces approach and the exclusion of certain nonsafety-related SCs from the scope of subsequent license renewal and finds 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 subsequent license renewal 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 its review of the SLRA, the NRC 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 subsequent license renewal is in accordance with the requirements of 10 CFR 54.4(a)(2) and, 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 subsequent license renewal 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:

> This [applicant] 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 NRC staff reviewed SLRA Section 2.1.4.3, which describes the method used to identify and to include within the scope of subsequent license renewal those 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, "Fire protection"); environmental qualification (10 CFR 50.49, "Environmental qualification of electric equipment important to safety for nuclear power plants"); pressurized thermal shock (10 CFR 50.61, "Fracture toughness requirements for protection against pressurized thermal shock events"); anticipated transients without scram (10 CFR 50.62, "Requirements for reduction of risk from anticipated transients without scram (ATWS) events for light-water-cooled nuclear power plants"); and station blackout (10 CFR 50.63, "Loss of all alternating current power").

The NRC 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 subsequent license renewal 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 subsequent license renewal. Based on its 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 subsequent license renewal in accordance with the requirements of 10 CFR 54.4(a)(3).

2.1.4.3.3 Conclusion

Based on its review of the SLRA, the NRC 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, 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 Subsequent License Renewal.

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 license renewal 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 SLR.

2.1.4.4.2 Staff Evaluation

The NRC 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 subsequent license renewal 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 NRC staff determined that the applicant identified the SSCs within the scope of subsequent license renewal 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 and Controls." SLRA Sections 2.3 through 2.5 include a description of the system or structure, a listing of functions performed by the system or structure, 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. The staff determined that the applicant's process is consistent with the description provided in SLRA Sections 2.0 and 2.1 through 2.5 and the guidance in SRP-SLR Section 2.1.

2.1.4.4.3 Conclusion

Based on its review of the SLRA, the NRC staff finds that the applicant's scoping methodology is consistent with the guidance contained in the SRP-SLR and identified those SSCs (1) that are safety related, (2) whose failure could affect safety-related intended functions, and (3) that are necessary to demonstrate compliance with the NRC's regulations for fire protection, environmental qualification, pressurized thermal shock, anticipated transient without scram, and station blackout. The staff finds that the applicant's methodology is consistent with the requirements of 10 CFR 54.4(a) and, 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 structures and components within the scope of SLR to identify the long-lived and passive structures and components subject to an AMR. The passive intended functions of structures and components 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 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).

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 subsequent license renewal 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 period of extended operation.

The NRC staff reviewed SLRA Sections 2.1.1 and 2.1.5, which describe the methodology used by the applicant to identify the mechanical, structural, and electrical SCs within the scope of subsequent license renewal 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 subsequent license renewal, to determine which ones are passive and long-lived and, therefore, subject to an AMR.

Mechanical and Structural

The NRC 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 documents, 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 NRC 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, "Electrical and I&C Systems." 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 its review of the SLRA, the NRC 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 subsequent license renewal 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, therefore, acceptable.

2.1.6 Summary of Evaluation Findings

Based on its review of the SLRA, the NRC staff finds that the applicant's description and justification of its methodology for identifying SSCs within the scope of subsequent license renewal 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, therefore, acceptable.

2.2 Plant-Level Scoping Results

2.2.1 Introduction

In SLRA Section 2.1, the applicant described its methodology for identifying SSCs within the scope of subsequent license renewal 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 subsequent license renewal.

The NRC 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 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)).

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

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

2.2.2 Summary of Technical Information in the Application

SLRA Section 2.2 states:

> PBN's IPA methodology consists of scoping, screening, and AMRs. [SLRA] Table 2.2-1 lists the PBN systems, structures and commodity groups that were evaluated to determine if they were within the scope of subsequent license renewal, using the methodology described in [SLRA] Section 2.1. A reference to the section of the application that contains the scoping and screening results is provided for each in-scope mechanical system, structure, and electrical system in the Table.

SLRA Table 2.2-1, "Plant Level Scoping Reports," lists the plant mechanical, structural, and electrical and I&C systems within the scope of subsequent license renewal.

2.2.3 Staff Evaluation

SE Section 2.1 contains the NRC 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 to confirm that the applicant did not omit any plant-level systems and structures within the scope of subsequent license renewal.

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

The NRC 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 subsequent license renewal (as defined by 10 CFR 54.4) that had been omitted from the scope of subsequent license renewal. The staff identified no such omissions.

2.2.4 Conclusion

Based on its review of the SLRA, the NRC staff finds that the SLRA adequately identifies the systems and structures within the scope of subsequent license renewal 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 system

In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant must list those passive, long-lived SCs that are within the scope of subsequent license renewal and that are subject to an AMR. To verify that the applicant properly implemented its methodology, the NRC staff focused its 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 NRC 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 meet the subsequent license renewal 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 its scoping evaluation, the NRC staff reviewed the SLRA, applicable sections of the UFSAR, subsequent license renewal boundary drawings, and other licensing-basis documents, as appropriate, for each mechanical system within the scope of subsequent license renewal. 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 NRC 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).

2.3.1 Reactor Coolant System

SLRA Section 2.3.1, "Reactor Coolant System," identifies the Reactor Coolant System (RCS) SCs subject to an AMR for subsequent license renewal. The applicant described the supporting SCs of the RCS in the following SLRA sections:

- SLRA Section 2.3.1.1, "Reactor Vessel"
- SLRA Section 2.3.1.2, "Reactor Vessel Internals"
- SLRA Section 2.3.1.3, "Pressurizers"
- SLRA Section 2.3.1.4, "Reactor Coolant and Connected Piping"
- SLRA Section 2.3.1.5, "Steam Generators"

SE Sections 2.3.1.1–2.3.1.5 include the NRC staff's findings on its review of SLRA Sections 2.3.1.1–2.3.1.5, respectively.

2.3.1.1 Reactor Vessel

2.3.1.1.1 Summary of Technical Information in the Application

SLRA Section 2.3.1.1 describes the reactor vessel components subject to an AMR. The reactor vessel boundaries are included in the subsequent license renewal boundary drawings listed in SLRA Section 2.3.1. SLRA Table 2.3.1-1 lists the reactor vessel component types subject to an AMR and their intended functions. SLRA Table 3.1.2-1 provides the results of the applicant's AMR for reactor vessel SCs.

2.3.1.1.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the NRC staff reviewed the following:

- SLRA Section 2.3.1.1
- SLRA Table 2.3.1-1
- SLRA Table 3.1.2-1
- UFSAR Sections 3.0 and 4.0

2.3.1.1.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.1.1.2 and on a review of the SLRA and UFSAR, the staff concludes that the applicant appropriately identified the reactor vessel components within the scope of subsequent license renewal, as required by 10 CFR 54.4. The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.1.2 Reactor Vessel Internals

2.3.1.2.1 Summary of Technical Information in the Application

SLRA Section 2.3.1.2 describes the reactor vessel internals components subject to an AMR. The reactor vessel internals boundaries are included in the subsequent license renewal boundary drawings listed in SLRA Section 2.3.1. SLRA Table 2.3.1-2 provides a list of the reactor vessel internals component types subject to an AMR and their intended functions. SLRA Table 3.1.2-2 provides the results of the applicant's AMR for reactor vessel internals SCs.

2.3.1.2.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.1.2
- SLRA Table 2.3.1-2
- SLRA Table 3.1.2-2
- UFSAR Sections 3.0 and 4.0

2.3.1.2.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.1.2.2 and on a review of the SLRA and UFSAR, the staff concludes that the applicant appropriately identified the reactor vessel internal components within the scope of subsequent license renewal, as required by 10 CFR 54.4. The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.1.3 Pressurizers

2.3.1.3.1 Summary of Technical Information in the Application

SLRA Section 2.3.1.3 describes the pressurizer components subject to an AMR. The pressurizer boundaries are included in the subsequent license renewal boundary drawings listed in SLRA Section 2.3.1. SLRA Table 2.3.1-3 lists the pressurizer component types subject to an AMR and their intended functions. SLRA Table 3.1.2-3 provides the results of the applicant's AMR for pressurizer SCs.

2.3.1.3.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as being within the scope of subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.1.3
- SLRA Table 2.3.1-3
- SLRA Table 3.1.2-3
- UFSAR Sections 4.1 and 4.2

2.3.1.3.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.1.3.2 and on a review of the SLRA and UFSAR, the staff concludes that the applicant appropriately identified the pressurizer components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.1.4 Reactor Coolant and Connected Piping

2.3.1.4.1 Summary of Technical Information in the Application

SLRA Section 2.3.1.4 describes the components subject to an AMR within the reactor coolant and connected piping. The reactor coolant and connected piping boundaries are included in the subsequent license renewal boundary drawings listed in SLRA Section 2.3.1. SLRA Table 2.3.1-4 lists the reactor coolant and connected piping component types subject to an AMR and their intended functions. SLRA Table 3.1.2-4 provides the results of the applicant's AMR for reactor coolant and connected piping SCs.

2.3.1.4.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent license renewal to verify that the applicant included all passive and long-lived components subject to an AMR, in accordance with 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, the staff reviewed the following:

- SLRA Section 2.3.1.4
- SLRA Table 2.3.1-4
- SLRA Table 3.1.2-4
- UFSAR Sections 4.1, 4.2, and 4.3

2.3.1.4.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.1.4.2 and on a review of the SLRA and UFSAR, the staff concludes that the applicant appropriately identified the reactor coolant and connected piping components within the scope of subsequent license renewal, as required by 10 CFR 54.4. The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

2.3.1.5 Steam Generators

2.3.1.5.1 Summary of Technical Information in the Application

SLRA Section 2.3.1.5 describes the steam generator components subject to an AMR. The steam generator boundaries are included in the subsequent license renewal boundary drawings listed in SLRA Section 2.3.1. SLRA Table 2.3.1-5 lists the steam generator component types subject to an AMR and their intended functions. SLRA Table 3.1.2-5 provides the results of the applicant's AMR for steam generator SCs.

2.3.1.5.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.1.5
- SLRA Table 2.3.1-5
- SLRA Table 3.1.2-5
- UFSAR Section 4.0

2.3.1.5.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.1.5.2 and on a review of the SLRA and UFSAR, the staff concludes that the applicant appropriately identified the steam generator components within the scope of subsequent license renewal, as required by 10 CFR 54.4. The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.2 Engineered Safety Features

SLRA Section 2.3.2, "Engineered Safety Features," identifies the engineered safety feature (ESF) SCs subject to an AMR for subsequent license renewal. The applicant described the supporting SCs of the ESFs in the following SLRA sections:

- SLRA Section 2.3.2.1, "Safety Injection"
- SLRA Section 2.3.2.2, "Containment Spray"

- SLRA Section 2.3.2.3, “Residual Heat Removal”
- SLRA Section 2.3.2.4, “Containment Isolation Components”

SE Sections 2.3.2.1–2.3.2.4 include the NRC staff’s findings on its review of SLRA Sections 2.3.2.1–2.3.2.4, respectively.

2.3.2.1 Safety Injection

2.3.2.1.1 Summary of Technical Information in the Application

SLRA Section 2.3.2.1 describes the safety injection (SI) components subject to an AMR and lists the subsequent license renewal boundary drawings that show the SI system boundaries. SLRA Table 2.3.2-1 lists the SI component types subject to an AMR and their intended functions. SLRA Table 3.2.2-1 provides the results of the applicant’s AMR for safety injection system SCs.

2.3.2.1.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as being within the scope of subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.2.1
- SLRA Table 2.3.2-1
- SLRA Table 3.2.2-1
- UFSAR Sections 6.2 and 14.3

2.3.2.1.3 Conclusion

Based on the NRC staff’s evaluation in SE Section 2.3.2.1.2 and on a review of the SLRA and UFSAR, the staff concludes that the applicant appropriately identified the safety injection components within the scope of subsequent license renewal, as required by 10 CFR 54.4. The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.2.2 Containment Spray

2.3.2.2.1 Summary of Technical Information in the Application

SLRA Section 2.3.2.2 describes the containment spray system (CSS) components subject to an AMR and lists the boundary drawings that show the CSS boundaries. SLRA Table 2.3.2-2 lists the CSS component types subject to an AMR and their intended functions. SLRA Table 3.2.2-2 provides the results of the applicant’s AMR for CSS SCs.

2.3.2.2.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.2.2
- SLRA Table 2.3.2-2
- SLRA Table 3.2.2-2
- UFSAR Sections 6.4 and 9.1.1

2.3.2.2.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.2.2.2 and on a review of the SLRA and UFSAR, the staff concludes that the applicant appropriately identified the CSS components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.2.3 Residual Heat Removal

2.3.2.3.1 Summary of Technical Information in the Application

SLRA Section 2.3.2.3 describes the residual heat removal (RHR) components subject to an AMR and lists the subsequent license renewal boundary drawings that show the RHR system boundaries. SLRA Table 2.3.2-3 lists the RHR component types subject to an AMR and their intended functions. SLRA Table 3.2.2-3 provides the results of the applicant's AMR for RHR SCs.

2.3.2.3.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as being within the scope of subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.2.3
- SLRA Table 2.3.2-3
- SLRA Table 3.2.2-3
- UFSAR Sections 5.2, 6.2, 6.4.2, 9.1.1, and 9.2

2.3.2.3.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.2.3.2 and on a review of the SLRA and UFSAR, the staff concludes that the applicant appropriately identified the residual heat removal components within the scope of subsequent license renewal, as required by 10 CFR 54.4. The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.2.4 Containment Isolation Components

2.3.2.4.1 Summary of Technical Information in the Application

SLRA Section 2.3.2.4 describes the containment isolation components subject to an AMR and lists the subsequent license renewal boundary drawings that show the containment isolation system boundaries. SLRA Table 2.3.2-4 lists the containment isolation component types subject to an AMR and their intended functions. SLRA Table 3.2.2-4 provides the results of the applicant's AMR for containment isolation SCs.

2.3.2.4.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.2.4
- SLRA Table 2.3.2-4
- SLRA Table 3.2.2-4
- UFSAR Section 5.2

2.3.2.4.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.2.4.2 and on a review of the SLRA and UFSAR, the staff concludes that the applicant appropriately identified the containment isolation components within the scope of subsequent license renewal, as required by 10 CFR 54.4. The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3 Auxiliary Systems

SLRA Section 2.3.3, "Auxiliary Systems," identifies the auxiliary systems SCs subject to an AMR for SLR. The applicant described the supporting SCs of the auxiliary systems in the following SLRA sections:

- 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, “Spent Fuel Cooling”
- SLRA Section 2.3.3.4, “Waste Disposal”
- SLRA Section 2.3.3.5, “Service Water”
- SLRA Section 2.3.3.6, “Fire Protection”
- SLRA Section 2.3.3.7, “Heating Steam”
- SLRA Section 2.3.3.8, “Emergency Power”
- SLRA Section 2.3.3.9, “Containment Ventilation”
- SLRA Section 2.3.3.10, “Essential Ventilation”
- SLRA Section 2.3.3.11, “Treated Water”
- SLRA Section 2.3.3.12, “Circulating Water”
- SLRA Section 2.3.3.13, “Containment Hydrogen Detectors and Recombiner”
- SLRA Section 2.3.3.14, “Plant Sampling”
- SLRA Section 2.3.3.15, “Plant Air”

SE Sections 2.3.3.1–2.3.3.15 include the NRC staff’s findings on its review of SLRA Sections 2.3.3.1–2.3.3.15, respectively.

2.3.3.1 Chemical and Volume Control

2.3.3.1.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.1 describes the chemical and volume control system (CV) components subject to an AMR and lists the subsequent license renewal boundary drawings that show the CV boundaries. SLRA Table 2.3.3-1 lists the CV component types subject to an AMR and their intended functions. SLRA Table 3.3.2-1 provides the results of the applicant’s AMR for CV SCs.

2.3.3.1.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.3.1
- SLRA Table 2.3.3-1
- SLRA Table 3.3.2-1
- UFSAR Sections 5.2, 9.1, 9.3, and 14.1.4

2.3.3.1.3 Conclusion

Based on the NRC staff’s evaluation in SE Section 2.3.3.1.2 and on a review of the SLRA, UFSAR, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the CV components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.2 Component Cooling Water

2.3.3.2.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.2 describes the component cooling water (CC) components subject to an AMR and lists the subsequent license renewal boundary drawings that show the CC system boundaries. SLRA Table 2.3.3-2 lists the CC component types subject to an AMR and their intended functions. SLRA Table 3.3.2-2 provides the results of the applicant's AMR for CC SCs.

2.3.3.2.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.3.2
- SLRA Table 2.3.3-2
- SLRA Table 3.3.2-2
- UFSAR Sections 6.2.2, 9.1, 14.1.8, 14.2.4, and 14.2.5

2.3.3.2.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.3.2.2 and on a review of the SLRA, UFSAR, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the CC components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.3 Spent Fuel Cooling

2.3.3.3.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.3 describes the spent fuel cooling (SF) components subject to an AMR and lists the subsequent license renewal boundary drawings that show the SF system boundaries. SLRA Table 2.3.3-3 lists the SF component types subject to an AMR and their intended functions. SLRA Table 3.3.2-3 provides the results of the applicant's AMR for SF systems and components.

2.3.3.3.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.3.3
- SLRA Table 2.3.3-3
- SLRA Table 3.3.2-3
- UFSAR Section 9.9

2.3.3.3.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.3.3.2 and on a review of the SLRA, UFSAR, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the SF components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.4 Waste Disposal

2.3.3.4.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.4 describes the waste disposal components subject to an AMR and lists the subsequent license renewal boundary drawings that show the waste disposal system boundaries. SLRA Table 2.3.3-4 lists the waste disposal component types subject to an AMR and their intended functions. SLRA Table 3.3.2-4 provides the results of the applicant's AMR for waste disposal SCs.

2.3.3.4.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.3.4
- SLRA Table 2.3.3-4
- SLRA Table 3.3.2-4

- UFSAR Sections 5.2, 11.1, 11.2, and 11.3

2.3.3.4.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.3.4.2 and on a review of the SLRA, UFSAR, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the waste disposal components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.5 Service Water

2.3.3.5.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.5 describes the service water components subject to an AMR and lists the subsequent license renewal boundary drawings that show the service water system boundaries. SLRA Table 2.3.3-5 lists the service water component types subject to an AMR and their intended functions. SLRA Table 3.3.2-5 provides the results of the applicant's AMR for service water SCs.

2.3.3.5.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.3.5
- SLRA Table 2.3.3-5
- SLRA Table 3.3.2-5
- UFSAR Sections 5.2, 6.3, 9.6, and 9.9

2.3.3.5.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.3.5.2 and on a review of the SLRA, UFSAR, system design basis documents, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the service water components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.6 Fire Protection

2.3.3.6.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.6 describes the fire protection components subject to an AMR and lists the subsequent license renewal boundary drawings that show the fire protection system boundaries. SLRA Table 2.3.3-6 lists the fire protection component types subject to an AMR and their intended functions. SLRA Table 3.3.2-6 provides the results of the applicant's AMR for fire protection SCs.

2.3.3.6.2 Staff Evaluation

The NRC staff evaluated the fire protection system components described in the SLRA, UFSAR, and subsequent license renewal boundary drawings to verify that the applicant included within the scope of subsequent license renewal 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 subsequent license renewal to verify that the applicant included all passive or 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, the staff reviewed the following:

- SLRA Section 2.3.3.6
- SLRA Table 2.3.3-6
- SLRA Table 3.3.2-6
- UFSAR Section 9.10
- NUREG-1839
- NRC safety evaluation related to the issuance of Amendment Nos. 256 and 260 for Point Beach, Units 1 and 2, respectively, regarding the transition to a risk-informed, performance-based fire protection program in accordance with 10 CFR 50.48(c) (ADAMS Accession No. ML16196A093)
- Point Beach Fire Protection Design Document, Revision 2

The Point Beach fire protection program is based on compliance with 10 CFR 50.48(a) and 10 CFR 50.48(c), "National Fire Protection Association Standard NFPA 805," and the Point Beach fire protection license conditions. On September 8, 2016, the NRC issued Amendment Nos. 256 and 260 for Point Beach, Units 1 and 2, respectively, that approved the licensee's request to maintain a fire protection program that complies with NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition," as permitted by 10 CFR 50.48(c). The amendments modified the Point Beach licensing basis by authorizing the transition of the licensee's fire protection program to a risk-informed, performance-based program based on the 2001 Edition of NFPA 805 as an alternative to requirements in 10 FR 50.48(b). The NFPA 805 standard describes how to use performance-based methods, such as risk-informed methods, fire probabilistic risk assessment, and fire modeling to demonstrate compliance with nuclear safety performance criteria (NSPC) (similar to compliance with post-fire safe-shutdown requirements in 10 CFR 50.48(b) and 10 CFR Part 50 Appendix R) and to ensure that structures, systems, and components (safety-related and important to safety) are protected from fire.

The applicant stated that the fire protection program is focused on protecting the safety of the public, the environment, and plant personnel from a plant fire, and its potential effect on safe reactor operations. The principal components of the fire protection system are the main firewater loop, a diesel-driven and motor-driven fire pump, jockey pump, accumulator, hose stations, hydrants, hoses, spray/sprinkler heads, nozzles, fuel oil day-tank, fuel oil supply to the diesel-driven fire pump, and the associated piping and valves to support the system functions. Also included are two fixed Halon gas suppression systems and the required gas cylinders, nozzles, and the associated piping and valves to support the Halon system's intended functions.

The applicant also stated that the fire protection system includes the reactor coolant pump (RCP) oil collection sub-system that contains leakage from the RCPs' lubricating oil system to reduce the possibility of a fire in accordance with the requirements of NFPA 805. The principal components of the RCP oil collection sub-system are the enclosures, drip pans, covers, oil collection tanks, piping, and valves.

SLRA Section 2.3.3.6 states that the only significant difference between the subsequent license renewal boundaries and the boundaries identified as part of the original Point Beach license renewal effort is that due to the replacement of the diesel-driven fire pump engine, the old diesel-driven fire pump engine heat exchanger was removed and replaced by a cooler/heat exchanger that is now integral to the engine skid rather than being a separate unit. This cooler/heat exchanger is now considered to be a part of the engine complex assembly and is not subject to AMR. In RAI 2.3.3.6-2, dated August 26, 2021 (ADAMS Accession No. ML21242A247), the NRC staff requested that the applicant justify its determination for not considering the diesel-driven fire pump cooler/heat exchanger subject to an AMR considering the guidance in NUREG-2192, Tables 2.1-2 and 2.3-2.

In its response dated September 16, 2021 (ADAMS Accession No. ML21259A153), the applicant stated that the new diesel-driven fire pump contains two heat exchangers. One heat exchanger is an air intake heat exchanger and the other is an engine coolant heat exchanger. The air intake heat exchanger is sealed and not able to be inspected so it is replaced periodically per vendor recommendations. Therefore, the air intake heat exchanger is not long-lived and not subject to AMR. The applicant also stated that the aging effects for the engine coolant heat exchanger are currently managed by periodically performing internal visual inspections and cleaning or replacing the heat exchanger as necessary. Therefore, the applicant revised the Point Beach SLRA by removing the discussion related to the diesel-driven fire pump engine coolant heat exchanger being part of the engine complex assembly. The revised text states that the engine coolant heat exchanger is subject to an AMR and adds this heat exchanger to Table 2.3.3-6 for AMR performance.

A virtual audit was held with NextEra staff for fire protection scoping and screening topics through a breakout session on March 24, 2021. The NRC staff discussed fire protection scoping and screening audit questions, interviewed the applicant staff, and reviewed documentation provided by the applicant. During the discussion, the NRC staff requested that the applicant verify whether the dry chemical extinguishing system is within the scope of license renewal in accordance with 10 CFR 54.4(a) and whether it is subject to an AMR in accordance with 10 CFR 54.21(a)(1), because it appears to be necessary to meet the requirements for 10 CFR 50.48. In its response dated August 11, 2021 (ADAMS Accession No ML21223A308), the applicant stated that the dry chemical suppression system for the turbine-generator bearings and the gas turbine exhaust bearing is in scope in accordance with 10 CFR 54.4(a). The dry chemical containers are managed similar to a fire extinguisher, where they are routinely monitored and replaced as needed. The fixed components subject to aging management are represented by component types "piping," "nozzle," and "valve body." "Nozzle" and "valve body" are already included in SLRA Tables 3.3.2-6. The applicant revised SLRA Table 3.3.2-6 to also include galvanized steel piping used in internal and external environments and revised SLRA Table 3.3-1 to reflect that item 3.3-1, 116 is now applicable.

2.3.3.6.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.3.6.2 and on a review of the SLRA, NUREG-1839, SLRA boundary drawings, UFSAR Section 9.10, Point Beach Fire Protection Design Document, Revision 2, and NRC safety evaluation related to the issuance of Amendment Nos. 256 and 260 for Point Beach, Units 1 and 2, respectively, the staff concludes that the applicant appropriately identified the fire protection system components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.7 Heating Steam

2.3.3.7.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.7 describes the heating steam system components subject to an AMR and lists the subsequent license renewal boundary drawings that show the heating steam system boundaries. SLRA Table 2.3.3-7 lists the heating steam component types subject to an AMR and their intended functions. SLRA Table 3.3.2-7 provides the results of the applicant's AMR for heating steam system SCs.

2.3.3.7.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.3.7
- SLRA Table 2.3.3-7
- SLRA Table 3.3.2-7

2.3.3.7.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.3.7.2 and on a review of the SLRA and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the heating steam system components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.8 Emergency Power

2.3.3.8.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.8 describes the emergency power system components subject to an AMR and lists the subsequent license renewal boundary drawings that show the emergency power system boundaries. SLRA Table 2.3.3-8 lists the emergency power system component types subject to an AMR and their intended functions. SLRA Table 3.3.2-8 provides the results of the applicant's AMR for emergency power system SCs.

2.3.3.8.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.3.8
- SLRA Table 2.3.3-8
- SLRA Table 3.3.2-8
- UFSAR Sections 8.8 and 8.9

2.3.3.8.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.3.8.2 and on a review of the SLRA, UFSAR, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the emergency power system components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.9 Containment Ventilation

2.3.3.9.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.9 describes the containment ventilation system components subject to an AMR and lists the subsequent license renewal boundary drawings that show the containment ventilation system boundaries. SLRA Table 2.3.3-9 lists the containment ventilation system component types subject to an AMR and their intended functions. SLRA Table 3.3.2-9 provides the results of the applicant's AMR for containment ventilation system SCs.

2.3.3.9.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.3.9
- SLRA Table 2.3.3-9
- SLRA Table 3.3.2-9
- UFSAR Sections 5.2, 5.3, and 6.3

2.3.3.9.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.3.9.2 and on a review of the SLRA, system design basis documents, UFSAR, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the containment ventilation system components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.10 Essential Ventilation

2.3.3.10.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.10 describes the essential ventilation system components subject to an AMR and lists the subsequent license renewal boundary drawings that show the essential ventilation system boundaries. SLRA Table 2.3.3-10 lists the essential ventilation system component types subject to an AMR and their intended functions. SLRA Table 3.3.2-10 provides the results of the applicant's AMR for essential ventilation system SCs.

2.3.3.10.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.3.10
- SLRA Table 2.3.3-10
- SLRA Table 3.3.2-10
- UFSAR Sections 8.7, 8.8, 9.5, and 9.8

2.3.3.10.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.3.10.2 and on a review of the SLRA, system design basis documents, UFSAR, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the essential ventilation system components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.11 Treated Water

2.3.3.11.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.11 describes the treated water system components subject to an AMR and lists the subsequent license renewal boundary drawings that show the treated water system boundaries. SLRA Table 2.3.3-11 lists the treated water component types subject to an AMR and their intended functions. SLRA Table 3.3.2-11 provides the results of the applicant's AMR for treated water system SCs.

2.3.3.11.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.3.11
- SLRA Table 2.3.3-11
- SLRA Table 3.3.2-11
- UFSAR Sections 5.2, 9.1, 9.3, 9.8, and 9.9

2.3.3.11.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.3.11.2 and on a review of the SLRA, UFSAR, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the treated water system components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.12 Circulating Water

2.3.3.12.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.12 describes the circulating water system components subject to an AMR and lists the subsequent license renewal boundary drawings that show the circulating water system boundaries. SLRA Table 2.3.3-12 lists the circulating water system component types subject to an AMR and their intended functions. SLRA Table 3.3.2-12 provides the results of the applicant's AMR for circulating water system SCs.

2.3.3.12.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.3.12
- SLRA Table 2.3.3-12
- SLRA Table 3.3.2-12
- UFSAR Sections 9.6 and 10.1

2.3.3.12.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.3.12.2 and on a review of the SLRA, UFSAR, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the circulating water system components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.13 Containment Hydrogen Detectors and Recombiner

2.3.3.13.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.13 describes the containment hydrogen detectors and recombiner system components subject to an AMR and lists the subsequent license renewal boundary drawings that show the containment hydrogen detector and recombiner system boundaries. SLRA Table 2.3.3-13 lists the containment hydrogen detector and recombiner system component types subject to an AMR and their intended functions. SLRA Table 3.3.2-13 provides the results of the applicant's AMR for containment hydrogen detector and recombiner system SCs.

2.3.3.13.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.3.13
- SLRA Table 2.3.3-13
- SLRA Table 3.3.2-13
- UFSAR Sections 5.2 and 9.11

2.3.3.13.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.3.13.2 and on a review of the SLRA, UFSAR, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the containment hydrogen detector and recombiner system components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.14 Plant Sampling

2.3.3.14.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.14 describes the plant sampling system components subject to an AMR and lists the subsequent license renewal boundary drawings that show the plant sampling system boundaries. SLRA Table 2.3.3-14 lists the plant sampling system component types subject to an AMR and their intended functions. SLRA Table 3.3.2-14 provides the results of the applicant's AMR for plant sampling system SCs.

2.3.3.14.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.3.14
- SLRA Table 2.3.3-14
- SLRA Table 3.3.2-14
- UFSAR Sections 5.2 and 9.11

2.3.3.14.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.3.14.2 and on a review of the SLRA, UFSAR, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the plant sampling system components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.15 Plant Air

2.3.3.15.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.15 describes the plant air system components subject to an AMR and lists the subsequent license renewal boundary drawings that show the plant air system boundaries. SLRA Table 2.3.3-15 lists the plant air system component types subject to an AMR and their intended functions. SLRA Table 3.3.2-15 provides the results of the applicant's AMR for plant air system SCs.

2.3.3.15.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.3.15
- SLRA Table 2.3.3-15
- SLRA Table 3.3.2-15
- UFSAR Sections 5.2, 9.7, and 14.2.4

2.3.3.15.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.3.15.2 and on a review of the SLRA, UFSAR, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the plant air system components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.4 Steam and Power Conversion

SLRA Section 2.3.4, "Steam and Power Conversion System," identifies the steam and power conversion system SCs subject to an AMR for subsequent license renewal. The applicant described the supporting SCs of the steam and power conversion system in the following SLRA sections:

- SLRA Section 2.3.4.1, "Main and Auxiliary Steam"
- SLRA Section 2.3.4.2, "Feedwater and Condensate"
- SLRA Section 2.3.4.3, "Auxiliary Feedwater"
- SE Sections 2.3.4.1–2.3.4.3 include the NRC staff's findings on its review of SLRA Sections 2.3.4.1–2.3.4.3, respectively.

2.3.4.1 Main and Auxiliary Steam

2.3.4.1.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.1 describes the main and auxiliary steam system components subject to an AMR and lists the subsequent license renewal boundary drawings that show the system boundaries. SLRA Table 2.3.4-1 lists the main and auxiliary steam system component types subject to an AMR and their intended functions. SLRA Table 3.4.2-1 provides the results of the applicant's AMR for main and auxiliary steam system SCs.

2.3.4.1.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.4.1
- SLRA Table 2.3.4-1
- SLRA Table 3.4.2-1
- UFSAR Sections 5.2, 7.2, 7.4, 10.0, 10.1, and 10.2

2.3.4.1.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.4.1.2 and on a review of the SLRA, system design basis documents, UFSAR, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the main and auxiliary steam system components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.2 Feedwater and Condensate

2.3.4.2.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.2 describes the feedwater and condensate system components subject to an AMR and lists the subsequent license renewal boundary drawings that show the system boundaries. SLRA Table 2.3.4-2 lists the feedwater and condensate system component types subject to an AMR and their intended functions. SLRA Table 3.4.2-2 provides the results of the applicant's AMR for feedwater and condensate system SCs.

2.3.4.2.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.4.2
- SLRA Table 2.3.4-2
- SLRA Table 3.4.2-2
- UFSAR Sections 5.2, 7.2, 7.4, and 10.0

2.3.4.2.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.4.2.2 and on a review of the SLRA, UFSAR, system design basis documents, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the feedwater and condensate system components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.3 Auxiliary Feedwater

2.3.4.3.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.3 describes the auxiliary feedwater system and condensate storage components subject to an AMR and lists the subsequent license renewal boundary drawings that show the system boundaries. SLRA Table 2.3.4-3 lists the auxiliary feedwater system and condensate storage component types subject to an AMR and their intended functions. SLRA Table 3.4.2-3 provides the results of the applicant's AMR for auxiliary feedwater system and condensate storage SCs.

2.3.4.3.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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 2.3, the staff reviewed the following:

- SLRA Section 2.3.4.3
- SLRA Table 2.3.4-3
- SLRA Table 3.4.2-3
- UFSAR Sections 5.2, 7.2, 7.4, and 10.2

2.3.4.3.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.3.4.3.2 and on a review of the SLRA, UFSAR, system design basis documents, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the auxiliary feedwater system and condensate storage components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately 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 subsequent license renewal 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 structures and components that meet the scoping criteria and that are subject to an AMR.

The NRC 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 subsequent license renewal 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 its scoping evaluation, the NRC staff reviewed the applicable SLRA sections, focusing on components that have not been identified as within the scope of subsequent license renewal. The staff reviewed relevant licensing-basis documents, including the UFSAR, for each structure to determine whether the applicant omitted from the scope of subsequent license renewal 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 NRC 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 2.4.15, 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 3.5.2-15 provide the results of the applicant's AMR for structures and structural components.

- SLRA Section 2.4.1, "Containment Structure and Internal Structural Components"

- SLRA Section 2.4.2, “Circulating Water Pumphouse Structure”
- SLRA Section 2.4.3, “Control Building Structure”
- SLRA Section 2.4.4, “Diesel Generator Building Structure”
- SLRA Section 2.4.5, “Façade (Unit 1/2) Structure”
- SLRA Section 2.4.6, “Fuel Oil Pumphouse Structure”
- SLRA Section 2.4.7, “Gas Turbine Building Structure”
- SLRA Section 2.4.8, “Primary Auxiliary Building Structure”
- SLRA Section 2.4.9, “Spent Fuel Pool and Transfer Canal”
- SLRA Section 2.4.10, “Turbine Building (Unit 1/2) Structure”
- SLRA Section 2.4.11, “Yard Structures”
- SLRA Section 2.4.12, “13.8 kV Switchgear Building Structure”
- SLRA Section 2.4.13, “Component Support Commodity”
- SLRA Section 2.4.14, “Fire Barrier Commodity”
- SLRA Section 2.4.15, “Cranes, Hosts, and Lifting Devices”

In addition, SLRA Section 2.4, “Scoping and Screening Results: Structures,” includes fire barriers located in structures within the scope of subsequent license renewal and subject to an AMR. In SLRA Section 2.4, fire barrier walls, floors, ceilings, and other structural fire barrier commodities are evaluated with the associated buildings and structures in which they are installed that are within the scope of subsequent license renewal. The following tables identify the fire barrier types and structures that are within the scope of the subsequent license renewal.

- Table 2.4-1, “Containment Structure and Internal Structural Components Subject to Aging Management Review”
- Table 2.4-2, “Circulating Water Pumphouse Structure Subject to Aging Management Review”
- Table 2.4-3, “Control Building Structure Subject to Aging Management Review”
- Table 2.4-4, “Diesel Generating Building Structure Subject to Aging Management Review”
- Table 2.4-6, “Fuel Oil Pumphouse Structure Components Subject to Aging Management Review”
- Table 2.4-7, “Gas Turbine Building Structure Components Subject to Aging Management Review”
- Table 2.4-8, “Primary Auxiliary Building Structure Subject to Aging Management Review”
- Table 2.4-10, “Turbine Building Structure Subject to Aging Management Review”
- In SLRA Section 2.4.14, “Fire Barrier Commodity,” the applicant stated that the fire barrier commodity includes all fire stops and fire wraps used throughout the site that are credited in the Fire Protection Program Design Document. Fire stops are the fire barrier penetration seals and cable tray fire stops. Fire wraps are an envelope system installed around electrical components, conduits, and cabling to maintain safe shutdown functions free of fire damage. In addition, structural steel member fire proofing would be considered a fire wrap.

2.4.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 2.4.1.15
- SLRA Tables 2.4.1-1 through 2.4.1-15
- SLRA Tables 3.5.2-1 through 3.5.2-15

2.4.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.4.2 and on a review of the SLRA, UFSAR, and subsequent license renewal boundary drawings, the staff concludes that the applicant appropriately identified the structures and structural components within the scope of subsequent license renewal, 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).

2.5 Scoping and Screening Results: Electrical and Instrumentation and Controls

This section documents the NRC 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 NRC 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 NRC 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 subsequent license renewal 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 its scoping evaluation, the NRC staff reviewed the applicable SLRA sections, focusing on components that have not been identified as within the scope of subsequent license renewal. The staff reviewed relevant licensing-basis documents, including the UFSAR, for each component to determine whether the applicant omitted from the scope of subsequent license renewal 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 NRC 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 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 NRC staff's review of the SLRA, as supplemented by letter dated July 26, 2021, for this section relates to scoping and screening of electrical and I&C system components subject to an AMR in accordance with 10 CFR 54.4 and 10 CFR 54.21.

The NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of subsequent license renewal 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 subsequent 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).

The NRC staff notes that 10 CFR 54.4(a) requires a list of plant SSCs within the scope of the subsequent licensee renewal, and 10 CFR 54.4(b) states, in part, that the intended functions of these SSCs must be shown to fulfill 10 CFR 54.21. In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant must identify and list passive, long-lived SSCs within the scope of the subsequent license renewal and subject to an AMR. SRP-SLR Section 2.1 and NEI 17-01 provide guidance on the scoping and screening for subsequent license renewal.

The NRC staff used the SRP-SLR and NEI 17-01 guidance to evaluate the methodology used by the applicant in performing the scoping and screening for the structures and components within the scope of the subsequent license renewal. The staff reviewed the scoping methodology and results pertaining to the electrical and I&C system components using the scoping methodology described in SRP-SLR, Section 2.5, "Scoping and Screening Results: Electrical," and NEI 17-01. The staff finds that the scoping methodology described in the SLRA is consistent with the SRP-SLR and NEI 17-01 guidance.

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 NRC staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant included within the scope of the subsequent license renewal all components with intended functions delineated under 10 CFR 54.4(a). The applicant, in SLRA Section 2.1.1, explained that electrical and I&C components that are part of in-scope electrical and I&C systems and in-scope mechanical systems are included within the scope of the subsequent license renewal.

In addition, the applicant noted in SLRA Section 2.1.3.4, "Other Scoping Pursuant to 10 CFR 54.4(a)(3)," that 10 CFR 54.4(a)(3) requires that all systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for SBO (e.g., alternate alternating current (AC) power sources) are within the scope of subsequent license renewal. The boundaries for electric equipment for SBO are shown in Figures 2.5-1, "PBN Unit 1 Restoration of Offsite Power Following an SBO," and 2.5-2, "PBN Unit 2 Restoration of Offsite Power Following an SBO," of Section 2.5.1.4, "Application of Screening Criteria 10 CFR 54.21(a)(1)(ii) to Electrical and I&C Commodity Groups," of SLRA Supplement 3, Revision 1, dated July 26, 2021 (ADAMS Accession No. ML21207A066), and identify the major components or commodities associated with restoration of off-site power following an SBO event.

The NRC staff reviewed those electrical and I&C system components that the applicant identified as within the scope of subsequent 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). The staff also verified whether the applicant omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1)

The applicant grouped the electrical and I&C system components that were identified to be within the scope of subsequent license renewal into component commodity groups. The applicant applied the screening criteria in 10 CFR 54.21(a)(1)(i) and 10 CFR 54.21(a)(1)(ii) to this list of component commodity groups to identify those that perform their intended functions without moving parts or without a change in configuration or properties, and to remove the component commodity groups that are subject to replacement based on a qualified life or specified time period.

The applicant eliminated cable tie wraps from the electrical commodities with intended functions. Cable tie-wraps are used in cable installations as cable ties. Cable tie-wraps hold groups of cables together for restraint and ease of maintenance. Cable tie-wraps are used to bundle wires and cables together to keep the wire and cable runs neat and orderly. There are no current licensing basis requirements that cable tie-wraps remain functional during and following design basis events. The seismic qualification of cable trays does not credit the use of cable tie-wraps. Cable tie-wraps are not credited in the design basis in terms of any 10 CFR 54.4 intended function. Therefore, cable tie-wraps are not within the scope of subsequent license renewal and are not subject to an AMR. Based on its review of this information, the NRC staff finds that the exclusion of cable tie-wraps from the electrical commodities subject to an AMR is acceptable.

The applicant eliminated cable bus from the electrical commodities with intended functions. Cable bus is a variation of metal enclosed bus which is similar in construction to a metal enclosed bus, but instead of segregated or nonsegregated electrical buses, cable bus is comprised of a fully enclosed metal enclosure that utilizes three-phase insulated power cables installed on insulated support blocks. Cable bus may omit the top cover or use a louvered top cover and enclosure. Both the cable bus and enclosures are not sealed against intrusion of dust, industrial pollution, moisture, rain, or ice and, therefore, may introduce debris into the internal cable bus assembly. Since cable bus is not utilized at PBN, the NRC staff finds that the exclusion of cable bus from the electrical commodities subject to an AMR is acceptable.

The applicant eliminated fuse holders (metallic clamps) from the electrical commodities with intended functions. The cables and connections commodity group includes fuse holders (fuse blocks). Consistent with NUREG-2191, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report,” XI.E5, “Fuse Holders,” the screening of fuse holder (metallic clamps) applies to those that are not part of a larger (active) assembly. Fuse holders inside the enclosure of an active component, such as switchgears, power supplies, power inverters, battery chargers, and circuit boards, are considered piece-parts of the larger assembly. The applicant noted that the results of its evaluations showed that there are no fuses at Point Beach that support a system level intended function that are not part of an active component such as switchgears, power supplies, power inverters, battery chargers, load centers, and circuit boards. Since piece-parts and subcomponents in such an enclosure are routinely inspected and regularly maintained as part of the plant’s normal maintenance and surveillance activities, the NRC staff finds that the exclusion of fuse holders (metal clamps) from the electrical commodities subject to an AMR is acceptable.

The applicant eliminated uninsulated ground conductors from the electrical commodities with intended functions. The uninsulated ground conductor component group is comprised of grounding cable and associated connectors. Ground conductors are provided for equipment and personnel protection. They do not perform an intended function for the subsequent license renewal. Therefore, uninsulated ground conductors are not within the scope of subsequent license renewal and are not subject to AMR. Based on its review of this information, the NRC staff finds that the exclusion of uninsulated ground conductors from the electric commodities subject to an AMR is acceptable.

The applicant noted that electrical and I&C components and commodities included in the EQ Program (10 CFR 50.49) are excluded because they have defined qualified lives and are replaced prior to the expiration of their qualified lives. Therefore, no electrical and I&C components and commodities within the EQ Program are subject to an AMR in accordance with the screening criterion of 10 CFR 54.21(a)(1)(ii). The applicant described the screening analysis for in-scope containment electrical and I&C penetrations that are managed by either the EQ Program or meet the criterion of 10 CFR 54.21(a)(1)(ii) and are subject to an AMR. The pressure boundary and structural support intended functions of electrical penetrations are included in the NRC staff’s evaluation of containment in SLRA Section 2.4.1 in SE Section 3.0.3.2.30.

The final results of applying screening criteria per 10 CFR 54.21(a)(1)(i) and 10 CFR 54.21(a)(1)(ii) and component types subject to AMR are listed in SLRA Table 2.5-2, “Electrical and Instrumentation and Control Systems Components Subject to Aging Management Review,” which contains the following list of passive component and commodity groups that the applicant determined were subject to an AMR:

- insulated cables and connections not included in the EQ Program
- electrical and I&C penetration assemblies not included in the EQ Program
- metal enclosed bus (for SBO recovery)
- High voltage insulators (for SBO recovery)
- switchyard bus and connections (for SBO recovery)
- transmission conductors and connections (for SBO recovery)

As a result of its review of the list of components subject to an AMR, the NRC staff finds that the electrical components identified by the applicant as being subject to an AMR are consistent with the SRP-SLR. The staff also finds that the applicant included all electrical and I&C components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1), because the listed electrical and I&C components meet the criteria in 10 CFR 54.21(a)(1)(i) and 10 CFR 54.21(a)(1)(ii). In addition, the staff finds that the inclusion of the electrical and I&C systems, electrical and I&C components in mechanical systems, and electrical equipment that supports the requirements of 10 CFR 50.63 within the scope of the subsequent license renewal satisfies the requirements in 10 CFR 54.4(a). Therefore, the staff finds that the applicant's scoping and screening for electrical and I&C system components is acceptable.

2.5.3 Conclusion

Based on the NRC 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 subsequent license renewal 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 NRC 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).

SECTION 3 AGING MANAGEMENT REVIEW RESULTS

This section of the safety evaluation (SE) contains the U.S. Nuclear Regulatory Commission (NRC or the Commission) staff's evaluation of the NextEra Energy Point Beach, LLC (NextEra or the applicant) aging management reviews (AMRs) and aging management programs (AMPs) for Point Beach Nuclear Plant, Units 1 and 2 (Point Beach or PBN). NextEra filed the application by letter dated November 16, 2020 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML20329A292), and supplemented by letters dated April 21, 2021 (ADAMS Accession No. ML21111A155), May 6, 2021 (ADAMS Accession No. ML21126A239), May 27, 2021 (ADAMS Accession No. ML21147A115), July 8, 2021 (ADAMS Accession No. ML21189A173), July 8, 2021 (ADAMS Accession No. ML21189A174), July 26, 2021 (ADAMS Accession No. ML21207A066), August 11, 2021 (ADAMS Accession No. ML21223A308), August 25, 2021 (ADAMS Accession No. ML21237A055), August 30, 2021 (ADAMS Accession No. ML21242A230), September 10, 2021 (ADAMS Accession No. ML21253A138), September 10, 2021 (ADAMS Accession No. ML21253A140), September 13, 2021 (ADAMS Accession No. ML21256A129),September 16, 2021 (ADAMS Accession No. ML21259A153), September 20, 2021 (ADAMS Accession No. ML21263A052), October 1, 2021 (ADAMS Accession No. ML21274A053), October 25, 2021 (ADAMS Accession No. ML21298A090), November 3, 2021 (ADAMS Accession No. ML21307A286), November 4, 2021 (ADAMS Accession No. ML21308A282), November 4, 2021 (ADAMS Accession No. ML21308A283), November 23, 2021 (ADAMS Accession No. ML21327A077), November 30, 2021 (ADAMS Accession No. ML21334A293), December 9, 2021 (ADAMS Accession No. ML21343A294), January 6, 2022 (ADAMS Accession No. ML22006A074), and January 6, 2022 (ADAMS Accession No. ML222006A046).

NextEra described these AMRs and AMPs in its subsequent license renewal application (SLRA) for PBN. 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 48 AMPs that the applicant will rely on to manage or monitor the aging of passive, long-lived SCs.

The NRC 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)
Electrical and Instrumentation and Controls (SE Section 3.6)

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

In preparing its SLRA, the applicant credited NUREG-2191, Revision 0, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," issued July 2017 (ADAMS Accession Nos. ML17187A031 and ML17187A204) (GALL-SLR Report), for AMPs and AMR items. The NRC may issue a subsequent renewed license, in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 54.29(a)(1), if it finds that the applicant has or will take 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). The GALL-SLR Report summarizes generic AMPs that the NRC staff has determined would be adequate to manage the effects of aging on related SCs subject to an AMR. The GALL-SLR Report identifies the following related to AMPs:

- structures, systems, and components (SSCs)
- SC materials
- environments to which the SCs are exposed
- aging effects associated with the material and environment combinations
- AMPs credited with managing or monitoring these aging effects
- recommendations for further evaluation of combinations of certain materials, environments, and aging effects

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 (ADAMS Accession No. 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 (ADAMS Accession No. 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 (ADAMS Accession No. 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 PBN 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 PBN. 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 NRC staff conducted the following three types of evaluations of NextEra'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. Because the GALL-SLR Report AMPs and AMR analyses are one acceptable method for managing the effects of aging, 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. In addition, 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, 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 NRC staff conducted a regulatory audit from January 19, 2021, to March 26, 2021, in accordance with the audit plan dated January 15, 2021 (ADAMS Accession No. ML21007A260) and as detailed in the Audit Report dated August 16, 2021 (ADAMS Accession No. ML21208A447).

These audits and technical reviews were conducted to determine if the NRC 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 NRC 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) "preventive actions"—should prevent or mitigate aging degradation.

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

(4) "detection of aging effects"—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) "monitoring and trending"—should provide predictability of the extent of degradation, as well as timely corrective or mitigative actions.

(6) "acceptance criteria"—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.

(7) "corrective actions"—should include root cause determination and prevention of recurrence and should be timely.

(8) "confirmation process"—should ensure that corrective actions have been completed and are effective.

(9) "administrative controls"—should provide for a formal review and approval.

(10) "operating experience"—should add the operating experience 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. Operating experience with existing programs should be discussed.

In addition, the ongoing review of both plant-specific and industry operating experience, 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 operating experience that the effects of aging may not be adequately managed.

Details of the NRC 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 NRC staff reviewed the applicant's quality assurance (QA) Program and documented its 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 (i.e., program elements 7, 8, and 9).

The NRC staff reviewed the information on the "operating experience" program element (i.e., program element 10) and documented its 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 NRC 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 NRC staff determined, on the basis of its 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 NRC 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 NRC 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. However, the AMP takes one or more exceptions to the GALL-SLR Report AMP. The NRC 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 NRC 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. However, note D is used to indicate that the applicant has taken one or more exceptions to the GALL-SLR Report AMP. The NRC 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 NRC 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

In 10 CFR 54.21(d), the NRC requires that each application include an updated final safety analysis report (UFSAR) supplement for the facility that must contain 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 NRC staff reviewed the UFSAR supplement.

3.0.2.4 Documentation and Documents Reviewed

In performing its review, the NRC 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 NRC 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 NRC 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 Point Beach Aging Management Programs

Point Beach 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	16.2.1.1 B.2.2.1	Existing	Consistent with enhancements	X.M1 Fatigue Monitoring	3.0.3.2.1
Neutron Fluence Monitoring	16.2.1.2 B.2.2.2	Existing	Consistent with enhancements	X.M2 Neutron Fluence Monitoring	3.0.3.2.2
Concrete Containment Unbonded Tendon Prestress	16.2.1.3 B.2.2.3	Existing	Consistent with enhancements	X.S1 Concrete Containment Tendon Prestress	3.0.3.2.3
Environmental Qualification of Electric Equipment	16.2.1.4 B.2.2.4	Existing	Consistent with enhancements	X.E1 Environmental Qualification (EQ) of Electric Components	3.0.3.2.4

Point Beach 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
ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	16.2.2.1 B.2.3.1	Existing	Consistent with enhancements	XI.M1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	3.0.3.2.5
Water Chemistry	16.2.2.2 B.2.3.2	Existing	Consistent with exception and enhancement	XI.M2 Water Chemistry as modified by SLR-ISG-2021-02 MECHANICAL,	3.0.3.2.6
Reactor Head Closure Stud Bolting	16.2.2.3 B.2.3.3	Existing	Consistent with exception and enhancement	XI.M3 Reactor Head Closure Stud Bolting	3.0.3.2.7
Boric Acid Corrosion	16.2.2.4 B.2.3.4	Existing	Consistent with enhancement	XI.M10 Boric Acid Corrosion	3.0.3.2.8
Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components	16.2.2.5 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)	3.0.3.2.9
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel	16.2.2.6 B.2.3.6	New	Consistent	XI.M12 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	3.0.3.1.1
Reactor Vessel Internals	16.2.2.7 B.2.3.7	Existing	Consistent with enhancements	XI.M16A PWR Vessel Internals, as modified by SLR-ISG-2021-01-PWRVI	3.0.3.2.10
Flow-Accelerated Corrosion	16.2.2.8 B.2.3.8	Existing	Consistent with enhancements	XI.M17 Flow-Accelerated Corrosion	3.0.3.2.11
Bolting Integrity	16.2.2.9 B.2.3.9	Existing	Consistent with enhancements	XI.M18 Bolting Integrity	3.0.3.2.12
Steam Generators	16.2.2.10 B.2.3.10	Existing	Consistent with exception and enhancements	XI.M19 Steam Generators	3.0.3.2.13
Open-Cycle Cooling Water System	16.2.2.11 B.2.3.11	Existing	Consistent with exception and enhancements	XI.M20 Open-Cycle Cooling Water System	3.0.3.2.14
Closed Treated Water Systems	16.2.2.12 B.2.3.12	Existing	Consistent with enhancements	XI.M21A Closed Treated Water Systems, as modified by SLR-ISG-2021-02-MECHANICAL	3.0.3.2.15

Point Beach 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
Inspection of Overhead Heavy Load Handling Systems	16.2.2.13 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	3.0.3.2.16
Compressed Air Monitoring	16.2.2.14 B.2.3.14	Existing	Consistent with enhancements	XI.M24 Compressed Air Monitoring	3.0.3.2.17
Fire Protection	16.2.2.15 B.2.3.15	Existing	Consistent with enhancements	XI.M26 Fire Protection	3.0.3.2.18
Fire Water System	16.2.2.16 B.2.3.16	Existing	Consistent with enhancements	XI.M27 Fire Water System	3.0.3.2.19
Outdoor and Large Atmospheric Metallic Storage Tanks	16.2.2.17 B.2.3.17	Existing	Consistent with enhancements	XI.M29 Outdoor and Large Atmospheric Metallic Storage Tanks	3.0.3.2.20
Fuel Oil Chemistry	16.2.2.18 B.2.3.18	Existing	Consistent with exception and enhancements	XI.M30 Fuel Oil Chemistry	3.0.3.2.21
Reactor Vessel Material Surveillance	16.2.2.19 B.2.3.19	Existing	Consistent with exceptions	XI.M31 Reactor Vessel Material Surveillance	3.0.3.2.22
One-Time Inspection	16.2.2.20 B.2.3.20	Existing	Consistent with enhancements	XI.M32 One-Time Inspection	3.0.3.2.23
Selective Leaching	16.2.2.21 B.2.3.21	New	Consistent	XI.M33 Selective Leaching	3.0.3.1.2
ASME Code Class 1 Small-Bore Piping	16.2.2.22 B.2.3.22	Existing	Consistent with enhancements	XI.M35 ASME Code Class 1 Small-Bore-Piping	3.0.3.2.24
External Surfaces Monitoring of Mechanical Components	16.2.2.23 B.2.3.23	Existing	Consistent with enhancements	XI.M36 External Surfaces Monitoring of Mechanical Components	3.0.3.2.25
Flux Thimble Tube Inspection	16.2.2.24 B.2.3.24	Existing	Consistent with enhancements	XI.M37 Flux Thimble Tube Inspection	3.0.3.2.26
Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	16.2.2.25 B.2.3.25	New	Consistent	XI.M38 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	3.0.3.1.3
Lubricating Oil Analysis	16.2.2.26 B.2.3.26	Existing	Consistent with enhancements	XI.M39 Lubricating Oil Analysis	3.0.3.2.27
Buried and Underground Piping and Tanks	16.2.2.27 B.2.3.27	Existing	Consistent with exceptions and enhancements	XI.M41 Buried and Underground Piping and Tanks	3.0.3.2.28

Point Beach 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
Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	16.2.2.28 B.2.3.28	New	Consistent with exception	XI.M42 Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks, as modified by SLR-ISG-2021-02-MECHANICAL	3.0.3.2.29
ASME Section XI, Subsection IWE	16.2.2.29 B.2.3.29	Existing	Consistent with enhancements	XI.S1 ASME Section XI, Subsection IWE Inservice Inspection	3.0.3.2.30
ASME Section XI, Subsection IWL	16.2.2.30 B.2.3.30	Existing	Consistent with enhancements	XI.S2 ASME Section XI, Subsection IWL Inservice Inspection	3.0.3.2.31
ASME Section XI, Subsection IWF	16.2.2.31 B.2.3.31	Existing	Consistent with exception and enhancements	XI.S3 ASME Section XI, Subsection IWF Inservice Inspection	3.0.3.2.32
10 CFR Part 50, Appendix J	16.2.2.32 B.2.3.32	Existing	Consistent	XI.S4 10 CFR Part 50, Appendix J	3.0.3.1.4
Masonry Walls	16.2.2.33 B.2.3.33	Existing	Consistent with enhancements	XI.S5 Masonry Walls	3.0.3.2.33
Structures Monitoring	16.2.2.34 B.2.3.34	Existing	Consistent with enhancements	XI.S6 Structures Monitoring	3.0.3.2.34
Inspection of Water-Control Structures Associated with Nuclear Power Plants	16.2.2.35 B.2.3.35	Existing	Consistent with enhancements	XI.S7 Inspection of Water-Control Structures Associated with Nuclear Power Plants	3.0.3.2.35
Protective Coating Monitoring and Maintenance	16.2.2.36 B.2.3.36	Existing	Consistent with enhancement	XI.S8 Protective Coating Monitoring and Maintenance, as modified by SLR-ISG-2021-03-STRUCTURES	3.0.3.2.36
Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	16.2.2.37 B.2.3.37	Existing	Consistent with enhancements	XI.E1 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.2.37

Point Beach 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 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements used in Instrumentation Circuits	16.2.2.38 B.2.3.38	Existing	Consistent with enhancements	XI.E2 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	3.0.3.2.38
Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	16.2.2.39 B.2.3.39	Existing	Consistent with enhancements	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	3.0.3.2.39
Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	16.2.2.40 B.2.3.40	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	3.0.3.1.5
Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	16.2.2.41 B.2.3.41	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	3.0.3.1.6
Metal Enclosed Bus	16.2.2.42 B.2.3.42	New	Consistent	XI.E4 Metal Enclosed Bus	3.0.3.1.7

Point Beach 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 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	3.0.3.1.8
High-Voltage Insulators	16.2.2.44 B.2.3.44	New	Consistent	XI.E7 High-Voltage Insulators New AMP, as modified by SLR-ISG-2021-04-ELECTRICAL	3.0.3.1.9

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:

- Thermal Aging Embrittlement of Cast Austenitic Stainless Steel
- Selective Leaching
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components
- 10 CFR Part 50, Appendix J
- Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification (EQ) Requirements
- Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements
- Metal Enclosed Bus
- Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements
- High-Voltage Insulators

In the following sections, the NRC 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, operating experience, and a review of the applicant's UFSAR supplement summary of the program.

3.0.3.1.1 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel

SLRA Section B.2.3.6 describes the new Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP as consistent with GALL-SLR Report AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)."

Staff Evaluation. During its audit, the NRC 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 to the corresponding program elements of GALL-SLR Report AMP XI.M12.

For the “detection of aging effects” program element, NextEra chose a flaw tolerance method to demonstrate that the susceptible CASS elbows main loop piping have tolerance for large flaws for the duration of the subsequent period of extended operation. SE Section 4.7.3 provides the staff’s review of NextEra’s flaw tolerance evaluation TLAA for the reactor coolant loop CASS piping elbows.

The NRC 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.M12.

Operating Experience. SLRA Section B.2.3.6 summarizes operating experience related to the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff conducted an independent search of the plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective actions 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 NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.6, provides the UFSAR supplement for the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP. The NRC 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 implementing the new Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP no later than 6 months before 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 its review of the applicant’s Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP, the NRC 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 Selective Leaching

SLRA Section B.2.3.21 describes the new Selective Leaching AMP as consistent with GALL-SLR Report AMP XI.M33, "Selective Leaching." The applicant amended this SLRA section by letter dated September 10, 2021 (ADAMS Accession No. ML21253A140).

Staff Evaluation. During its audit, the NRC 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 to the corresponding program elements of GALL-SLR Report AMP XI.M33.

For the "scope of program" program element, the NRC staff determined the need for additional information on why buried components can be excluded from the scope of the Selective Leaching AMP based on preventive measures (i.e., external coatings and cathodic protection), which resulted in the issuance of an RAI. RAI B.2.3.21-1 and the applicant's response are documented in ADAMS Accession Nos. ML21242A239 and ML21253A140, respectively.

In its response, the applicant revised SLRA Section B.2.3.21 to include the following statement:

> NUREG-2191, Section XI.M33, Element 1 allows the external surfaces of buried components to be excluded from the scope of the program if they are externally coated in accordance with NUREG-2191, Table XI.M41-1 and inspections show no coating damage OR if they are buried gray cast iron or ductile iron components cathodically protected since installation and meet the NUREG-2191, Table XI.M41-2 criteria for Preventive Category C. However, since portions of the buried piping are not coated and the buried piping is not completely cathodically protected and does not meet Preventive Category C, such exclusions will not be used.

The NRC staff finds the applicant's response and changes to SLRA Section B.2.3.21 acceptable because buried components will not be excluded from the scope of the Selective Leaching AMP based on preventive measures; therefore, the staff's concerns described in RAI B.2.3.21-1 have been appropriately addressed.

For the "detection of aging effects" program element, the NRC staff determined the need for additional information on the basis for using the extent of inspections in GALL-SLR Report AMP XI.M33 for gray cast iron piping and piping components exposed to soil, which resulted in the issuance of an RAI. The staff's issuance of the RAI was based on recent operating experience documented in NRC Information Notice (IN) 2020-04, "Operating Experience Related to Failure of Buried Fire Protection Main Yard Piping" (ADAMS Accession No. ML20223A333), which documented a failure of buried gray cast iron piping due to graphitic corrosion (i.e., selective leaching). RAI B.2.3.21-2 and the applicant's response are documented in ADAMS Accession Nos. ML21242A239 and ML21253A140, respectively.

In its response, the applicant stated, in part:

- The OE [operating experience] review provided within SLRA Section B.2.3.27 [Buried and Underground Piping and Tanks] was inclusive of all buried components, including components outside the scope of SLR. In 2009 and 2012, during fire protection piping excavations, hardness testing was performed to detect potential selective leaching. In both instances, the hardness was satisfactory. No aging-related failures were identified for buried piping or tank components…. The OE review indicated that when excavations were performed in 2009, 2012, 2015, and 2016, the corrosion rate was either determined to be negligible or no evidence of wall loss was identified.

- A 2009 analysis of soil samples in the immediate vicinity of the buried fire protection system piping, some of which is gray cast iron … indicated that resistivity was within the 13,800-16,600 Ohm-cm range, redox potential had a range of 81.9-172 mV, the soil pH was 7.9, chlorides were measured at 31.8 mg/kg, sulfides were within a range of 11.6-13.4 mg/kg, and moisture content was at 19.1 percent.
- A 2012 soil analysis was performed on soil near the original construction fire protection main ring header, some of which was gray cast iron. The sample results indicated the resistivity to be 6740 Ohm-cm, the redox potential to be 107 mV, the soil pH was 8.6, chlorides were measured at 22.4 mg/kg, sulfides were within a range of 1.1 to 1.2 mg/kg, and moisture content was at 7.9 percent.

During its evaluation of the applicant's response to RAI B.2.3.21-2, the NRC staff noted the following: (a) the previous version of AMP XI.M33 (i.e., in NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report" (ADAMS Accession No. ML103490041), which was issued in 2010) recommended hardness testing to detect selective leaching of cast iron components, (b) GALL-SLR Report Table XI.M41-2, "Inspection of Buried and Underground Piping and Tanks," references American Water Works Association (AWWA) C105, "Polyethylene Encasement for Ductile-Iron Pipe Systems," Table A.1, "Soil-Test Evaluation," with respect to determining soil corrosivity, (c) gray cast iron and ductile iron exhibit similar corrosion rate behavior in a soil environment (i.e., the staff considers AWWA C105, Table A.1 applicable to gray cast iron, in addition to ductile iron), (d) AWWA C105, Table A.1 uses the soil parameters of soil resistivity, pH, redox potential, sulfides, and moisture to determine the overall soil corrosivity index, and (e) AWWA C105, Table A.1 indicates that soil is considered corrosive when the soil corrosivity index is 10 points or greater. The staff finds the applicant's justification for using the extent of inspections in GALL-SLR Report AMP XI.M33 for gray cast iron piping and piping components exposed to soil acceptable based on the following reasons: (a) inspections performed in 2009 and 2012 (using a method capable of detecting selective leaching per GALL Report, Revision 2 guidance) did not detect selective leaching, (b) the operating experience review performed between 2009 and 2016 did not identify any instances of significant wall loss for buried components, and (c) the soil analyses performed in 2009 and 2012 indicated noncorrosive soil conditions per GALL-SLR Report AMP XI.M41 guidance (i.e., the soil corrosivity index was less than 10 points per AWWA C105, Table A.1).

The NRC 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 the applicant's responses to RAI B.2.3.21-1 and RAI 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.

<u>Operating Experience</u>. SLRA Section B.2.3.21 summarizes operating experience related to the Selective Leaching AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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 NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program beyond that incorporated during the staff's review of the SLRA. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Selective Leaching AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.21, provides the UFSAR supplement for the Selective Leaching AMP. The NRC 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 implementing the new Selective Leaching AMP no later than 6 months before the subsequent period of extended operation, or no later than the last refueling outage before the subsequent period of extended operation, for managing the effects of aging for applicable components. The staff also noted that the applicant committed to performing the one-time inspections no earlier than 10 years before the subsequent period of extended operation and no later than 6 months before 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 its review of the applicant's Selective Leaching AMP, the NRC 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).

3.0.3.1.3 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

SLRA Section B.2.3.25 describes the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP as consistent with GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components." The applicant amended this SLRA section by letters dated April 21, 2021 (ADAMS Accession No. ML21111A155) and May 6, 2021 (ADAMS Accession No. ML21126A239). The NRC staff noted that the May 6, 2021, letter incorporated changes related to recurring internal corrosion, which is addressed in SE Sections 3.3.2.2.7 and 3.4.2.2.6.

Staff Evaluation. During its audit, the NRC 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.M38.

For the "detection of aging effects" program element, the NRC staff determined the need for additional information on why cracking of copper-alloy components containing greater than 15 percent zinc is not addressed in SLRA Section B.2.3.25. The applicant provided a supplement on April 21, 2021, revising SLRA Section B.2.3.25 to state that the program also manages cracking of copper alloy containing greater than 15 percent zinc components.

Therefore, the staff's concern related to the "detection of aging effects" program element is resolved.

The NRC 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 letters dated April 21, 2021, and May 6, 2021, 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. As amended by letter dated May 6, 2021, SLRA Section B.2.3.25 summarizes operating experience related to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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 NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.25, provides the UFSAR supplement for the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP. The NRC staff reviewed this UFSAR supplement description of the program against the recommended description for this type of program as described in GALL-SLR Report Table XI-01 and determined the need for additional information on why (a) surface examinations or American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Section XI VT-1 examinations are not being credited to manage cracking of copper-alloy components containing greater than 15 percent zinc, and (b) surface examinations are not being credited to manage loss of material (in addition to cracking) of stainless steel (SS) components. The applicant addressed the staff's concerns (by letter dated April 21, 2021) by revising SLRA Appendix A, Section 16.2.2.25, to reflect that (a) surface examinations or ASME Code Section XI VT-1 examinations will be used to manage cracking of copper-alloy components containing greater than 15 percent zinc, and (b) surface examinations will be used to manage loss of material of SS components. With this supplemental response, the staff finds that the UFSAR supplement for the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP is consistent with the corresponding program description in GALL-SLR Report Table XI-01.

The NRC staff also noted that the applicant committed to implementing the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP no later than 6 months before the subsequent period of extended operation, or no later than the last refueling outage before the subsequent period of extended operation, for managing the effects of aging for applicable components. The staff also noted that the applicant committed to performing an internal inspection of the PBN Unit 1 residual heat removal flow control valves within the next two refueling outages. The staff finds that the information in the UFSAR supplement, as amended by letters dated April 21, 2021, and May 6, 2021, is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP, the NRC 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).

3.0.3.1.4 10 CFR Part 50, Appendix J

SLRA Section B.2.3.32 describes the existing 10 CFR Part 50, Appendix J AMP as consistent with GALL-SLR Report AMP XI.S4, "10 CFR Part 50, Appendix J." The applicant amended this SLRA section by Attachment 25 of Supplement 1 dated April 21, 2021 (ADAMS Accession No. ML21111A155).

Staff Evaluation. During its audit, the NRC 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 NRC 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 amendments, 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.2.3.32 summarizes operating experience related to the 10 CFR Part 50, Appendix J AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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 NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the 10 CFR Part 50, Appendix J AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.32, provides the UFSAR supplement for the 10 CFR Part 50, Appendix J AMP. The NRC 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 NRC staff also noted that the applicant committed to ongoing implementation of the existing 10 CFR Part 50, Appendix J AMP (Commitment No. 36) for managing the effects of aging for applicable components during the subsequent period of extended operation.

The NRC staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's 10 CFR Part 50, Appendix J AMP, the NRC 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).

3.0.3.1.5 Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

SLRA Section B.2.3.40 describes the new Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP as consistent with the program elements in the GALL-SLR Report AMP XI.E3B, "Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," as modified by SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance" (ADAMS Accession No. ML20181A395). The applicant supplemented this SLRA section, as well as Appendix A, Section 16.2.2.40, by letter dated April 21, 2021.

Staff Evaluation. During its audit, the NRC 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.E3B, as modified by SLR-ISG-2021-04-ELECTRICAL.

The NRC 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.E3B, as modified by SLR-ISG-2021-04-ELECTRICAL.

Operating Experience. SLRA Section B.2.3.40 summarizes operating experience related to the Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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 NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.40, provides the UFSAR supplement for the Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP. The NRC 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 implementing the program no later than 6 months before 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 its review of the applicant's Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP, the NRC 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 Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

SLRA Section B.2.3.41 describes the new Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP 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. The applicant supplemented this SLRA section, as well as Appendix A, Section 16.2.2.41, by letter dated April 21, 2021.

Staff Evaluation. During its audit, the NRC 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.E3C, as modified by SLR-ISG-2021-04-ELECTRICAL.

The NRC staff conducted an audit to verify the applicant 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.E3C, as modified by SLR-ISG-2021-04-ELECTRICAL.

Operating Experience. SLRA Section B.2.3.41 summarizes operating experience related to the Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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 NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience 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 AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.41, provides the UFSAR supplement for the Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP. The NRC 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. The staff also noted that the applicant committed to implementing the program no later than 6 months before 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 its review of the applicant's Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP, the NRC 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).

3.0.3.1.7 Metal Enclosed Bus

SLRA Section B.2.3.42 describes the new Metal Enclosed Bus AMP as consistent with GALL-SLR Report AMP XI.E4, "Metal Enclosed Bus."

Staff Evaluation. During its audit, the NRC 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.E4.

The NRC 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.E4.

Operating Experience. SLRA Section B.2.3.42 summarizes operating experience related to the Metal Enclosed Bus AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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 NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Metal Enclosed Bus AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.42, provides the UFSAR supplement for the Metal Enclosed Bus AMP. The NRC 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 implementing the program no later than 6 months before 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 its review of the applicant's Metal Enclosed Bus AMP, the NRC 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 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

SLRA Section B.2.3.43 describes the new Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP as consistent with GALL-SLR Report AMP XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Staff Evaluation. During its audit, the NRC 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.E6.

The NRC 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.E6.

Operating Experience. SLRA Section B.2.3.43 summarizes operating experience related to the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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 NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.43, provides the UFSAR supplement for the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP. The NRC staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in the GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to implementing the new Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP no later than 6 months before the subsequent period of 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 its review of the applicant's Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP, the NRC 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).

3.0.3.1.9 High-Voltage Insulators

SLRA Section B.2.3.44 describes the new High-Voltage Insulators AMP as consistent with GALL-SLR Report AMP XI.E7, "High-Voltage Insulators" as modified by SLR-ISG-2021-04-ELECTRICAL. Regarding SLR-ISG-2021-04-ELECTRICAL, the SLRA stated that PBN does not have polymer and toughened glass high-voltage insulators within the scope of SLR. The SLRA also stated that PBN does not have any medium-voltage insulators within the scope of SLR.

Staff Evaluation. During its audit, the NRC staff reviewed the applicant's claim of consistency with the GALL-SLR Report as modified by SLR-ISG-2021-04-ELECTRICAL. 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.E7, as modified by SLR-ISG-2021-04-ELECTRICAL.

The NRC 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. 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.E7, as modified by SLR-ISG-2021-04-ELECTRICAL. The staff confirmed that PBN does not have polymer and toughened glass high-voltage insulators within the scope of SLR. The staff also confirmed that PBN does not have any in-scope medium-voltage insulators. Therefore, the provisions of SLR-ISG-2021-04-ELECTRICAL do not apply to PBN.

Operating Experience. SLRA Section B.2.3.44 summarizes operating experience related to the High-Voltage Insulators AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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 NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the High-Voltage Insulators AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.44, provides the UFSAR supplement for the High-Voltage Insulators AMP. The NRC staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in the GALL-SLR Report Table XI-01, as modified by SLR-ISG-2021-04-ELECTRICAL. The staff also noted that the applicant committed to implementing the new High-Voltage Insulators AMP no later than 6 months before the subsequent period of 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 its review of the applicant's High-Voltage Insulators AMP, the NRC 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 supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2 AMPs Consistent with the GALL-SLR Report with Exceptions or Enhancements or Both

In SLRA Appendix B, the applicant stated that the following AMPs are, or will be, consistent with the GALL-SLR Report, with exceptions or enhancements:

- Fatigue Monitoring
- Neutron Fluence Monitoring
- Concrete Containment Unbonded Tendon Prestress
- Environmental Qualification of Electric Equipment
- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- Water Chemistry
- Reactor Head Closure Stud Bolting
- Boric Acid Corrosion
- Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components
- Reactor Vessel Internals
- Flow-Accelerated Corrosion
- Bolting Integrity
- Steam Generators
- Open-Cycle Cooling Water System
- Closed Treated Water Systems
- Inspection of Overhead Heavy Load Handling Systems
- Compressed Air Monitoring
- Fire Protection
- Fire Water System
- Outdoor and Large Atmospheric Metallic Storage Tanks
- Fuel Oil Chemistry
- Reactor Vessel Material Surveillance
- One-Time Inspection
- ASME Code Class 1 Small-Bore Piping
- External Surfaces Monitoring of Mechanical Components
- Flux Thimble Tube Inspection
- Lubricating Oil Analysis
- Buried and Underground Piping and Tanks
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks

- ASME Section XI, Subsection IWE
- ASME Section XI, Subsection IWL
- ASME Section XI, Subsection IWF
- Masonry Walls
- Structures Monitoring
- Inspection of Water-Control Structures Associated with Nuclear Power Plants
- Protective Coating Monitoring and Maintenance
- Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements
- Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits
- Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements

For AMPs that the applicant claimed are consistent with the GALL-SLR Report with exception(s) and/or enhancement(s), the NRC staff performed an audit and review to confirm that those attributes or features of the program for which the applicant claimed consistency with the GALL-SLR Report are indeed consistent. The staff reviewed the exceptions to the GALL-SLR Report to determine whether they are acceptable and adequate. The staff also reviewed the enhancements to determine whether they will make the AMP consistent with the GALL-SLR Report AMP to which it is compared. The results of the staff's audits and reviews are documented in the following sections.

3.0.3.2.1 Fatigue Monitoring

SLRA Section B.2.2.1 states that the Fatigue Monitoring AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP X.M1, "Fatigue Monitoring." The applicant amended this SLRA section by letters dated August 11, 2021; August 25, 2021; and November 3, 2021 (ADAMS Accession Nos. ML21223A308, ML21237A055, and ML21307A286, respectively).

Staff Evaluation. During its audit, the NRC 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 X.M1.

For the "parameters monitored or inspected" program element, the NRC staff determined the need for additional information, which resulted in the issuance of RAI B.2.2.1-1. The applicant's responses are documented in ADAMS Accession Nos. ML21223A308 and ML21307A286. The staff noted that SLRA Table 4.3.1-1 addressed the design transient cycles for the reactor vessel internal baffle former bolts, which will be used for fatigue monitoring. However, the transient cycles in SLRA Table 4.3.1-1 were not consistent with those in SLRA Appendix A (the UFSAR supplement), Table 4.1-8 that are based on the existing fatigue analysis for the baffle former bolts. SLRA Appendix A, Table 4.1-8 identifies the more limiting transient cycles that are specific to the baffle former bolts and these more liming cycles are not addressed in SLRA Table 4.3.1-1.

In its response, the applicant revised SLRA Table 4.3.1-1 to identify the more limiting transient cycles that are specific to the baffle former bolts. As part of the revision, the applicant added notes to SLRA Table 4.3.1-1 to clarify that the more limiting transient cycles are applied to the baffle former bolts in comparison to the transient cycles for the other ASME Code Class 1 components. The NRC staff finds the applicant's response and revision acceptable because the revision to SLRA Table 4.3.1-1 identifies the more limiting transient cycles that are specific to the baffle former bolts, consistent with SLRA Appendix A, Table 4.1-8.

For the "monitoring and trending" program element, the NRC staff determined the need for additional information, which resulted in the issuance of RAI B.2.2.1-2 and the applicant's responses are documented in ADAMS Accession No. ML21237A055. The staff noted that the applicant will no longer use a stress-based monitoring method for the subsequent period of extended operation. The staff found a need to clarify why the manual count method is sufficient to monitor fatigue cycles for the pressurizer surge line subject to thermal stratification.

In its response, the applicant explained that the thermal transient monitoring data for the pressurizer surge line has been extensively reviewed and, consistent with the review results, significantly conservative transient definitions are used in the fatigue analysis for the pressurizer surge line. The applicant also clarified that the idealized insurge/outsurge transients associated with thermal stratification were developed in response to NRC Bulletin 88-11, "Pressurizer Surge Line Thermal Stratification," and are documented in Westinghouse Commercial Atomic Power (WCAP)-13510, "Structural Evaluation of the Point Beach Units 1 & 2 Pressurizer Surge Lines, Considering the Effects of Thermal Stratification." The applicant further indicated that the analysis in the WCAP report is the analysis of record for the Point Beach plant.

The NRC staff noted that these transient definitions, including transient cycles, conservatively bound plant-specific operating conditions and practices. For example, the applicant's fatigue analysis for the pressurizer surge line uses a maximum delta T (i.e., the maximum temperature difference between pressurizer and reactor coolant system hot leg) greater than 300 °F. This maximum delta T is significantly higher than actual delta T of the pressurizer surge line, which is in the range from 160 °F to 220 °F during the plant operation.

The NRC staff finds the applicant's response and related discussion acceptable because (1) the insurge/outsurge transients associated with thermal stratification are defined in WCAP-13510, which is the analysis of record for the applicant's fatigue analysis on the pressurizer surge line, (2) the transient definitions including the cycle numbers are conservatively bounding for the actual transients of insurge/outsurge, as demonstrated by the actual transient data from the plant operation, and (3) these insurge/outsurge transient cycles are based on the design cycles (e.g., heatup and cooldown transient cycles), which are specified in SLRA Table 4.3.1-1 and monitored by the Fatigue Monitoring AMP.

The NRC staff also reviewed the portions of the "parameters monitored or inspected" and "monitoring and trending" program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these enhancements follows.

Enhancement 1. SLRA Section B.2.2.1 includes an enhancement to the "parameters monitored or inspected" program element. The enhancement relates to updating the implementing procedure of the Fatigue Monitoring AMP to monitor the chemistry parameters that provide inputs to environmental correction factors (F_{en}) used in the environmental fatigue usage (CUF_{en}) calculations.

The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.M1 and finds it acceptable because, when it is implemented, it will ensure that the implementing procedure of the Fatigue Monitoring AMP uses the water chemistry parameters (e.g., dissolved oxygen), as tracked and monitored in the Water Chemistry AMP, in the F_{en} and CUF_{en} calculations. The staff's safety evaluation of the Water Chemistry AMP is documented in SE Section 3.0.3.2.6.

Enhancement 2. SLRA Section B.2.2.1 includes another enhancement to the "parameters monitored or inspected" program element. The enhancement relates to updating the implementing procedure of the Fatigue Monitoring AMP to require monitoring of the 80-year plant design cycles that are utilized as inputs to component CUF_{en} calculations.

The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.M1 and finds it acceptable because, when it is implemented, it will ensure that the implementing procedure of the Fatigue Monitoring AMP specifies and monitors the transient cycles in the CUF_{en} calculations for the subsequent period of extended operation and will ensure that the CUF_{en} calculations do not exceed the design limit (i.e., 1.0).

Enhancement 3. SLRA Section B.2.2.1, as supplemented on August 11, 2021 and November 3, 2021, includes an enhancement to the "parameters monitored or inspected" program element. The enhancement relates to updating the implementing procedure of the Fatigue Monitoring AMP to include monitoring of "feedwater cycling at hot standby" and "boron concentration equilibrium" transients to ensure that they remain within design cycle limits.

In its supplement dated August 11, 2021, the applicant indicated that the actual temperature excursion of the "feedwater cycling at hot standby" transient is 4.5 °F on average, which is significantly less than the temperature excursion specified in the design transient definition (60 °F). The applicant also clarified that 12 cycles of the "feedwater cycling at hot standby" transient occur per each cycle of the plant startup and shutdown operation.

The NRC staff noted that the actual severity of the transient is lower than the design transient severity by a factor of at least 12 (4.5 °F versus 60 °F). The staff also noted that, since 12 cycles of the "feedwater cycling at hot standby" transient occur per each cycle of startup and shutdown operation, the 80-year projected cycle number of the "feedwater cycling at hot standby" transient is approximately 1440 cycles (12 cycles x 120 startup and shutdown cycles for 80 years). The projected cycle number is less than the design cycles (2000 cycles). Therefore, the staff finds that the applicant can effectively monitor the "feedwater cycling at hot standby" transient cycles to ensure that the actual cycles do not exceed the design transient cycles. The staff also finds that this evaluation is very conservative because the actual severity of the transient is significantly less than the severity of the design transient as discussed above.

In its supplement dated August 11, 2021, the applicant also clarified that, for the "boron concentration equilibrium" transient, an average of one equilibrium design cycle per month is bounding for the current operation and subsequent period of extended operation except for the cycle number for the first 20 years of operation when the plant performed load following operation. The applicant explained that, for the first 20 years of operation, the cycle number is conservatively determined to be two cycles per day.

The NRC staff noted that, based on these cycle numbers for the first 20 years of operation and the rest of the plant operation up to 80 years (20 to 80 years), the 80-year projected cycle number of the “boron concentration equilibrium” transient is 15320 cycles ((2 cycles per day x 365 days per year x 20 years) + (1 cycle per month x 12 months per year x 60 years)). This 80-year projected cycle number is significantly less than the design cycles (23360 cycles). Therefore, the staff finds that the applicant can effectively monitor the “boron concentration equilibrium” transient cycles to ensure that the actual cycles do not exceed the design transient cycles.

The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.M1 and finds it acceptable because, when it is implemented, it will ensure that the implementing procedure of the program includes the “feedwater cycling at hot standby” and “boron concentration equilibrium” transients and that the design cycles for these transients are not exceeded during the subsequent period of extended operation.

Enhancement 4. SLRA Section B.2.2.1, as supplemented on November 3, 2021, includes an enhancement to the “parameters monitored or inspected” program element. The enhancement relates to updating the implementing procedure of the program to include monitoring of the pressurizer spray transient group cycles to ensure that they remain within the cycle limit (225 cycles) for each 10-year interval for the ASME Code, Section XI, Appendix L flaw tolerance evaluation of the pressurizer spray nozzles. As discussed in Appendix A of Westinghouse LTR-SDA-20-064-NP, Revision 1, the pressurizer spray transient group cycles are counted if a pressurizer main spray valve is opened from the fully-closed position when the plant is in the power operation or startup mode.

The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.M1 and finds it acceptable because, when it is implemented, it will ensure that (1) the program monitors the pressurizer spray transient group cycles that are used in the flaw tolerance evaluation of the pressurizer spray nozzles, and (2) the actual cycles meet the cycle limit for the 10-year interval of the flaw tolerance evaluation so that the flaw tolerance evaluation remains valid for the subsequent period of extended operation.

Enhancement 5. SLRA Section B.2.2.1 includes an enhancement to the “monitoring and trending” program element. The enhancement relates to updating the implementing procedure of the Fatigue Monitoring AMP to identify the corrective action options if the allowable values for fatigue parameters are approached, transient severities exceed the design or assumed severities, transient counts exceed the design or assumed quantities, transient definitions have changed, unanticipated new fatigue loading events are discovered, or the geometries of components are modified.

The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.M1 and finds it acceptable because, when it is implemented, it will ensure that the implementing procedure of the Fatigue Monitoring AMP (1) identifies the changes in the fatigue usage factors, assumptions, or bases for fatigue monitoring and evaluation, or conformance to cycle limits and (2) directs actions that will address these changes in the fatigue monitoring and evaluation in order to ensure that the fatigue design limits are not exceeded.

The NRC 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.2.2.1-1 and B.2.2.1-2, 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 X.M1. In addition, the staff reviewed the enhancements associated with the "parameters monitored or inspected," and "monitoring and trending" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.2.1 summarizes operating experience related to the Fatigue Monitoring AMP. The NRC staff also reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed Fatigue Monitoring AMP to manage the effects of aging in the subsequent period of extended operation. The staff noted that the applicant's evaluation of operating experience adequately included the NRC generic communications (i.e., Regulatory Issue Summary (RIS) 2008-30 and RIS 2011-14).

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Fatigue Monitoring AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.1.1, provides the UFSAR supplement for the Fatigue Monitoring AMP. The NRC staff noted that the applicant committed to implement the program enhancements no later than 6 months prior to the subsequent period of extended operation, as described in SLRA Appendix A Section 16.4. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Fatigue Monitoring AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, with the enhancements when 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).

3.0.3.2.2 Neutron Fluence Monitoring

SLRA Section B.2.2.2 describes the existing Neutron Fluence Monitoring AMP, previously the fluence and uncertainty calculation portion of the PBN Reactor Vessel Material Surveillance AMP, as consistent, with enhancements, with GALL-SLR Report AMP X.M2, "Neutron Fluence Monitoring." The Neutron Fluence Monitoring AMP is an existing program that, in conjunction with the Reactor Vessel Material Surveillance AMP, ensures the continued validity of the neutron fluence analyses and neutron fluence-based TLAA and related analyses involving time-dependent neutron irradiation through monitoring and periodic updates. The applicant stated that this AMP also provides an acceptable basis for managing aging effects attributable to neutron fluence irradiation in accordance with requirements in 10 CFR 54.21(c)(1)(iii).

The Neutron Fluence Monitoring AMP evaluates the reactor pressure vessel (RPV) surveillance capsule dosimetry data and updates the neutron fluence projections in the cylindrical RPV locations, as needed. The WCAP-16083-NP-A methodology (equivalent to WCAP-14040-A), which complies with Regulatory Guide (RG) 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence" (ADAMS Accession No. ML010890301), in conjunction with WCAP-18124-NP-A (ADAMS Accession No. ML18204A010), is used for neutron fluence determinations for the RPV beltline. Calculational methods, benchmarking, qualification, and surveillance data are monitored to maintain the adequacy and assessment of uncertainty of RPV beltline neutron fluence calculations. The NRC staff noted that the WCAP-16083-NP-A methodology was used for the fluence calculations performed in support of the Point Beach, Units 1 and 2 extended power uprates (EPUs).

The applicant identified three main purposes of the Neutron Fluence Monitoring AMP, insofar as these purposes define the program scope; namely, (1) to assess the reactor vessel (RV) integrity in concert with the reactor vessel embrittlement TLAAs, (2) to assess susceptibility of reactor vessel internal (RVI) components to neutron irradiation-related damage, and (3) to determine the extent of the RPV beltline region in accordance with RIS 2014-11, "Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components."

Neutron fluence calculations are updated periodically, such as in support of related licensing actions and surveillance capsule information, to ensure that the plant and core operating conditions remain consistent with the assumptions used in the neutron fluence analyses and that the related analyses are updated, as necessary.

There are no specific acceptance criteria values for neutron fluence; the acceptance criteria relate to the different parameters that are evaluated using neutron fluence. The Neutron Fluence Monitoring AMP evaluates the RPV surveillance capsule dosimetry data and updates the neutron fluence projections in the cylindrical RPV locations, as needed.

The applicant identified the parameters monitored or inspected by the Neutron Fluence Monitoring AMP. Calculational methods, benchmarking, qualification, and surveillance data are monitored to maintain the adequacy and ascribed uncertainty of the RPV beltline neutron fluence calculations and corresponding RPV integrity analyses. Surveillance data associated with the RPV surveillance program are also used for the qualification of neutron fluence calculations. The applicant will apply enhancements to the "parameters monitored or inspected" and the "acceptance criteria" program elements no later than 6 months before entering the subsequent period of extended operation. The applicant will follow related industry efforts and use such information to confirm the adequacy of neutron fluence estimates, performed in accordance with RG 1.190 guidance, for RPV areas outside the region immediately adjacent to the core.

While the applicant stated that there are no specific acceptance criteria values for neutron fluence, the applicant also noted that the neutron fluence for Point Beach, Units 1 and 2 has been projected using RG 1.190-adherent methods. The applicant also adopted an enhancement to the "acceptance criteria" program element to address methods to evaluate neutron fluence for RPV regions other than those adjacent to the active fuel.

<u>Staff Evaluation</u>. During its review, the NRC staff evaluated the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP X.M2.

The staff reviewed the applicant's scope of the Neutron Fluence Monitoring AMP and determined that it was consistent with GALL-SLR Report AMP X.M2, insofar as RPV beltline and extended beltline neutron fluence estimates are concerned. The staff reached this determination because neutron fluence was calculated using NRC-approved, RG 1.190-adherent methods to determine neutron fluence in these regions, to determine where neutron fluence exceeds 1×10^{17} n/cm^2 (E > 1 MeV), and as input to the RPV TLAAs, as appropriate. This treatment is consistent with GALL-SLR Report AMP X.M2 because it identifies the scope of a Neutron Fluence Monitoring AMP with respect to RPV neutron fluence estimates, in regions adjacent to the core, or above or below the core, such as the RPV nozzle region.

GALL-SLR Report AMP X.M2 contains no specified acceptance values for neutron fluence. The program element refers to the guidance contained in RG 1.190 as specifying elements of methods used to estimate RPV fluence that are considered acceptable to the NRC staff and notes that such guidance may not be appropriate for RPV extended beltline or RVI components. The staff determined that the application is consistent with the GALL-SLR Report because it also includes no specific acceptance criteria, refers to the use of RG 1.190-adherent fluence calculations, and includes enhancements to draw on existing UFSAR information to provide additional justification for RPV fluence values calculated in regions other than the active fuel region. SLRA Section B.2.2.2 includes enhancements to the "parameters monitored or inspected" and "acceptance criteria" program elements.

Enhancement 1. The NRC staff reviewed the "parameters monitored or inspected" enhancement against the corresponding program element in GALL-SLR Report AMP X.M2 and finds it acceptable because, when implemented, it will provide additional justification for the use of information from supplemental nozzle region dosimetry measurements and reference cases or other information to justify the use of the WCAP-16083-NP-A methodology in conjunction with WCAP-18124-NP-A or similar methodology to estimate RPV fluence in regions above or below the active fuel region. As noted in the GALL-SLR Report, RG 1.190 does not provide guidance for determining the fluence for regions outside the traditional RPV beltline. The applicant stated that information from supplemental nozzle region dosimetry measurements and reference cases or other information will be used to provide additional justification for the use of the WCAP-16083-NP-A methodology in conjunction with WCAP-18124-NP-A or similar methodology to estimate RPV fluence in regions above or below the active fuel region.

Enhancement 2. The NRC staff reviewed the "acceptance criteria" enhancement against the corresponding program element in GALL-SLR Report AMP X.M2 and finds it acceptable because, when it is implemented, it will ensure that the applicant's existing neutron fluence methods are appropriately applied to determine neutron fluence outside the RPV region directly adjacent to the active fuel region.

Operating Experience. SLRA Section B.2.2.2 summarizes operating experience related to the Neutron Fluence Monitoring AMP. The applicant described recent industry licensing actions that consider neutron fluence calculations for adjacent RPV regions outside the effective height of the active fuel. The applicant noted that plant-specific licensing actions that impact CLB information consider recent utility licensing submittals, NRC staff RAIs, NRC staff SEs, and utility responses.

The applicant also described plant-specific operating experience and stated that the RPV beltline neutron fluence and uncertainty calculations for Point Beach, Units 1 and 2 have been performed in accordance with the guidelines of RG 1.190 and validated using data obtained from capsule dosimetry. The results of the neutron fluence uncertainty values were within the NRC-suggested limit of plus or minus 20 percent. The applicant stated that, to date, no enhancements to the AMP have been identified as a result of operating experience and noted that operating experience will be reviewed to identify indications that the effects of aging are not being adequately managed. If that situation arises, a corrective action will be initiated to either enhance the AMP or to implement new AMPs, as appropriate. In addition, AMP effectiveness will be assessed at least every 5 years in accordance with NEI 14-12.

The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

The NRC staff did not identify any operating experience that would indicate that the applicant should consider modifying its proposed program beyond that incorporated during the development of the SLRA. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the GALL-SLR Report AMP X.M2 was evaluated.

<u>UFSAR Supplement</u>. SLRA Appendix A, Section 16.2.1.2, provides the UFSAR supplement for the Neutron Fluence Monitoring AMP. The NRC staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table X-01 with enhancements. The NRC staff noted that the applicant committed to implement the program enhancements no later than 6 months prior to the subsequent period of extended operation, as described in SLRA Appendix A Section 16.4. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

<u>Conclusion</u>. Based on its review of the applicant's Neutron Fluence Monitoring AMP, the NRC staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and confirmed that their implementation before the subsequent period of extended operation will make the AMP 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).

3.0.3.2.3 Concrete Containment Unbonded Tendon Prestress

SLRA Section B.2.2.3 states that the Concrete Containment Unbonded Tendon Prestress AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP X.S1, "Concrete Containment Unbonded Tendon Prestress." The applicant amended this SLRA section by letter dated April 21, 2021.

<u>Staff Evaluation</u>. During its audit, the NRC 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 X.S1.

The NRC staff also reviewed the portions of the “monitoring and trending” and “acceptance criteria” program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of these enhancements follows.

Enhancement 1. SLRA Section B.2.2.3 includes an enhancement to the “monitoring and trending” program element, which relates to updating the prestress calculations and trend lines after each scheduled physical inspection, in accordance with RG 1.35.1, “Determining Prestressing Forces for Inspection of Prestressed Concrete Containments” (ADAMS Accession No. ML003740040).

The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.S1 and finds it acceptable because, when implemented, it will ensure that the tendon trend lines are updated to include the latest inspection data, after every physical inspection, as recommended by RG 1.35.1 and the GALL-SLR Report.

Enhancement 2. SLRA Section B.2.2.3, as amended by Attachment 23 to letter dated April 21, 2021, includes an enhancement to the “acceptance criteria” program element, which relates to using the updated 80-year prestress calculations for the acceptance limits during the subsequent period of extended operation.

The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.S1 and finds it acceptable because, when it is implemented, it will ensure that the acceptance criteria for the subsequent period of extended operation are based on the most up-to-date data and are projected to the end of the 80-year licensing period.

The NRC staff conducted an audit to verify the applicant’s claim of consistency with the GALL-SLR Report. Based on the audit and a review of the SLRA, as amended, 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 X.S1. In addition, the staff reviewed the enhancements associated with the “monitoring and trending” and “acceptance criteria” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.2.3 summarizes operating experience related to the Concrete Containment Unbonded Tendon Prestress AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant’s plant operating experience 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Concrete Containment Unbonded Tendon Prestress AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.1.3, provides the UFSAR supplement for the Concrete Containment Unbonded Tendon Prestress AMP. The NRC staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table X-01. The staff also noted that the applicant committed to ongoing implementation of the existing Concrete Containment Unbonded Tendon Prestress AMP 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 its review of the applicant's Concrete Containment Unbonded Tendon Prestress AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when implemented with the enhancements, 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).

3.0.3.2.4 Environmental Qualification of Electric Equipment

SLRA Section B.2.2.4 states that the Environmental Qualification of Electric Equipment AMP is an existing program with an enhancement that will be consistent with the program elements in the GALL-SLR Report AMP X.E1, "Environmental Qualification of Electric Equipment." The applicant amended this SLRA section by letter dated April 21, 2021.

Staff Evaluation. During its audit, the NRC 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 X.E1.

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

Enhancement. SLRA Section B.2.2.4 includes an enhancement to the "detection of aging effects" program element, which relates to the detection of aging effects of environmentally qualified electric equipment that could potentially be impacted by adverse localized environments.

The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.E1 and finds it acceptable because, when it is implemented, it will be consistent with AMP X.E1 and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of environmentally qualified electric components within the scope of the AMP will be maintained consistent with the CLB.

The NRC staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on its review of the SLRA, as amended, 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 the GALL-SLR Report AMP X.E1. In addition, the staff reviewed the enhancement associated with the "detection of aging effects" program element and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.2.4 summarizes operating experience related to the Environmental Qualification of Electric Equipment AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's "corrective actions" 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Environmental Qualification of Electric Equipment AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.1.4, provides the UFSAR supplement for the Environmental Qualification of Electric Equipment AMP. The NRC staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table X-01. The staff also noted that the applicant committed to ongoing implementation of the existing Environmental Qualification of Electric Equipment AMP 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 its review of the applicant's Environmental Qualification of Electric Equipment AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancement and finds that, with the enhancement when 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).

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

SLRA Section B.2.3.1 states that the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP is an existing program with an enhancement that will be consistent with the program elements in the GALL-SLR Report AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD."

Staff Evaluation. During its audit, the NRC 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.M1.

For the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements, the NRC staff finds the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP consistent with the GALL-SRP. The staff also reviewed the portions of the "detection of aging effects" program element associated with the enhancement to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of the enhancement follows.

Enhancement. SLRA Section B.2.3.1 includes an enhancement to the "detection of aging effects" program element, which is related to inspections of the pressurizer spray nozzle SS-to-safe-end weld once every 10 years for each unit with the first inspection being performed no earlier than 10 years before the subsequent period of extended operation and no later than the last refueling outage before the subsequent period of extended operation.

The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M1. The staff notes that GALL-SLR Report AMP XI.M1 does not mention an inspection of this piping. The staff finds that this enhancement is an improvement in monitoring structural integrity of the subject piping. Therefore, the staff finds this enhancement acceptable because, when it is implemented, the applicant will inspect these additional components to ensure structural integrity.

Operating Experience. SLRA Section B.2.3.1 summarizes operating experience related to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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 during the subsequent period of extended operation.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.1, provides the UFSAR supplement for the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP. The NRC 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 with enhancements. The staff noted that the UFSAR supplement in SLRA, Appendix A, Section 1.1, includes the augmented inspection for various safety-related components. The staff finds that the augmented inspection is an improvement to monitor the structural integrity of the safety-related components and is, therefore, acceptable. The staff noted that the applicant committed to ongoing implementation of the existing ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP 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 its review of the applicant's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff reviewed the enhancement and finds that its implementation before the subsequent period of extended operation will improve the AMP's ability to adequately 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).

3.0.3.2.6 Water Chemistry

SLRA Section B.2.3.2 states that the Water Chemistry AMP is an existing program with enhancement that will be consistent with the program elements in the GALL-SLR Report AMP XI.M2, "Water Chemistry," as modified by SLR-ISG-Mechanical-2020-XX, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance," except for the exception identified in the SLRA. The staff notes that, subsequent to the applicant's submittal of its SLRA, draft SLR-ISG-Mechanical-2020-XX was issued as the final SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance" (ADAMS Accession No. ML20181A434).

Staff Evaluation. During its audit, the NRC 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.M2, as modified by SLR-ISG-2021-02-MECHANICAL.

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

Exception. SLRA Section B.2.3.2 includes an exception to the "scope of program" program element, which relates to managing aging of components in the Heating Steam System (HSS) as part of the Water Chemistry Program. An ASME water chemistry consensus standard for industrial boilers would be applied to the treated water in the HSS. The NRC staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP XI.M2 and finds it acceptable because using water chemistry guidelines to prevent loss of material is an approach consistent with the GALL-SLR, and the Electric Power Research Institute (EPRI) primary and secondary water chemistry guidelines in GALL-SLR Report AMP XI.M2 do not apply to the HSS.

Enhancement. SLRA Section B.2.3.2 includes an enhancement to the "scope of program" program element, which relates to how water chemistry controls will be applied and evaluated for the HSS as part of the Water Chemistry Program. An ASME water chemistry consensus standard for industrial boilers would be applied to the HSS, and a one-time inspection would be conducted to verify the effectiveness. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M2 and finds it acceptable because the proposed water chemistry guidelines are appropriate for industrial heating boilers and because the applicant proposed using the One-Time Inspection AMP to verify the effectiveness of the program in managing the aging of the in-scope components.

Operating Experience. SLRA Section B.2.3.2 summarizes operating experience related to the Water Chemistry AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Water Chemistry AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.2, provides the UFSAR supplement for the Water Chemistry AMP. The NRC 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 AMP 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 continued implementation of the Water Chemistry AMP, including enhancements, no later than 6 months before the subsequent period of extended operation. By letter dated April 21, 2021, the applicant amended its commitment by adding that the program will be implemented 5 years before the subsequent period of extended operation and that the one-time inspections will be started no earlier than 5 years before the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement, as amended by letter dated April 21, 2021, is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Water Chemistry AMP, the NRC 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 enhancement and finds that, with the exception and the enhancement when 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).

3.0.3.2.7 Reactor Head Closure Stud Bolting

SLRA Section B.2.3.3 states that the Reactor Head Closure Stud Bolting AMP is an existing program with an enhancement that will be consistent with the program elements in the GALL-SLR Report AMP XI.M3, "Reactor Head Closure Stud Bolting," except for the exception identified in the SLRA.

Staff Evaluation. During its audit, the NRC 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.M3.

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

Exception. SLRA Section B.2.3.3 includes an exception to the "preventive actions" program element related to limits on yield strength of replacement bolts. GALL-SLR Report AMP XI.M3 places limits on the yield and ultimate strength of the reactor head closure studs as a preventive measure to reduce the potential for, but not eliminate, stress corrosion cracking (SCC) or intergranular stress corrosion cracking (IGSCC) in the studs. The maximum tensile strength recommended in GALL-SLR Report AMP XI.M3 for the installed reactor head closure stud bolting is 170 kilopounds per square inch (ksi). The preventive measure is recommended because, at tensile strength levels above 170 ksi, susceptibility of the studs to SCC or IGSCC increases. The applicant stated in SLRA Section B.2.3.3 that the PBN closure stud bolting is considered high-strength steel and, therefore, the applicant is taking exception to Element 2(d), Preventive Actions, of GALL-SLR Report AMP XI.M3.

The NRC staff reviewed the exception against the corresponding program element in GALL-SLR Report AMP XI.M3 and finds it acceptable for the following reasons: (1) plant-specific operating experience indicates that there was no degradation in the reactor head closure stud bolting, as summarized in SLRA Section B.2.3.3, which supports the staff's observation in the Audit Report on the most recent examinations performed for the 48 reactor head closure studs, (2) as part of the ASME Section XI Inservice Inspection AMP, the Reactor Head Closure Stud Bolting AMP will continue the volumetric examination of the 48 reactor head closure studs under IWB-2500, Examination Category B-G-1, Item No. B6.20, which is an effective examination for detecting degradation due to SCC or IGSCC, and (3) implementation of the enhancement (described next) will ensure that the replacement bolts will have the yield strength necessary to be consistent with the recommendations in GALL-SLR Report AMP XI.M3.

Enhancement. SLRA Section B.2.3.3 includes an enhancement to the "preventive actions" and "corrective actions" program elements. The enhancement is to revise procurement documents in the program to ensure that replacement studs are fabricated from bolting materials with maximum measured yield strength less than 150 ksi, consistent with the guidance for the corresponding program in the GALL-SLR Report and RG 1.65, Revision 1, "Materials and Inspections for Reactor Vessel Closure Studs" (ADAMS Accession No. ML092050716).

The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M3 and finds it acceptable because, when it is implemented, it will be consistent with the GALL-SLR Report AMP XI.M3 guidance.

The NRC 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.M3. The staff also reviewed the exception 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. In addition, the staff reviewed the enhancement associated with the "preventive actions" and "corrective actions" program elements and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.3 summarizes operating experience related to the Reactor Head Closure Stud Bolting AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Reactor Head Closure Stud Bolting AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.3, provides the UFSAR supplement for the Reactor Head Closure Stud Bolting AMP. The NRC 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 existing Reactor Head Closure Stud Bolting AMP, and to implement the program enhancement no later than 6 months prior to the subsequent period of extended operation, for managing the effects of aging for applicable components during the SLR period. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Reactor Head Closure Stud Bolting AMP, the NRC 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 enhancement and finds that, with the exception and the implemented enhancement, 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).

3.0.3.2.8 Boric Acid Corrosion

SLRA Section B.2.3.4 states that the Boric Acid Corrosion AMP is an existing program that, with an enhancement, will be consistent with the program elements in the GALL-SLR Report AMP XI.M10, "Boric Acid Corrosion."

Staff Evaluation. During its audit, the NRC 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 to the corresponding program elements of GALL-SLR Report AMP XI.M10. The staff also reviewed the portions of the “parameters monitored or inspected” program element associated with the enhancement to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of this enhancement follows.

Enhancement. SLRA Section B.2.3.4 includes an enhancement to the “parameters monitored or inspected” program element relating to coordination with other AMPs for evidence of boric acid residue plating out inside containment cooler housings or similar locations as an indication of an ongoing boric acid leakage in containment. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M10 and finds it acceptable because the program will be consistent with the guidance for identifying potential borated water leaks that may not be detected during walkdowns or maintenance.

Operating Experience. SLRA Section B.2.3.4 summarizes operating experience related to the Boric Acid Corrosion AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant’s plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Boric Acid Corrosion AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.4, provides the UFSAR supplement for the Boric Acid Corrosion AMP. The NRC 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 continuing the existing Boric Acid Corrosion AMP and to implementing the above enhancement no later than 6 months before 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 its review of the applicant’s Boric Acid Corrosion AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancement and finds that, with the enhancement, the program 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).

3.0.3.2.9 Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components

SLRA Section B.2.3.5 states that the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP is an existing program with an enhancement that will be consistent with GALL-SLR Report

AMP XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components."

Staff Evaluation. During its audit, the NRC 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.M11B.

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

Enhancement. SLRA Section B.2.3.5 includes an enhancement to the "detection of aging effects" program element, which relates to an update of PBN plant procedures to ensure that no additional nickel alloys will be used at PBN for reactor coolant pressure boundary applications during the subsequent period of extended operation. If used, appropriate baseline and subsequent inspections will be put in place. The NRC staff reviewed the enhancement against the corresponding program element in the GALL-SLR Report AMP and finds it acceptable because, when implemented, it will make the program consistent with the GALL-SLR Report AMP. Specifically, the "detection of aging effects" program element of the GALL-SLR Report AMP references the performance of baseline inspections before the subsequent period of extended operations.

The NRC 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.M11B. In addition, the staff reviewed the enhancement associated with the "detection of aging effects" program element and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects. The staff finds that the AMP is adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.5 summarizes operating experience related to the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the NRC staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.5, provides the UFSAR supplement for the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP. The NRC 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 existing Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP for managing the effects of aging for applicable components during the subsequent period of extended operation and to implementing the above enhancement no later than 6 months before 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 its review of the applicant's Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancement and finds that, with the enhancement, 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).

3.0.3.2.10 Reactor Vessel Internals

SLRA Section B.2.3.7 states that the Reactor Vessel Internals AMP is an existing program with enhancements that, with one exception taken to the "scope of program" program element of the AMP, will be consistent with the program elements identified in GALL-SLR AMP XI.M16A, "PWR Vessel Internals." The applicant amended this AMP in SLRA Supplement 3, Revision 1, dated July 26, 2021. In this SLRA supplement, the applicant amended the Reactor Vessel Internals AMP to adopt the version of GALL-SLR AMP XI.M16A used to develop the AMP in SLR-ISG-2021-01-PWRVI (ADAMS Accession No. ML20217L203). The applicant also amended the Reactor Vessel Internals AMP to remove the exception to GALL-SLR AMP XI.M16A that was originally taken in the "scope of program" program element of the applicant's AMP.

Staff Evaluation. During its audit, the NRC staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program" (including the initial exception taken to this program element), "preventive actions," "parameters monitored or inspected," "detection of aging effects" (including the applicant's enhancement of this program element), "monitoring and trending" (including the applicant's enhancement of this program element), "acceptance criteria" (including the applicant's enhancement of this program element), and "corrective actions" program elements of the applicant's program in the SLRA to the corresponding program elements of GALL-SLR AMP XI.M16A, as updated in SLR-ISG-2021-01-PWRVI.

The NRC staff's evaluation of the applicant's basis for adopting, applying, and implementing the program elements in the ISG version of GALL-SLR AMP XI.M16A as the program element criteria for the Reactor Vessel Internals AMP is provided in both the staff's evaluation of the initial AMP exception (and the applicant's subsequent basis for deleting the exception in SLRA Supplement 3, Revision 1) and the staff evaluations of the AMP enhancements that follow later in this SE section.

The NRC staff also evaluated the impact that the gap analysis and gap analysis results (discussed in SLRA Appendix C) would have on the program elements and element criteria for the Reactor Vessel Internals AMP. The staff's evaluation of the applicant's RVI gap analysis is discussed in the "Operating Experience" subsection of this SE section.

Exception, and its Subsequent Deletion in SLRA Supplement 3, Revision 1. SLRA Section B.2.3.7 initially included an exception to the "scope of program" program element associated with the version of EPRI Materials Reliability Program Report No. (MRP)-227 that will serve as the foundation for the version of the Reactor Vessel Internals AMP that will be implemented during the subsequent period of extended operation. Specifically, in this exception, the applicant determined that the version of MRP-227 referenced for use in the version of GALL-SLR AMP XI.M16A in NUREG-2191, Volume 2, is EPRI Report No. MRP-227-A (ADAMS Accession Nos. ML12017A194, ML12017A196, ML12017A197, ML12017A191, ML12017A192, ML12017A195, and ML12017A199). In contrast to MRP-227-A, the applicant determined that the version of MRP-227 used as the foundation for the subsequent license renewal version of its Reactor Vessel Internals AMP is MRP-227, Revision 1-A (ADAMS Accession No. ML20175A112), which is a newer and enhanced version of MRP-227-A.

In SLRA Supplement 3, Revision 1, the applicant amended the Reactor Vessel Internals AMP to delete this exception based on the applicant's decision to adopt the program elements of the updated ISG version of GALL-SLR AMP XI.M16A as the updated program element criteria for the Reactor Vessel Internals AMP. The NRC staff found this deletion of the exception to be both appropriate and acceptable for the objectives of the AMP because: (1) the updated version of GALL-SLR AMP XI.M16A in SLR-ISG-2021-01-PWRVI recommends the inspection methods in MRP-227, Revision 1-A, as the foundation for its program element bases, (2) the applicant uses MRP-227, Revision 1-A, as the basis for its Reactor Vessel Internals AMP, where the methods in MRP-227, Revision 1-A, have been appropriately subjected to the results of the applicant's RVI gap analysis that was included and performed in SLRA Appendix C for 80-year AMP impact determinations, and (3) the revised basis is consistent with the staff's updated guidance of SRP-SLR Section 3.1.2.2.9 and GALL-SLR AMP XI.M16A in the referenced ISG. Therefore, the staff finds the program elements of the Reactor Vessel Internals AMP (as subject to the enhancements defined and evaluated in the following subsections) to be acceptable because the staff confirmed that, when the enhancements are implemented, the program elements of the AMP will be consistent with the program elements of GALL-SLR AMP XI.M16A, as defined in SLR-ISG-2021-01-PWRVI.

Enhancement 1. SLRA Section B.2.3.7 includes an enhancement to the "detection of aging effects" program element, which states that the AMP will be enhanced to implement MRP-227, Revision 1-A, as supplemented by the results of a gap analysis, or by an NRC staff-approved version of MRP-227 that addresses 80 years of plant operations (if available before the subsequent period of extended operation). The staff reviewed this enhancement against the corresponding program element in the revised version of GALL-SLR AMP XI.M16A in SLR-ISG-2021-01-PWRVI. As is documented later in this SE section in relation to the staff's review of relevant operating experience associated with this AMP, the staff did not identify any operating experience results that would require the applicant to alter the current inspection methods used for the RVI "Primary," "Expansion," or "Existing Program" category components under the existing program, other than those applicant-made adjustments of the program element criteria that the applicant identified and the staff found to be acceptable as a result of the staff's review of the RVI gap analysis in SLRA Appendix C. Thus, based on this review, the staff finds the enhancement to be acceptable because, when implemented, the applicant's enhanced "detection of aging effects" basis will be consistent with the criteria in the updated "detection of aging effects" program element of GALL-SLR AMP XI.M16A in SLR-ISG-2021-01-PWRVI.

Enhancement 2. SLRA Section B.2.3.7 includes an enhancement to the "monitoring and trending" program element, which states that the examination and re-examination schedules in the AMP will be enhanced to be implemented in accordance with MRP-227, Revision 1-A (as supplemented by the results of a gap analysis). The NRC staff reviewed this enhancement against the corresponding program element in the revised version of GALL-SLR AMP XI.M16A in SLR-ISG-2021-01-PWRVI. As is documented later in this SE section on the staff's review of relevant operating experience associated with the AMP, the staff did not identify any operating experience results or RVI gap analysis assessment criteria for the PBN units that would call for the applicant to perform re-inspections of the RVI components more frequently than the intervals for reinspecting the components specified in either MRP-227, Revision 1-A, or in supplemental EPRI MRP or vendor-issued methodologies used for the component-specific inspections (see the Audit Report for the interim guidelines or supplemental methodologies used by the applicant). Thus, based on this review, the staff finds that the enhancement is acceptable because, when implemented, the applicant's enhanced "monitoring and trending" basis will be consistent with the updated criteria in the "monitoring and trending" program element of GALL-SLR AMP XI.M16A in SLR-ISG-2021-01-PWRVI.

Enhancement 3. SLRA Section B.2.3.7 includes an enhancement to the "acceptance criteria" program element, which states that the AMP will be enhanced to incorporate the "updated examination acceptance criteria, Primary/Expansion links, expansion criteria, and expansion item examination criteria" in MRP-227, Revision 1-A. The NRC staff reviewed this enhancement against the corresponding program element of the revised version of GALL-SLR AMP XI.M16A in SLR-ISG-2021-01-PWRVI. As is documented later in this SE section on the staff's review of relevant operating experience associated with the AMP, the staff did not identify any operating experience results or RVI gap analysis assessment criteria for the PBN units that would call for the applicant to alter the examination acceptance criteria, "Primary"-to-"Expansion" category component links, expansion criteria, and expansion item examination criteria of the program beyond those defined for the program in MRP-227, Revision 1-A, or else as appropriately adjusted by the results of the RVI gap analysis in the SLRA (i.e., specifically for those programmatic component-specific changes identified by the applicant in the gap analysis, which are permitted by GALL-SLR AMP XI.M16A and which the staff confirmed to be acceptable for implementation). Thus, based on this review, the staff finds the enhancement to be acceptable because, when implemented, the applicant's enhanced acceptance criteria basis will be consistent with the updated criteria in the "acceptance criteria" program element of GALL-SLR AMP XI.M16A in SLR-ISG-2021-01-PWRVI.

<u>Operating Experience (Including Operating Experience Assessed and Addressed in the Gap Analysis of SLRA Appendix C)</u>. SLRA Section B.2.3.7 summarizes operating experience related to the Reactor Vessel Internals AMP. The NRC staff reviewed the operating experience information in the application and during the audit. As discussed in the Audit Report, the staff conducted an audit of both the plant-specific and generic operating experience that are potentially applicable to the RVI components to: (a) identify examples of age-related degradation that is relevant to the components, as documented in the applicant's AMP or SLRA

Appendix C gap analysis, and (b) determine whether the applicant's proposed AMP will manage the effects of age-related degradation detected in specific RVI component-specific locations during the subsequent period of extended operation. During its audit of SLRA AMP B.2.3.7, the staff noted that the applicant treated the changes made in SLR-ISG-2021-01-PWRVI as relevant operating experience for the AMP. This resulted in some changes to the AMP (i.e., deletion of the initial AMP exception in SLRA Supplement 3, Revision 1, as evaluated previously in this SE section) and updates of the AMR line items for the RVI components for consistency with those developed for Westinghouse-design RVI components in the ISG (see SE Section 3.1.2.2.9 for the AMR assessment).

As documented in the NRC staff's Audit Report section for SLRA AMP B.2.3.7, the staff observed that the applicant appropriately addressed all plant-specific or generic operating experience associated with the PBN RVI components, including but not limited to operating experience associated with the following RVI components:

- baffle-to-former bolts
- control rod guide tube (CRGT) assembly guide plates (guide cards)
- CRGT support pins (split pins)
- core barrel assembly middle axial welds and lower axial welds
- thermal shield flexures
- clevis insert assemblies, including operating experience associated with the dowels, radial keys, and clevis insert bolts and with potential distortion of clevis insert assemblies (as reported in a Westinghouse-design PWR unit).

The NRC staff confirmed that the applicant evaluated the operating experience as part of its RVI component gap analysis that was included in SLRA Appendix C. Based on the staff's audit review of the operating experience and the gap analysis, the staff confirmed that the applicant appropriately used the operating experience to either: (1) determine and establish those RVI component-specific inspection category changes that would need to be upgraded from those defined for the components in MRP-227, Revision 1-A, or (2) justify the fact that the reinspection intervals for the "Primary" or "Existing Program" RVI components could remain at a 10-year reinspection basis. For defined "Primary," "Expansion," or "Existing Program" category components in the AMP, the staff confirmed that the applicant's gap analysis did not need to change any of the component-specific inspection criteria for those defined for the components in either MRP-227, Revision 1-A, or alternatively, in supplemental inspection and evaluation methodologies issued by the EPRI MRP and accepted by the staff.

The NRC staff noted that a second key element of the applicant's Reactor Vessel Internals AMP was the treatment of any EPRI MRP or Westinghouse Interim Guidelines for specific RVI component types/locations as relevant operating experience for the program. As such, the program implements a specific supplemental guidance methodology if it is found to be relevant and applicable to a specific RVI component included in the PBN reactor design. The staff confirmed that the use of supplemental interim guidance methodologies or topical report methodologies is permissible by the program elements defined in GALL-SLR AMP XI.M16A, as updated in SLR-ISG-2021-01-PWRVI, and the staff's Audit Report input for the Reactor Vessel Internals AMP identifies the interim guidance and supplemental reports that are currently implemented as supplemental methodologies for the applicant's program. Thus, the staff finds acceptable the applicant's use of supplemental interim guidance or topical report methodologies as part of the “scope” of the program, including those supplemental methodologies that are issued by the industry in response to generic operating experience and that the applicant finds appropriate for implementation.

Based on its review, the NRC staff did not find any instances where the site-specific 80-year aging management assessment basis for a given RVI component (as assessed in the SLRA gap analysis, including those for the components listed above) was updated in the gap analysis to supersede the current aging management criteria for the component in MRP-227, Revision 1-A, or where the updated aging management basis for the component would not be sufficient to manage the effects of aging during the subsequent period of extended operation. Therefore, the staff finds the results of the applicant’s RVI gap analysis and operating experience review to be acceptable for the applicant to implement. Accordingly, the staff did not identify any operating experience that would indicate that the applicant should modify its Reactor Vessel Internals AMP beyond those changes that were incorporated into the program by the results of the gap analysis in the SLRA or the subsequent changes to the AMP that were made in SLRA Supplement 3, Revision 1 (i.e., for consistency with the version of GALL-SLR AMP XI.M16A in SLR-ISG-2021-01-PWRVI).

<u>UFSAR Supplement</u>. SLRA Appendix A, Section 16.2.2.7, provides the UFSAR supplement for the Reactor Vessel Internals AMP. The NRC staff reviewed this UFSAR supplement description and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that, in Commitment No. 11 of SLRA Table 16-3 (as administratively amended in SLRA Supplement 3, Revision 1), the applicant committed to implementing the three enhancements of the Reactor Vessel Internals AMP no later than 6 months before entering the subsequent period of extended operation for the units. The staff found the enhancements associated with Commitment No. 11 to be acceptable because the criteria associated with the program element-specific enhancements are consistent with the corresponding criteria for the applicable program elements of GALL AMP XI.M16A in SLR-ISG-2021-01-PWRVI.

Based on this review, the NRC staff finds that the information in the UFSAR supplement is an adequate summary description of the Reactor Vessel Internals AMP. The staff also finds that SLRA Commitment No. 11 is acceptable for the applicant to implement.

<u>Conclusion</u>. Based on its review of the applicant’s Reactor Vessel Internals AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the program elements in GALL-SLR AMP XI.16A, as amended in SLR-ISG-2021-01-PWRVI. The staff also reviewed the enhancements and finds that, when 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 during 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).

3.0.3.2.11 Flow-Accelerated Corrosion

SLRA Section B.2.3.8 states that the Flow-Accelerated Corrosion (FAC) AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M17, “Flow-Accelerated Corrosion.” The applicant amended this SLRA section by letters dated April 21, 2021, and November 4, 2021.

Staff Evaluation. During its audit, the NRC 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.M17.

For the "scope of program," "parameters monitored or inspected," and "monitoring and trending," program elements, the NRC staff requested additional information regarding: (a) the revision level of NSAC-202L, (b) the software products used in the PBN FAC program and their QA classification, and (c) wall thinning due to FAC and/or erosion of certain components exposed to an internal treated water environment in several systems. The staff's requests (RAIs B.2.3.8-1, B.2.3.8-2, B.2.3.8-2a, and B.2.3.8-3) and the applicant's responses are documented in ADAMS Accession Nos. ML21223A308 and ML21308A282.

In its response to RAI B.2.3.8-1, the applicant confirmed that the FAC program is based on Revision 4 of NSAC-202L and revised SLRA Appendix A, Section 16.5, to be consistent with other SLRA sections by referencing Revision 4 of NSAC-202L. The NRC staff finds the applicant's response acceptable because, as a result, the SLRA consistently references Revision 4 of NSAC-202L.

In its responses to RAI B.2.3.8-2 and follow-up RAI B.2.3.8-2a, the applicant stated that CHECWORKS™ Steam/Feedwater Application and FAC Manager Web Edition are the software products used in the PBN FAC program and that they are both classified in accordance with procedure IM-AA-101, "Software Quality Assurance Program," as Level C. With regard to the associated procedure's software validation and verification (V&V) activities and software error reporting, the applicant amended SLRA Section B.2.3.8 to include additional enhancements to address these issues. The NRC staff finds the applicant's response acceptable because the FAC program will be enhanced to include V&V for FAC software (CHECWORKS™ and FAC Manager Web Edition) prior to and at least every 7 years during the subsequent period of extended operation, and to ensure that error reporting is applied to the FAC software. For additional discussion, see *Enhancement 5* below.

In its response to B.2.3.8-3, the applicant clarified its use of specific component types and associated intended functions by stating that the component type "piping and piping components" with a "pressure boundary" or "leakage boundary (spatial)" intended function are used for components subject to fatigue, therefore, only "piping and piping components" with a "structural integrity (attached)" intended function would include wall thinning due to FAC and erosion. Individual component types, such as "piping" and "valves" with a "pressure boundary," "leakage boundary (spatial)," and "structural integrity (attached)" intended function would include wall thinning due to FAC and erosion. In addition, the applicant stated that the carbon steel drain traps and flow elements, and stainless steel drain traps are not subject to high flow rates in the main and auxiliary steam systems and are, therefore, not susceptible to wall thinning due to FAC and erosion. The applicant revised SLRA Tables 3.4.2-1 and 3.4.2-2 by adding AMR items to manage wall thinning due to FAC and/or erosion for carbon steel, copper alloy, and stainless steel "piping," "piping and piping components," and "valve bodies." The staff finds the applicant's response acceptable because the applicant revised the SLRA to include AMR items to manage wall thinning due to FAC and/or erosion for susceptible components in the appropriate systems.

The NRC staff also reviewed the portions of the "scope of program," "detection of aging effects," "monitoring and trending," and "corrective actions" program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluations of the enhancements follows.

Enhancement 1. As amended by letter dated April 21, 2021, SLRA Section B.2.3.8 includes an enhancement to the "scope of program" program element that relates to reassessing systems that have initially been excluded from the program based on usage less than 2 percent of plant operating time and formalizing a separate erosion susceptibility evaluation that will include erosion susceptible components based on operating experience and industry guidance. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M17 and finds it acceptable because when it is implemented the applicant will have confirmed that there is sufficient technical basis to continue excluding low usage systems from the FAC program, and will identify erosion susceptible locations based on operating experience and industry guidance and include them in a formalized erosion susceptibility evaluation; which are consistent with the recommendations in GALL-SLR Report AMP XI.M17.

Enhancement 2. As amended by letter dated April 21, 2021, SLRA Section B.2.3.8 includes an enhancement to the "detection of aging effects" program element that relates to baseline inspections of erosion susceptible locations and revising or developing procedures related to erosion susceptible locations. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M17 and finds it acceptable because when it is implemented there will be baseline inspection information for erosion susceptible locations, and consistent with the recommendations in GALL-SLR Report AMP XI.M17, the FAC program will treat erosion susceptible components similar to NSAC-202L "susceptible-not-modeled," and procedures will have considered guidance in NUREG/CR-6031, EPRI 1011231, and EPRI TR-112657.

Enhancement 3. SLRA Section B.2.3.8 includes an enhancement to the "monitoring and trending" program element that relates to revising or developing procedures for performing, evaluating, and trending wall thickness measurements. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M17 and finds it acceptable because when it is implemented it will require performing wall thickness measurements for erosion, trending results to adjust monitoring frequency and to predict remaining service life, evaluating results to determine whether extent-of-condition review assumptions remain valid, trending activities considering infrequent operational alignments, and periodic wall thickness measurements of replacement components continuing until the effectiveness of the corrective action is confirmed; which are consistent with GALL-SLR Report AMP XI.M17.

Enhancement 4. SLRA Section B.2.3.8 includes an enhancement to the "corrective actions" program element that relates to corrective actions for erosion mechanisms. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M17 and finds it acceptable because when it is implemented it will require long-term corrective actions for erosion mechanisms, require verification of the effectiveness of the corrective actions, and require periodic monitoring activities to continue for components replaced with alternative material; which are consistent with GALL-SLR Report AMP XI.M17.

Enhancement 5. As amended by letter dated November 4, 2021, SLRA Section B.2.3.8 includes an enhancement to the "monitoring and trending" program element that relates to V&V and error notification of FAC software. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M17 and finds it acceptable because when it is implemented it will require software QA activities of V&V and error notification for FAC software (CHECWORKS™ and FAC Manager Web Edition). In addition, V&V for the FAC software will be performed prior to and at least every 7 years during the subsequent period of extended operation.

The NRC 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.2.3.8-1, B.2.3.8-2, B.2.3.8-2a, and B.2.3.8-3, 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.M17. In addition, the staff reviewed the enhancements associated with the "scope of the program," "detection of aging effects," "monitoring and trending," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

<u>Operating Experience</u>. SLRA Section B.2.3.8 summarizes operating experience related to the FAC program. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

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

<u>UFSAR Supplement</u>. SLRA Appendix A, Section 16.2.2.8, provides the UFSAR supplement for the FAC program. The NRC staff reviewed this UFSAR supplement description of the program, as amended, and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted in SLRA Appendix A, Table 16.3, that the applicant committed to enhance the FAC program by implementing the enhancements discussed above no later than 6 months 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.

<u>Conclusion</u>. Based on its review of the applicant's FAC program, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and concluded that their implementation prior to the subsequent period of extended operation will make the AMP 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).

3.0.3.2.12 Bolting Integrity

SLRA Section B.2.3.9 states that the Bolting Integrity AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M18, “Bolting Integrity.” The applicant amended this SLRA section by letter dated April 21, 2021.

Staff Evaluation. During its audit, the NRC 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.M18.

The NRC staff also reviewed the portions of the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of these eight enhancements follows.

Enhancement 1. SLRA Section B.2.3.9 includes an enhancement to the “preventive actions” and “corrective actions” program elements, which relates to replacing existing references to EPRI NP-5067 and TR-104213 with references to EPRI Reports 1015336 and 1015337, and to incorporate their respective guidance into their procedures. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-SLR Report recommendations to ensure that the selection of bolting material and the use of lubricant are in accordance with the referenced industry guidelines to prevent or mitigate SCC.

Enhancement 2. SLRA Section B.2.3.9 includes an enhancement to the “preventive actions” program element, which relates to ensuring that molybdenum disulfide (MoS_2) lubricant is not used in pressure-retaining bolting applications. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-SLR Report recommendations to ensure that lubricants known to be a potential contributor to SCC are not used.

Enhancement 3. SLRA Section B.2.3.9 includes an enhancement to the “preventive actions,” “parameters monitored or inspected,” and “detection of aging effects” program elements, which relates to ensuring that bolting material with yield strength greater than or equal to 150 ksi is not used in pressure-retaining bolting applications and, if it is used, to perform a volumetric examination in accordance with that of ASME Code Section XI, Table IWB-2500-1.

The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-SLR Report recommendations to include preventive actions for high-strength bolts and, if they are used, to perform volumetric examination in accordance with ASME Code Section XI, Subsection IWB, to adequately detect and manage the applicable aging effects before a loss of intended function.

Enhancement 4. SLRA Section B.2.3.9 includes an enhancement to the "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements, which relates to developing a new plant procedure to perform alternative means of testing and inspection for closure bolting where leakage is difficult to detect. The established acceptance criteria for the alternative means of testing and inspection will be that there is no indication of leakage from the bolted connection, and inspections will be performed on a representative sample of the population of bolt heads and threads (i.e., 20 percent of population, up to a maximum of 19 per PBN unit). The NRC staff noted that SLRA Section B.1.4, as amended by letter dated April 21, 2021, describes the similarities of the two PBN units and the operating experience credited for the use of a reduced number of inspections. The staff reviewed this enhancement as amended by letter dated April 21, 2021, against the corresponding program elements in GALL-SLR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-SLR Report recommendations to ensure that: (a) closure bolting in locations that preclude detection of joint leakage are inspected and/or monitored for degradations as described in GALL-SLR Report AMP XI.M18, (b) the selected representative example is sufficient, based on PBN units' similarities, to provide adequate representative inspection results, and (c) appropriate acceptance criteria are clearly defined and established.

Enhancement 5. SLRA Section B.2.3.9 includes an enhancement to the "detection of aging effects" program element, which relates to revising plant procedures to include requirements to ensure that bolted joints that are not readily visible during plant operation and refueling outages are inspected when they are made accessible. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M18 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to ensure that the aging effects in bolted joints that are not readily visible for inspection are being monitored when they are made accessible and at such intervals as would provide reasonable assurance that the components' intended functions are maintained.

Enhancement 6. SLRA Section B.2.3.9 includes an enhancement (Commitment No. 13(f)) to the "monitoring and trending" program element, which relates to including the requirement for projecting identified degradations until the next scheduled inspection and to evaluate the results against the acceptance criteria to confirm that the timing of subsequent inspections will maintain the components' intended functions based on the projected rate of degradation. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-SLR Report recommendation to ensure that identified degradation is projected and that results are evaluated to confirm that the selected inspection frequency will maintain the components' intended functions throughout the subsequent period of extended operation.

Enhancement 7. SLRA Section B.2.3.9 includes an enhancement (also included as part of Commitment No.13(f)) to the "monitoring and trending" program element, which relates to evaluating the results from sampling-based inspections against the acceptance criteria to confirm that the sampling bases will maintain the components' intended functions, and to increase the inspection frequency or sample size when the evaluation determines it to be required. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M18 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to evaluate the results from sampling-based inspections against the acceptance criteria to confirm that the components' intended functions will be maintained throughout the subsequent period of extended operation.

Enhancement 8. SLRA Section B.2.3.9, as amended by letter dated April 21, 2021, includes an enhancement to the "corrective actions" program element, which relates to including the guidance for leak monitoring, sample expansion, and additional inspections as described in the program element of the GALL-SLR Report AMP XI.M18. The NRC staff reviewed this enhancement, as amended by letter dated April 21, 2021, against the corresponding program element in GALL-SLR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-SLR Report recommendations for adequately addressing results that do not meet the acceptance criteria.

The NRC 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 21, 2021, 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, or consistent with enhancements, with the corresponding program elements of GALL-SLR Report AMP XI.M18. In addition, the staff reviewed the enhancements associated with the "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.9 summarizes operating experience related to the Bolting Integrity AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Bolting Integrity AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.9, as amended by letter dated April 21, 2021, provides the UFSAR supplement for the Bolting Integrity AMP. The NRC 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 (i.e., SLRA Commitment No. 13) to implementing the program enhancements by no later than 6 months before the subsequent period of extended operation. The staff also noted that the applicant committed to ongoing implementation of the existing Bolting Integrity AMP 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, as amended by letter dated April 21, 2021, is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Bolting Integrity AMP, as amended by letter dated April 21, 2021, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when the enhancements are 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).

3.0.3.2.13 Steam Generators

SLRA Section B.2.3.10 states that the Steam Generators AMP is an existing program with an enhancement that will be consistent with the program elements in the GALL-SLR Report AMP XI.M19, “Steam Generators,” except for the exception identified in the SLRA. The applicant amended this SLRA section by letters dated April 21, 2021, and August 11, 2021.

Staff Evaluation. During its audit, the NRC 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.

For the “scope of program” and “parameters monitored or inspected” program elements, the NRC staff needed additional information on the programs that will manage loss of material for the carbon steel blowdown piping nozzles and secondary side shell penetrations exposed to treated water and the steam generator (SG) tube plugging material in the PBN SGs and issued RAIs B.2.3.10-1 and B.2.3.10-2, respectively. The staff’s request and the applicant’s response are documented in ADAMS Accession No. ML21223A308.

In its response to RAI B.2.3.10-1, the applicant stated that loss of material for the carbon steel blowdown piping nozzles and secondary side shell penetrations exposed to treated water will be managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, and Water Chemistry AMPs.

During its evaluation of the applicant’s response to RAI B.2.3.10-1, the NRC staff noted SLRA Table 3.1.2-5 was revised to remove AMR item 3.1-1, 072 to clarify that loss of material for the carbon steel blowdown piping nozzles and secondary side shell penetrations exposed to treated water will be managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, and Water Chemistry AMPs. The staff finds the applicant’s response acceptable because the use of the Water Chemistry AMP to manage loss of material is consistent with the GALL-SLR Report, and the periodic inspections conducted as part of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP are capable of detecting whether loss of material is occurring.

In its response to RAI B.2.3.10-2, the applicant stated that the only Alloy 600 plugs installed in the PBN SGs are six Alloy 600 welded plugs installed in three tubes during manufacturing of the PBN Unit 1 SG A. In addition, the applicant stated that all Alloy 600 plugs in the PBN Unit 1 SG B have been replaced with Alloy 690 mechanical plugs.

During its evaluation of the applicant’s response to RAI B.2.3.10-2, the NRC staff noted that SLRA Section B.2.3.10 was revised to clarify that there are six Alloy 600 welded plugs in three tubes in the PBN Unit 1 SG A and that all plugs are inspected during SG tube inspections. The staff finds the applicant's response acceptable because SLRA Section B.2.3.10 accurately reflects the materials of the plugs in the PBN SGs and the aging effects of the plugs, regardless of material, will be managed by the Steam Generators AMP.

The NRC staff also reviewed the portions of the "scope of the program," and "parameters monitored or inspected" program elements associated with the exception and enhancement to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of the exception and enhancement are as follows.

Exception. As amended by letter dated April 21, 2021, SLRA Section B.2.3.10 includes an exception to the "scope of program" program element to exclude the tube-to-tubesheet welds from inspection and monitoring. The tube-to-tubesheet joint consists of the tube, which is hydraulically expanded against the bore of the tubesheet, the tube-to-tubesheet weld located at the tube end, and the tubesheet. The applicant's approved H* alternate repair criteria (ADAMS Accession No. ML17159A778) relies on the ability of the hydraulically expanded portion of the tube from the top of the tubesheet to 20.6 inches below the top of the tubesheet to resist tube end cap pressure loads. The alternate repair criteria takes no credit for the portion of the tube more than 20.6 inches below the top of the tubesheet or the tube-to-tubesheet weld to maintain structural and leakage integrity, which removes the tube-to-tubesheet weld from a pressure boundary function. The NRC staff reviewed the exception against the corresponding program element in GALL-SLR Report AMP XI.M19 and finds it acceptable because the tube-to-tubesheet weld is no longer part of the reactor coolant pressure boundary consistent with item 2 in SRP-SLR Section 3.1.2.2.11.

Enhancement. As amended by letter dated April 21, 2021, SLRA Section B.2.3.10 includes an enhancement to the "parameters monitored or inspected" program element. The enhancement conservatively assumes that the PBN Unit 1 SGs are not bounded by the industry analyses in EPRI 3002002850 and requires performing a one-time inspection of the divider plate assemblies to confirm that the Water Chemistry and Steam Generators AMPs are mitigating primary water stress corrosion cracking (PWSCC). The NRC staff reviewed the enhancement against the corresponding program element in GALL-SLR Report AMP XI.M19 and finds it acceptable because performing a one-time inspection of the divider plate assemblies that is capable of detecting cracking to verify the effectiveness of the Water Chemistry and Steam Generators AMPs and the absence of PWSCC is consistent with item 1 in SRP-SLR Section 3.1.2.2.11.

The NRC 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.2.3.10-1 and B.2.3.10-2, 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.M19. The staff also reviewed the exception associated with the "scope of the program" program element, and the justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancement associated with the "parameters monitored or inspected" program element and finds, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.10 summarizes operating experience related to the Steam Generators AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Steam Generators AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.10, provides the UFSAR supplement for the Steam Generators AMP. The NRC 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 enhancing the Steam Generators AMP by implementing the enhancement stated above no later than 6 months before 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 its review of the applicant's Steam Generators AMP, the NRC 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 enhancement and finds that, when the exception and the enhancement are implemented before the subsequent period of extended operation, 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).

3.0.3.2.14 Open-Cycle Cooling Water System

SLRA Section B.2.3.11 states that the Open-Cycle Cooling Water System AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M20, "Open-Cycle Cooling Water System," except for the exception identified in the SLRA. The applicant amended this SLRA section by letter dated May 6, 2021.

Staff Evaluation. During its audit, the NRC 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.M20.

The NRC staff also reviewed the portions of the "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements associated with an exception and enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of this one exception and six enhancements follows.

Exception. SLRA Section B.2.3.11 includes an exception to the “detection of aging effects” program element related to performing heat transfer performance testing of the primary auxiliary building battery room vent coolers, turbine driven auxiliary feedwater pump turbine oil coolers, containment fan motor coolers, and emergency diesel generator (EDG) coolant heat exchangers, since these components are not routinely tested to verify heat transfer capability. The NRC staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP XI.M20 and finds it acceptable because these components receive frequent regular maintenance, including flushing, cleaning, and inspection, which meets the acceptable alternative described in the PBN Generic Letter (GL) 89-13 Program Document, dated January 29, 2004 (ADAMS Accession No. ML051520155).

Enhancement 1. SLRA Section B.2.3.11 includes an enhancement to the “parameters monitored or inspected” program element, which relates to updating the primary program documents and procedures, and the applicable preventive maintenance requirements, to clearly identify the portions of the service water system within the scope of GL 89-13, where flow monitoring is not performed. For these portions of the service water system, the procedures will calculate friction (or roughness) factors based on test results from the flow monitored portions of the service water system and use these factors to confirm that design flow rates will be achieved with the overall fouling identified in the system. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M20 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR.

Enhancement 2. SLRA Section B.2.3.11 includes an enhancement to the “detection of aging effects” program element, which relates to updating the primary program documents and procedures, and the applicable preventive maintenance requirements, to clearly identify the inspections and tests that are within the scope of the ASME Code and those inspections and tests that are not. The procedures and preventive maintenance requirements that perform the ASME Code inspections and tests shall be consistent with and reference the respective ASME Code. The procedures and preventive maintenance requirements that perform the non-ASME Code inspections and tests shall follow site procedures that include requirements for items such as lighting, distance offset, surface coverage, presence of protective coatings, and cleaning processes. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M20 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR.

Enhancement 3. SLRA Section B.2.3.11 includes an enhancement to the “detection of aging effects” program element, which relates to updating the primary program documents and procedures, and the applicable preventive maintenance requirements, to state that examinations of polymeric materials (i.e., neoprene expansion joints) shall include visual and tactile inspections whenever the component surfaces are accessible during the performance of periodic surveillances or during maintenance activities or scheduled outages. These inspections shall check for surface cracking, crazing, discoloration, scuffing, loss of material due to wear, dimensional change, and exposure of reinforcing fibers/mesh/metal. Manual or physical manipulation, or pressurization, of flexible polymeric components is used to augment visual inspection, where appropriate, to assess loss of material or strength. The sample size for manipulation is at least 10 percent of accessible surface area, including visually identified suspect areas. Hardening, loss of strength, or loss of material due to wear is expected to be detectable before any loss of intended function. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M20 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR.

Enhancement 4. SLRA Section B.2.3.11 includes an enhancement to the “monitoring and trending” program element, which relates to updating the primary program documents and procedures, and the applicable preventive maintenance requirements, to perform trending of the observed or calculated friction (or roughness) factors to confirm that the design flow rates will be achieved in the portions of the service water system, within the scope of GL 89-13, where flow monitoring is not performed. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M20 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR.

Enhancement 5. SLRA Section B.2.3.11 includes an enhancement to the “acceptance criteria” program element, which relates to updating the primary program documents and procedures, and the applicable preventive maintenance requirements, to clarify that, when previous pipe wall thickness measurements are not available to determine a corrosion rate, a corrosion rate that has been calculated from other locations with nearly identical operating conditions, material, pipe size, and configuration may be used to determine reinspection intervals. This corrosion rate assignment must be documented in an engineering evaluation that includes the location(s) used, basis for correlation, and final corrosion rate assigned. A mill tolerance of 12.5 percent shall be used for added conservatism when establishing an initial wall thickness value when determining corrosion rates at new inspection locations if corrosion rates at other locations with nearly identical operating conditions, material, pipe size, and configuration cannot be used. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M20 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR.

Enhancement 6. SLRA Section B.2.3.11 includes an enhancement to the “corrective actions” program element, which relates to updating the primary program documents and procedures, and the applicable preventive maintenance requirements, to clarify that if fouling is identified, the overall effect is evaluated for reduction of heat transfer, flow blockage, loss of material, and chemical treatment effectiveness. For ongoing degradation mechanisms (e.g., microbiologically-induced corrosion (MIC) and erosion) or loss of material due to recurring internal corrosion, 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 PBN corrective actions program; however, no fewer than five additional inspections are conducted for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging effect combination is inspected, whichever is less. Since PBN 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 the SRP-SLR. 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. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M20 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR.

The NRC 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.M20. The staff also reviewed the exception between the applicant’s program and GALL-SLR Report XI.M20 associated with the “detection of aging effects” program element, and its justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the “parameters monitored and inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.11 summarizes operating experience related to the Open-Cycle Cooling Water System AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant’s plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Open-Cycle Cooling Water System AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.11, provides the UFSAR supplement for the Open-Cycle Cooling Water System AMP. The NRC staff reviewed the UFSAR supplement description of this program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted in SLRA Appendix A, Table 16-3, that the applicant committed to continuing the existing Open-Cycle Cooling Water System AMP and implementing enhancements no later than 6 months before the subsequent period of extended operation, or no later than the last refueling outage before 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 its review of the applicant’s Open-Cycle Cooling Water System AMP, the NRC 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 the enhancements and finds that, when the exception and the enhancements are 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).

3.0.3.2.15 Closed Treated Water Systems

SLRA Section B.2.3.12 states that the Closed Treated Water Systems AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR

Report AMP XI.M21A, “Closed Treated Water Systems,” which includes the exception identified in the SLRA.

Staff Evaluation. During its audit, the NRC 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.M21A.

The NRC staff also reviewed the portions of the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements associated with an exception and enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of this one exception and eight enhancements follows.

Exception. SLRA Section B.2.3.12 includes an exception to the “parameters monitored or inspected” program element that relates to which specific water chemistry parameters the applicant monitors and trends in certain closed treated water systems. Some example water chemistry parameters are listed in GALL-SLR, which also references EPRI 1007820, “Closed Cooling Water Chemistry Guideline,” issued April 2004, that is used in its entirety for the water chemistry control or guidance. In its SLRA, the applicant referenced EPRI 3002000590, “Closed Cooling Water Chemistry Guideline,” issued December 2013, which is a more recent version of the EPRI guidance than the one specified in GALL-SLR Report XI.M21A. The NRC staff approved the use of EPRI 3002000590 in SLR-ISG-2021-02-MECHANICAL. The staff reviewed this exception and finds that it is not actually an exception because the sampling parameters of these coolant systems include the control and diagnostic parameters specified in, and performed at a frequency consistent with, EPRI 3002000590.

Enhancement 1. SLRA Section B.2.3.12 includes an enhancement to the “parameters monitored or inspected” program element, which relates to ensuring that new visual inspection procedure(s) and/or preventive maintenance requirements evaluate the visual appearance of surfaces for evidence of loss of material. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR.

Enhancement 2. SLRA Section B.2.3.12 includes an enhancement to the “parameters monitored or inspected” program element, which relates to creating new procedure(s) and/or preventive maintenance requirements that perform surface and/or volumetric examinations and evaluate the examination results for surface discontinuities indicative of cracking. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR.

Enhancement 3. SLRA Section B.2.3.12 includes an enhancement to the “parameters monitored or inspected” program element, which relates to creating visual inspection procedure(s) and/or preventive maintenance requirements, for heat exchangers that are unable to be functionally tested, to determine the tube surface cleanliness and verify that design heat removal rates are maintained. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR.

Enhancement 4. SLRA Section B.2.3.12 includes an enhancement to the “detection of aging effects” program element, which relates to ensuring that visual inspections of internal surfaces of closed treated water system components are conducted whenever the system boundary is opened. The ongoing opportunistic visual inspections can be credited towards the representative samples for the loss of material and fouling; however, surface or volumetric examinations must be used to confirm that there is no cracking. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR.

Enhancement 5. SLRA Section B.2.3.12 includes an enhancement to the “detection of aging effects” program element, which relates to creating 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 subsequent period of extended operation, 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 20 percent of the population (described 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 Point Beach is a two-unit plant. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR.

Enhancement 6. SLRA Section B.2.3.12 includes an enhancement to the “monitoring and trending” program element, which relates to ensuring 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 subsequent period of extended operation based on the projected rate and extent of degradation. Where practical, identified degradation is projected through the next scheduled inspection. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR.

Enhancement 7. SLRA Section B.2.3.12 includes an enhancement to the “acceptance criteria” program element, which relates to ensuring that the new inspection and test procedure(s) and/or preventive maintenance requirements identify and evaluate any detectable loss of material, cracking, or fouling in accordance with the PBN corrective actions program. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR.

Enhancement 8. SLRA Section B.2.3.12 includes an enhancement to the “corrective actions” program element, which relates to ensuring that the following additional inspections and actions are required if a post-repair/replacement inspection or subsequent inspection fails to meet acceptance criteria. First, the number of increased inspections is determined in accordance with the PBN corrective actions process; however, there are no fewer than five additional inspections for each inspection that did not meet the acceptance criteria, or 20 percent of each applicable material, environment, and aging effect combination is inspected, whichever is less. Second, if subsequent inspections do not meet the acceptance criteria, an extent-of-condition and extent-of-cause analysis is conducted to determine the further extent of inspections. Third, additional samples are inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. Since Point Beach is a two-unit site, the additional inspections include those at all units with the same material, environment, and aging effect combination. Fourth, the additional inspections are completed within the interval (e.g., refueling outage interval, 10-year inspection interval) in which the original inspection was conducted. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR.

The NRC 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.M21A. The staff also reviewed the exception between the applicant's program and GALL-SLR Report XI.M21A associated with the "parameters monitored and inspected" program element, and its justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the "parameters monitored and inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.12 summarizes operating experience related to the Closed Treated Water Systems AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Closed Treated Water Systems AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.12, provides the UFSAR supplement for the Closed Treated Water Systems AMP. The NRC 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, in SLRA Appendix A, Table 16-3, that the applicant committed to continuing the existing Closed Treated Water System AMP and implement enhancements no later than 6 months before the subsequent period of extended operation, or no later than the last refueling outage before 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 its review of the applicant's Closed Treated Water Systems AMP, the NRC 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 enhancements and finds that, with the exception and the enhancements, when 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).

3.0.3.2.16 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

SLRA Section B.2.3.13 states that the Inspection of Overhead Heavy Load Handling Systems AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems." The applicant amended this SLRA section by letter dated April 21, 2021.

Staff Evaluation. During its audit, the NRC 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.M23.

The NRC staff also reviewed the portions of the "scope of program," "parameters monitored or inspected," "detection of aging effects," "acceptance criteria," and "corrective actions" program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these five enhancements follows:

Enhancement 1. SLRA Section B.2.3.13 includes an enhancement to the "scope of program" program element which specifies, in the implementing procedures, that NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants" (ADAMS Accession No. ML070250180), load handling systems are in the scope of the AMP. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.23 and finds it acceptable to specify NUREG-0612 load handling systems in the AMP procedure because NUREG-0612, issued July 1980, provides acceptable guidance for the control of heavy loads. In addition, including NUREG-0612 load handling systems in the scope of the program ensures that these systems are properly managed for aging during the subsequent period of extended operation.

Enhancement 2. SLRA Section B.2.3.13 includes an enhancement to the "parameters monitored or inspected" program element, which clarifies that the visual inspections include monitoring for loss of material due to wear in the AMP procedure. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M23 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation for performing periodic visual inspections to monitor for loss of material due to wear.

Enhancement 3. SLRA Section B.2.3.13 includes an enhancement to the "detection of aging effects" program element, which specifies, in the AMP procedure, that the in-scope systems that are infrequently in service (idle for a period of 1 year or more), such as containment polar cranes, shall be inspected before being placed in service in accordance with the requirements in paragraphs 2-2.1.1 and 2-2.1.3 of the 2005 edition of ASME B30.2. The applicant will also update the AMP governing procedure, inspection procedures, and/or preventive maintenance requirements for load handling systems within the scope of NUREG-0612 to state their respective periodic visual inspection frequencies as required by ASME B30.2. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M32 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation associated with implementing the ASME B30.2 standard for:

(a) performing periodic visual inspections by a designated person yearly for normal service applications
(b) inspecting NUREG-0612 load handling systems that have been idle for a period of 1 year or more, before placing them in service in accordance with the requirements of ASME B30.2.

Enhancement 4. SLRA Section B.2.3.13 includes an enhancement to the "acceptance criteria," program element which specifies, in the AMP procedure, 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 the 2005 Edition of ASME B30.2. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M23 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation associated with implementing the ASME B30.2 standard.

Enhancement 5. SLRA Section B.2.3.13 includes an enhancement to the "corrective actions" program element, which specifies, in the AMP procedure, that repairs made to NUREG-0612 load handling systems are performed as specified in the 2005 Edition of ASME B30.2. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M23 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to perform repairs in accordance with the applicable criteria and guidelines of the ASME B30.2 standard.

The NRC 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.M23. In addition, the staff reviewed the enhancements associated with the "scope of program," "parameters monitored or inspected," "detection of aging effects," "acceptance criteria" and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.13 summarizes operating experience related to the Inspection of Overhead Heavy Load Handling Systems AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Inspection of Overhead Heavy Load Handling Systems AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.3, provides the UFSAR supplement for the Inspection of Overhead Heavy Load Handling Systems AMP. The NRC 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 existing Inspection of Overhead Heavy Load Handling Systems AMP 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 its review of the applicant's Inspection of Overhead Heavy Load Handling Systems AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when the enhancements are 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).

3.0.3.2.17 Compressed Air Monitoring

SLRA Section B.2.3.14 states that the Compressed Air Monitoring AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M24, "Compressed Air Monitoring."

Staff Evaluation. During its audit, the NRC 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.M24.

The NRC staff also reviewed the portions of the "scope of program," "preventive actions," "detection of aging effects," and "monitoring and trending" program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these four enhancements follows.

Enhancement 1. SLRA Section B.2.3.14 includes an enhancement to the "scope of program" program element, which relates to revising the program procedure for the Compressed Air Monitoring AMP to include the element-by-element requirements presented in the GALL-SLR Report AMP XI.M24. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M24 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations.

Enhancement 2. SLRA Section B.2.3.14 includes an enhancement to the "preventive actions" program element, which relates to revising the program procedure for the Compressed Air Monitoring AMP to include the air quality provisions provided in the guidance of EPRI 108147, "Compressor and Instant Air System Maintenance Guide," and to consider the related guidance in ASME OM-2012, Division 2, Part 28. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M24 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations.

Enhancement 3. SLRA Section B.2.3.14 includes an enhancement to the “detection of aging effects” program element, which relates the revision of pertinent documents to include inspections of internal air line surfaces with maintenance, corrective, or other activities that involve opening of the component or system. This enhancement also includes revisions to pertinent documents to include inspection frequency and inspection methods for the opportunistic inspections with the guidance of standards or documents such as ASME OM-2012, Division 2, Part 28. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M24 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations.

Enhancement 4. SLRA Section B.2.3.14 includes an enhancement to the “monitoring and trending” program element, which relates to revising the program procedure for the Compressed Air Monitoring AMP by including air quality sampling and/or governing procedures to review air quality test results and to consider ASME OM-2012, Division 2, Part 28, for monitoring and trending guidance. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M24 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations.

The NRC 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.M24. In addition, the staff reviewed the enhancements associated with the “scope of program,” “preventive actions,” “detection of aging effects,” and “monitoring and trending” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.14 summarizes operating experience related to the Compressed Air Monitoring AMP. The NRC staff evaluated operating experience information by reviewing the SLRA and conducting an audit. As discussed in the Audit Report , the staff reviewed the applicant’s plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Compressed Air Monitoring AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.14, provides the UFSAR supplement for the Compressed Air Monitoring AMP. The NRC 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 existing Compressed Air Monitoring AMP 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 its review of the applicant's Compressed Air Monitoring AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that their implementation before the subsequent period of extended operation will make the AMP 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).

3.0.3.2.18 Fire Protection

SLRA Section B.2.3.15 states that the Fire Protection AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M26, "Fire Protection," as modified by SLR-ISG-2021-02-MECHANICAL. The applicant amended this SLRA section by letters dated April 21, 2021, October 25, 2021, November 23, 2021, and December 9, 2021.

Staff Evaluation. During its audit, the NRC 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.M26, as modified by SLR-ISG-2021-02-MECHANICAL.

For the "scope of program" program element, the NRC staff needed additional information regarding the fire retardant coatings present at PBN, the programs credited to manage the applicable aging effects for the fire barrier intended function, and inspections of penetration seals and fire damper assemblies and issued RAIs B.2.3.15-1, B.2.3.15-2, B.2.3.15-3, and B.2.3.15-3a. The staff's requests and the applicant's responses are documented in ADAMS Accession Nos. ML21256A129, ML21298A090, ML21327A077, and ML21343A294.

In its response to B.2.3.15-1, the applicant stated that "fire retardant coatings" refers to Flamemastic because it is the only fire retardant coating material used at PBN. During its evaluation of the applicant's response to B.2.3.15-1, the NRC staff noted, as amended by letter dated April 21, 2021, SLRA Section 3.5.2.1.14 and SLRA Table 3.5.2-14 include "fire retardant coatings" as a fire barrier commodity material and includes AMR items for managing applicable aging effects for fire retardant coating penetration seals and fire stops and wraps. The staff finds the applicant's response acceptable because, consistent with the GALL-SLR, cracking/delamination, loss of material, change in material properties, and separation will be managed for fire retardant coatings (Flamemastic).

In its response to RAI B.2.3.15-2, the applicant stated that the inspection and acceptance criteria for the 10 CFR Part 50, Appendix J; ASME Section XI, Subsection IWE; and ASME Section XI, Subsection IWL AMPs cited to manage the applicable aging effects for structural components that have a fire barrier intended function are equivalent or better than those in the Fire Protection AMP. To meet the guidance in the Fire Protection AMP, the implementing procedure for the Structures Monitoring and Water-Control Structures Associated with Nuclear Power Plants AMPs, and the implementing procedure for the Masonry Walls AMP were enhanced to include spalling and scaling as applicable aging effects for masonry block walls.

The applicant stated that these implementing procedures are also implementing procedures for the Fire Protection AMP. SLRA Table 2.4-1 was updated to remove direct flow and fire barrier as intended functions for the liner plate. Plant-specific note 4 to SLRA Table 3.5.2-6 was updated to refer to both the Structures Monitoring and Masonry Walls AMPs. Plant-specific note 6 to SLRA Table 3.5.2-11 was updated to refer to the Masonry Walls AMP instead of the Structures Monitoring AMP. SLRA Tables 2.4-11 and 3.5.2-11 were updated to add intended functions of “shelter, protection” and “structural support” for the manholes, and SLRA Table 2.4-11 was updated to add the intended function “shelter, protection” for the manhole covers (insulated). SLRA Table 3.5.2-11 was revised to indicate that the manhole covers are insulated. The applicant stated that steel fire-rated doors and penetration seals are visually inspected for conditions that could impact their ability to perform their intended functions, including flood barrier. In addition, the applicant stated that the same procedure is used for inspections of the fire-rated, flood, and high energy line break doors and any visual indication of cracking, separation of seals, rupture, or puncture is unacceptable for fire seals and conduit wrapping.

The NRC staff finds the applicant’s response acceptable because the programs cited to manage applicable aging effects for components with a fire barrier intended function either have inspection and acceptance criteria equivalent to or better than the Fire Protection AMP or enhancements to meet the Fire Protection AMP guidance were made to the implementing procedures for the cited programs. In addition, the Fire Protection AMP visual inspections can be capable of detecting conditions that could impact the ability of fire-rated doors and penetration seals to perform their intended functions.

In its response to RAI B.2.3.15-3, the applicant stated that the inspection sample size will be expanded when more than 15 percent of a type of penetration seal or fire damper assembly have any sign of degradation. The expanded inspection will include an additional 10 percent of a type of penetration seal or fire damper assembly. The additional testing will continue until failures are less than 15 percent. In addition, the applicant stated that the approach to expand the inspection sample size is consistent with the sample population and acceptable failure rate for fire dampers and that approach is part of the plant’s approved Fire Protection Program (ADAMS Accession Nos. ML20149E960 and ML20245A450), and that the approach will ensure that degradation is detected prior to a loss of intended function. The NRC staff needed additional information and issued RAI B.2.3.15-3a because the approach is related to testing fire damper closure (active function) and is not related to expanding the visual inspections for age-related degradation of fire damper assemblies.

In its response to RAI B.2.3.15-3a, the applicant revised enhancement k) in SLRA Appendix A, Table 16.3, and SLRA Section B.2.3.15, including the enhancement to the “monitoring and trending” and “corrective actions” program elements, to state that when a penetration seal or fire damper assembly does not meet acceptance criteria due to current or projected degradation, an evaluation is performed to confirm that the penetration seal or fire damper assembly will continue to perform its fire barrier function until the next scheduled inspection, or to determine that the penetration seal or fire damper assembly requires repair (see *enhancement 11*). The applicant stated that the “Evaluation may include performing additional fire damper assembly inspections as required to provide reasonable assurance that the intended functions for fire protection are maintained.” If additional inspections are performed, the sample will come from the remaining population of penetration seals or fire damper assemblies that are susceptible to similar degradation. The applicant revised enhancement b) in SLRA Appendix A, Table 16.3, and the enhancement to the “scope of program,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements in SLRA Section B.2.3.15 to revise procedures to clarify corrective actions for fire damper closure tests and visual inspections of fire damper assemblies for age-related degradation (see *enhancement 2*). In addition, the applicant revised enhancement f) in SLRA Appendix A, Table 16.3, and the enhancement to the "detection of aging effects" program element in SLRA Section B.2.3.15 to revise procedures to state that the sample of penetration seals (33 percent of the total population) that is visually inspected every 18 months includes at least 10 percent of each type of seal (see *enhancement 6*).

The NRC staff finds the applicant's response acceptable because (1) when a penetration seal or fire damper assembly does not meet acceptance criteria due to current or projected degradation, an evaluation will be performed to confirm that the penetration seal or fire damper assembly will continue to perform its fire barrier function until the next scheduled inspection or to determine that the penetration seal or fire damper assembly requires repair; (2) additional penetration seal or fire damper assembly inspections may be performed, as part of the evaluation, to provide additional assurance that the fire barrier intended function will be maintained; (3) procedures will be clear on the corrective actions for fire damper closure tests and fire damper assembly visual inspections; and (4) consistent with GALL-SLR Report AMP XI.M26, at least 10 percent of each type of seal will be visually inspected every 18 months.

The NRC staff also reviewed the portions of the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these enhancements follows.

<u>*Enhancement 1*</u>. SLRA Section B.2.3.15 includes an enhancement to the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements that relates to revising procedures by specifying that penetration seals will be inspected for increased hardness, shrinkage, and loss of strength. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M26 and finds it acceptable because when it is implemented it will require penetration seals to be inspected for increased hardness, shrinkage, and loss of strength, which is consistent with GALL-SLR Report AMP XI.M26.

<u>*Enhancement 2*</u>. As amended by letter dated December 9, 2021, SLRA Section B.2.3.15 includes an enhancement to the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements that relates to revising procedures by specifying that any loss of material of fire damper assemblies is unacceptable. In addition, procedures will be revised to clarify corrective actions for fire damper closure tests and visual inspections of fire damper assemblies for age-related degradation. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M26 and finds it acceptable because when it is implemented it will require that any loss of material of fire damper assemblies is unacceptable, which is consistent with GALL-SLR Report AMP XI.M26, and the procedures will be clear on the corrective actions for fire damper closure tests and fire damper assembly visual inspections.

<u>*Enhancement 3*</u>. SLRA Section B.2.3.15 includes an enhancement to the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements that relates to revising procedures by specifying that well-sealed and robustly secured components, fully enclosed cable tray covers, and fire proofing material sprayed onto structural steel will be inspected for loss of material, cracking, and changes to elastomer properties, as appropriate. The NRC staff reviewed this enhancement

against the corresponding program element in GALL-SLR Report AMP XI.M26 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report AMP XI.M26 recommendation to visually inspect fire barrier materials and, as a result, loss of material, cracking, and changes to elastomer properties can be managed to ensure that the components can continue to perform their intended function during the subsequent period of extended operation.

Enhancement 4. SLRA Section B.2.3.15 includes an enhancement to the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements that relates to revising procedures by adding the degradation effects of spalling and scaling that masonry block walls will be inspected for. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M26 and finds it acceptable because when it is implemented it will require masonry block walls be inspected for spalling and scaling that may result in a loss of material, which is consistent with GALL-SLR Report AMP XI.M26.

Enhancement 5. SLRA Section B.2.3.15 includes an enhancement to the "detection of aging effects" program element that relates to revising procedures by specifying that personnel performing fire protection inspections will be qualified. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M26 and finds it acceptable because when it is implemented it will require that personnel performing fire protection inspections be qualified, which is consistent with GALL-SLR Report AMP XI.M26.

Enhancement 6. As amended by letter dated December 9, 2021, SLRA Section B.2.3.15 includes an enhancement to the "detection of aging effects" program element that relates to revising procedures by stating that the sample of penetration seals (33 percent of the total population) that is visually inspected every 18 months includes at least 10 percent of each type of seal. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M26 and finds it acceptable because when it is implemented it will require at least 10 percent of each type of seal be visually inspected every 18 months, which is consistent with GALL-SLR Report AMP XI.M26.

Enhancement 7. SLRA Section B.2.3.15 includes an enhancement to the "detection of aging effects" program element that relates to revising procedures by specifying well-sealed and robustly secured components, fully enclosed cable tray covers, and fire proofing material sprayed onto structural steel will be inspected every 4.5 years (33 percent of the population every 18 months). The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M26 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report AMP XI.M26 recommendation to visually inspect fire barrier materials and, as a result, the applicable aging effects can be managed to ensure that the components can continue to perform their intended function during the subsequent period of extended operation.

Enhancement 8. SLRA Section B.2.3.15 includes an enhancement to the "detection of aging effects" program element that relates to revising procedures by specifying that dry chemical fire extinguishing systems will be inspected semi-annually. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M26 and finds it acceptable because when it is implemented it will require semi-annually inspecting the dry chemical fire extinguishing systems and, as a result, the applicable aging effects can be managed to ensure that the component can continue to perform its intended function during the subsequent period of extended operation.

Enhancement 9. SLRA Section B.2.3.15 includes an enhancement to the "monitoring and trending" program element that relates to revising procedures by specifying that the dry chemical fire extinguishing system inspections will be monitored and trended. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M26 and finds it acceptable because when it is implemented it will require trending of dry chemical fire extinguishing system inspection results, which is consistent with the recommendation in GALL-SLR Report AMP XI.M26 to monitor and trend inspection results.

Enhancement 10. As amended by letter dated April 21, 2021, SLRA Section B.2.3.15 includes an enhancement to the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements that relates to revising procedures by including inspecting, monitoring, and trending of cracking and loss of material for oil collection channels, trenches, and skids credited to mitigate the spread of combustible liquids. The inspections will be performed every 18 months and the acceptance criteria are that there is no indication of cracking or loss of material. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M26 and finds it acceptable because the periodic visual inspections of the Fire Protection Program can be capable of detecting cracking and loss of material of the oil collection channels, trenches, and skids to prevent loss of intended function.

Enhancement 11. As amended by letters dated October 25, 2021, and December 9, 2021, SLRA Section B.2.3.15 includes an enhancement to the "monitoring and trending" and "corrective actions" program elements that relates to revising procedures by requiring an assessment for additional inspections of penetration seals or fire damper assemblies when the acceptance criteria are not met. The NRC staff needed additional information for this enhancement and issued RAIs B.2.3.15-3 and B.2.3.15-3a. The staff's evaluation of the associated information provided for RAI B.2.3.15-3 and B.2.3.15-3a is discussed above. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M26 and finds it acceptable because when a penetration seal or fire damper assembly does not meet acceptance criteria due to current or projected degradation, an evaluation is performed to confirm that the penetration seal or fire damper assembly will continue to perform its fire barrier function until the next scheduled inspection, which may include performing additional penetration seal or fire damper assembly inspections, or to determine that the penetration seal or fire damper assembly requires repair. Additional inspections of penetration seals or fire damper assemblies that are susceptible to similar degradation would provide additional assurance that the fire barrier intended function will be maintained.

The NRC 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.2.3.15-1, B.2.3.15-2, B.2.3.15-3, and B.2.3.15-3a, 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.M26, as modified by SLR-ISG-2021-02-MECHANICAL. In addition, the staff reviewed the enhancements associated with the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.15 summarizes operating experience related to the Fire Protection AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Fire Protection AMP was evaluated.

UFSAR Supplement. As amended by letters dated October 25, 2021, November 23, 2021, and December 9, 2021, SLRA Appendix A, Section 16.2.2.15 provides the UFSAR supplement for the Fire Protection AMP. The NRC 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 in SLRA Appendix A, Table 16-3, that the applicant committed to enhance the Fire Protection Program by implementing *Enhancements 1 through 11* stated above no later than 6 months 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 its review of the applicant's Fire Protection AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and concluded that their implementation prior to the subsequent period of extended operation will make the AMP 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).

3.0.3.2.19 Fire Water System

SLRA Section B.2.3.16 states that the Fire Water System AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M27, "Fire Water System." The applicant amended this SLRA section by letters dated April 21, 2021, and May 6, 2021.

Staff Evaluation. During its audit, the NRC 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.M27.

For the "parameters monitored or inspected" program element, the NRC staff needed additional information on the water-based fire protection system components subject to the wet-dry cycle and issued RAI B.2.3.16-1. The staff's request and the applicant's response are documented in ADAMS Accession No. ML21223A308.

In its response to B.2.3.16-1, the applicant explained that the last internal visual inspection of one representative branch line of the warehouse #2 suppression system was in 2014 and the results were that there was little to no internal wear and no sprinkler head blockage. The gas turbine building and low-voltage auxiliary transformers suppression system was also inspected in 2014, and the results were that the pipe had 2 to 3 gallons of water that was drained and there was minor corrosion and normal pipe wear. The applicant also confirmed that fire suppression system components subject to the wet-dry cycle will be inspected consistent with the recommendations in GALL SLR Report AMP XI.M27.

During its evaluation of the applicant's response to B.2.3.16-1, the NRC staff noted that the inspections performed on the warehouse #2 suppression system and the gas turbine building and low-voltage auxiliary transformers suppression system in 2014 and those scheduled in June 2022 and August 2021, respectively, are independent from the Enhancement 2 discussed below, which will be implemented before the subsequent period of extended operation. The staff finds the applicant's response acceptable because it has identified portions of the water-based fire protection system components that have been wetted but are normally dry, and the Fire Water System AMP will be enhanced before the subsequent period of extended operation to perform volumetric wall thickness examinations on the portions of the water-based fire protection system components that have been wetted but are normally dry, consistent with the recommendations in GALL-SLR Report AMP XI.M27.

The NRC staff also reviewed the portions of the "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements associated with the enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluations of these enhancements follows.

Enhancement 1. SLRA Section B.2.3.16 includes an enhancement to the "parameters monitored or inspected" program element related to updating procedures on visual inspections for detecting loss of material, including that the visual inspection is capable of detecting surface irregularities and that follow-up volumetric wall thickness examinations are performed when surface irregularities are detected. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because, when implemented, the procedural changes will be consistent with the recommendations in GALL-SLR Report AMP XI.M27 and, as a result, the visual inspections can be capable of detecting surface irregularities, and follow-up volumetric wall thickness examinations will be performed when surface irregularities are detected.

Enhancement 2. SLRA Section B.2.3.16 includes an enhancement to the "parameters monitored or inspected" program element related to performing volumetric wall thickness examinations on portions of the water-based fire protection system components that have been wetted but are normally dry. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because, when implemented, volumetric wall thickness examinations will be performed on portions of the water-based fire protection system components that have been wetted but are normally dry, which is consistent with the recommendations in GALL-SLR Report AMP XI.M27.

Enhancement 3. As amended by letter dated April 21, 2021, SLRA Section B.2.3.16 includes an enhancement to the "parameters monitored or inspected" program element related to examinations for identifying cracking due to SCC in copper alloy greater than 15 percent zinc valve bodies. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because, when implemented, the Fire Water System AMP will include similar inspection methods and acceptance criteria as the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP and, as a result, will be capable of identifying cracking due to SCC in copper alloy greater than 15 percent zinc valve bodies before the loss of intended function.

Enhancement 4. As amended by letter dated April 21, 2021, SLRA Section B.2.3.16 includes an enhancement to the "detection of aging effects" program element related to updating procedures to perform testing and visual inspections in accordance with the guidance in the corresponding program element and Table XI.M27-1 of GALL-SLR Report AMP XI.M27 (i.e., testing and inspection methods and intervals). SLRA Section B.2.3.16 was also amended by letter dated April 21, 2021, by adding a table to provide additional detail on the enhancement. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because, when implemented, testing and visual inspections will be performed in accordance with the surveillance recommendations in GALL-SLR Report AMP XI.M27.

Enhancement 5. SLRA Section B.2.3.16 includes an enhancement to the "monitoring and trending" program element related to evaluating results of flow tests, flushes, and inspections. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report AMP XI.M27 recommendations that: (a) results of flow testing, flushes, and wall thickness measurements will be monitored and trended, (b) degradation will be projected, (c) timing of future inspections will be based on results, (d) conditions not meeting acceptance criteria will be addressed in the corrective actions program, and (e) adequacy of sampling-based inspections will be confirmed.

Enhancement 6. SLRA Section B.2.3.16 includes an enhancement to the "monitoring and trending" program element related to continuous monitoring of the fire water system pressure. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because, when implemented, it will be consistent with the recommendations associated with continuously monitoring the system discharge pressure in GALL-SLR Report AMP XI.M27.

Enhancement 7. SLRA Section B.2.3.16 includes an enhancement to the "monitoring and trending" program element related to evaluating, monitoring, and trending results of flow tests, flushes, and wall thickness measurements. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because, when implemented, results of flow tests, flushes, and wall thickness measurements will be evaluated, monitored, and trended, which is consistent with the recommendations in GALL-SLR Report AMP XI.M27.

Enhancement 8. As amended by letter dated April 21, 2021, SLRA Section B.2.3.16 includes an enhancement to the "monitoring and trending" program element related to updating spray and sprinkler system flushing procedures to include documenting, evaluating, and trending deposits (i.e., scale and foreign material). The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because, when implemented, deposits will be documented, evaluated, and trended to determine impacts on the spray and sprinkler systems' intended function, which is consistent with the recommendations in GALL-SLR Report AMP XI.M27.

Enhancement 9. SLRA Section B.2.3.16 includes an enhancement to the "acceptance criteria" program element related to updating procedures to state that the minimum component wall thickness of in-scope piping must be maintained. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because, when implemented, it will be consistent with the recommendations in GALL-SLR AMP XI.M27 associated with maintaining the minimum wall thickness of fire water system components.

Enhancement 10. SLRA Section B.2.3.16 includes an enhancement to the "acceptance criteria" program element related to updating procedures to reference the procedures to perform wall thickness examinations and to compare the results to the minimum design wall thickness. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because, when implemented, it will be consistent with the recommendations in GALL-SLR AMP XI.M27 associated with maintaining the minimum wall thickness of fire water system components.

Enhancement 11. As amended by letter dated April 21, 2021, SLRA Section B.2.3.16 includes an enhancement to the "corrective actions" program element related to updating flow testing and flushing procedures to include conducting additional tests when acceptance criteria are not met. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because, when implemented, the scope of testing will be expanded when inspection results do not meet acceptance criteria, which is consistent with the recommendations in GALL-SLR Report AMP XI.M27.

Enhancement 12. As amended by letter dated May 6, 2021, SLRA Section B.2.3.16 includes an enhancement to the "corrective actions" program element related to how recurring internal corrosion will be managed during the subsequent period of extended operation. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because, when implemented, recurring internal corrosion will be managed for the fire water system; additional inspections will be performed when the acceptance criteria are not met, inspection locations will be reviewed to validate their relevance and usefulness and adjusted as necessary, the corrosion degradation rate will be determined, results will be compared to the design minimum allowable wall thickness, and reinspection intervals will be determined based on results. By letter dated May 6, 2021, the applicant also revised the SLRA by adding item 3.3-1, 127 to Table 3.3.2-6 for managing loss of material due to recurring internal corrosion of carbon steel components by the Fire Water System AMP. SE Section 3.3.2.2.7 contains additional information on recurring internal corrosion.

The NRC 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 response to RAI B.2.3.16-1, 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.M27. In addition, the staff reviewed the enhancements associated with the "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.16 summarizes operating experience related to the Fire Water System AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Fire Water System AMP was evaluated.

UFSAR Supplement. As amended by letter dated May 6, 2021, SLRA Appendix A, Section 16.2.2.16, provides the UFSAR supplement for the Fire Water System AMP. The NRC 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 enhancing the Fire Water System AMP by implementing Enhancements 1 through 12, discussed above, 5 years before 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 its review of the applicant's Fire Water System AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that the AMP, with the enhancements implemented before the subsequent period of extended operation, 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).

3.0.3.2.20 Outdoor and Large Atmospheric Metallic Storage Tanks

SLRA Section B.2.3.17 states that the Outdoor and Large Atmospheric Metallic Storage Tanks AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks." The applicant amended this SLRA section in Supplement 1, dated April 21, 2021.

Staff Evaluation. During its audit, the NRC 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.M29.

The NRC staff also reviewed the portions of the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of these three enhancements follows.

Enhancement 1. SLRA Section B.2.3.17 includes an enhancement to the “preventive actions” program element, which relates to applying caulk or sealant to the concrete-to-tank interface for the fuel oil storage tanks before the subsequent period of extended operation. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M29 and finds it acceptable because, when implemented, the tank configurations will be consistent with the GALL-SLR Report recommendations.

Enhancement 2. SLRA Section B.2.3.17, as amended by letter dated April 21, 2021, includes enhancements to the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements, which relate to creating a new procedure and/or associated preventive maintenance requirements to: (a) address the interfaces, handoffs, and overlaps between the Outdoor and Large Atmospheric Metallic Storage Tanks AMP and other AMPs listed in SLRA Section B.2.3.17, (b) include periodic inspections for caulking/sealant on the fuel oil storage tanks at every refueling outage, and the various inspections on a 10-year frequency for the refueling water storage tanks (RWST), and the reactor makeup water tank (RMWT), (c) provide clarification on various aspects of inspection procedures and maintenance requirement documents, (d) include the acceptance criteria listed in SLRA Section B.2.3.17, and (e) include the appropriate corrective actions to be performed when degradation is identified. The NRC staff reviewed these enhancements against the corresponding program elements in GALL-SLR Report AMP XI.M29 and finds them acceptable because the proposed changes will delineate how other AMPs will coordinate with this program to manage the effects of aging on tanks and, when implemented, will enhance the program and be consistent with the GALL-SLR Report recommendations.

Enhancement 3. SLRA Section B.2.3.17 includes an enhancement to the “detection of aging effects” program element, which relates to performing baseline tank bottom thickness examinations using low-frequency electromagnetic testing for the RWST and RMWT, with follow-on ultrasonic testing at discrete locations and a baseline sample surface examination of an RWST tank exterior. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M29 and finds it acceptable because baseline examinations will establish starting points for effective trending activities to identify degradation before loss of intended function, consistent with GALL-SLR Report recommendations.
The NRC 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 Supplement 1, 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.M29. In addition, the staff reviewed the enhancements associated with the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.17 summarizes operating experience related to the Outdoor and Large Atmospheric Metallic Storage Tanks AMP, which the NRC staff reviewed in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Outdoor and Large Atmospheric Metallic Storage Tanks AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.17, provides the UFSAR supplement for the Outdoor and Large Atmospheric Metallic Storage Tanks AMP. The NRC 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 existing Outdoor and Large Atmospheric Metallic Storage Tanks AMP for managing the effects of aging for applicable components during the subsequent period of extended operation. Additionally, the staff noted, in SLRA Appendix A, Table 16-3, that the applicant committed to implementing the listed program enhancements no later than 6 months before the subsequent period of extended operation or no later than the last refueling outage before the subsequent period of extended operation and to start the one-time and 10-year interval inspections no earlier than 10 years before 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 its review of the applicant's Outdoor and Large Atmospheric Metallic Storage Tanks AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, with the enhancements 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).

3.0.3.2.21 Fuel Oil Chemistry

SLRA Section B.2.3.18 states that the Fuel Oil Chemistry AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M30, "Fuel Oil Chemistry," except for the exceptions identified in the SLRA.

Staff Evaluation. During its audit, the NRC 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.M30.

The NRC staff also reviewed the portions of the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria," program elements associated with exceptions and enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these exceptions and enhancements follows.

Exception 1. SLRA Section B.2.3.18 includes an exception to the "preventive actions" program element related to not routinely adding corrosion inhibitors, stabilizers, or biocides to the fuel oil. The NRC staff reviewed this exception against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because PBN has not experienced oil degradation or MIC that indicates the need for these measures. However, corrective actions up to and including fuel oil additives will be used if sample results indicate the presence of these degradation mechanisms.

Exception 2. SLRA Section B.2.3.18 includes an exception to the "detection of aging effects" program element related to the design of the EDG G-01 and G-02 skid tanks that does not allow for complete draining, cleaning, 100-percent internal visual inspection, or volumetric inspection of the bottom of the skid tanks. These skid tanks are integral to the baseplate of the diesel engine and generator/pump assembly and are not standalone tanks. The NRC staff reviewed this exception against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, as an alternative to the GALL-SLR Element 4 requirements, the applicant will drain and clean the EDG G-01 and G-02 skid tanks to the extent practicable. Additionally, the applicant will perform visual inspections of accessible locations of the skid tank internals and volumetric inspections of accessible portions of the skid tank as close to the bottom of the skid tank as possible.

Exception 3. SLRA Section B.2.3.18 includes an exception to the "parameters monitored and inspected," and "detection of aging effects" program elements related to underground tanks T-175A, G-01, G-02 EDG fuel oil storage tank, and T-175B, G-03, G-04 EDG fuel oil storage tank that will only be drained and inspected if deemed necessary, based on the results of fuel oil sample analysis or as recommended by the system engineer. The NRC staff reviewed this exception against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, as an alternative to the GALL-SLR Elements 3 and 4 recommendations, the applicant performed an acceptable inspection and wall thickness testing of other fuel oil tanks made of the same material, indicating that no appreciable material loss has occurred in more than 40 years of service as discussed in the operating experience section. In addition, due to the double wall tank design, regular leak chase monitoring is used, and such monitoring can identify any through wall leaks. This leak chase monitoring was used as justification for relief from a similar inspection ("Relief from the Requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code for Examination of Buried Components" (ADAMS Accession No. ML15127A291)).

Exception 4. SLRA Section B.2.3.18 includes an exception to the "parameters monitored and inspected" and "detection of aging effects" program elements related to the tanks, T-030, P-35B diesel-driven fire pump fuel oil day tank, T-176A, G-03 EDG fuel oil day tank, and T-176B, G-04 EDG fuel oil day tank, that have insufficient size and access to facilitate cleaning. An exception will be taken to not perform internal cleaning of these tanks. The NRC staff reviewed this exception against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, as an alternative to the GALL-SLR Elements 3 and 4 requirements, the applicant will perform additional actions based on visual and volumetric inspection results or when determined necessary by adverse trends or a system engineer's recommendation.

Exception 5. SLRA Section B.2.3.18 includes an exception to the “parameters monitored and inspected” and “detection of aging effects” program elements related to the tanks that do not have access locations or are very small (50 gallons), thus making it difficult to perform the required draining, cleaning, and internal inspections. The NRC staff reviewed this exception against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because the10-year external volumetric inspections of these tanks shall be performed to determine wall thickness in lieu of draining, cleaning, and inspection for the diesel generator day tanks T-031A, G-01, T-031B, G-02, the gas turbine generator starting diesel engine fuel oil tank T-504, and the gas turbine generator auxiliary power diesel engine fuel tanks T-505, and G-501.

Enhancement 1. SLRA Section B.2.3.18 includes an enhancement to the “parameters monitored or inspected” and “detection of aging” program elements, which relates to revising the procedures to include the frequency for T-072 and G-01 skid/sump tanks internal visual inspection preventive maintenance requests (PMRQs) from “on demand” to a 10-year frequency and explaining that the PMRQs shall include draining and cleaning. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 2. SLRA Section B.2.3.18 includes an enhancement to the “parameters monitored or inspected” and “detection of aging” program elements, which relates to creating a new procedure and/or PMRQ to perform draining and internal visual inspections at least once every 10 years for the diesel-driven fire pumps and EDG fuel oil day tanks. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 3. SLRA Section B.2.3.18 includes an enhancement to the “parameters monitored or inspected” and “detection of aging” program elements, which relates to creating a new procedure and/or PMRQ to perform volumetric (UT) wall thickness testing, to include bottom thickness measurements of the gas turbine generators starting diesel engine fuel oil tank and the gas turbine generator auxiliary power diesel engine fuel oil day tank. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 4. SLRA Section B.2.3.18 includes an enhancement to the “parameters monitored or inspected” and “detection of aging” program elements, which relates to updating an existing or creating a new procedure and/or PMRQ to perform volumetric (UT) wall thickness testing that will include bottom thickness measurements of the diesel-driven fire pumps, fuel oil day tank, diesel generators day tank, emergency fuel oil storage tank (buried), and EDG fuel oil day tank. The NRC staff reviewed this enhancement, against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 5. SLRA Section B.2.3.18 includes an enhancement to the “parameters monitored or inspected” and “monitoring and trending” program elements, which relates to enhancing PBN procedures to perform periodic fuel oil sampling of tanks and explaining that the sampling specifically monitors the following parameters for trending purposes: water content, sediment content, and total particle concentration for all in-scope tanks. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 6. SLRA Section B.2.3.18 includes an enhancement to the "detection of aging" program element, which relates to updating, for example, procedures and forms, to perform periodic fuel oil sampling of tanks with either multilevel and all level sampling or a representative sample from the lowest point in the tank if the respective tank does not allow a multilevel sample. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 7. SLRA Section B.2.3.18 includes an enhancement to the "monitored and trending" and "detection of aging" program elements, which relates to updating sampling procedures to perform corrective actions to prevent recurrence when the limits for fuel oil standards are exceeded or water is drained during periodic surveillance. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 8. SLRA Section B.2.3.18 includes an enhancement to the "acceptance criteria" program element, which relates to all new and existing procedures for this AMP. This enhancement will include the acceptance criteria to report and evaluate using the corrective actions program. Also, the thickness measures of the tank bottom are evaluated against the design thickness and corrosion allowance. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 9. SLRA Section B.2.3.18 includes an enhancement to the "corrective actions" program element, which relates to updating sampling procedures to perform corrective actions to prevent recurrence if the specified limits for fuel oil standards are exceeded when water is drained during periodic surveillance. The NRC staff reviewed this enhancement, against the corresponding program element in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 10. SLRA Section B.2.3.18 includes an enhancement to the "operating experience" program element, which relates to updating sampling procedure instructions to provide sampling data to the quarterly fuel oil system health reports in the operating experience portion of the program. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

The NRC 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, 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.M30. The staff also reviewed the exceptions associated with the "parameters monitored or inspected" and "detection of aging effects" program elements, and their justifications and finds that the AMP, with the exceptions, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.18 summarizes operating experience related to the Fuel Oil Chemistry AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Fuel Oil Chemistry AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.18, provides the UFSAR supplement for the Fuel Oil Chemistry AMP. The NRC 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 existing Fuel Oil Chemistry AMP 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, as amended by letter dated November 16, 2020, is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Fuel Oil Chemistry AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the exceptions and the enhancements and finds that, with the exceptions and the enhancements 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).

3.0.3.2.22 Reactor Vessel Material Surveillance

SLRA Section B.2.3.19 states that the Reactor Vessel Material Surveillance AMP is an existing program with two exceptions to the program elements in GALL-SLR Report AMP XI.M31, "Reactor Vessel Material Surveillance."

Staff Evaluation. During its audit, the NRC staff reviewed the applicant's claim of consistency with the GALL-SLR Report with two exceptions. 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.M31. The staff's evaluation of the two exceptions follows.

The applicant identified exceptions to elements 3 and 5 of GALL-SLR Report AMP XI.M31. The PBN "A" RV material surveillance capsule was scheduled for withdrawal and testing to address the initial period of extended operation. The currently approved withdrawal of Capsule "A" is scheduled for fall of 2024 at a neutron fluence of 5.07×10^{19} n/cm^2 (E > 1 MeV), for the initial license renewal period. The applicant requested a revision to this RV material surveillance capsule withdrawal schedule. Specifically, to achieve the peak 72 effective full-power year (EFPY) neutron fluence values identified in the RV embrittlement TLAAs for upper-shelf energy (USE), pressurized thermal shock (PTS), adjusted reference temperature (ART), and pressure-temperature P-T limits presented in SLRA Section 4.2, the applicant requested a revision to the approved capsule withdrawal schedule for the "A" capsule to a neutron fluence of 8.07×10^{19} n/cm^2 (E > 1 MeV), corresponding to 51 EFPY. This revision will provide data that will bound the 72 EFPY projected neutron fluence for the limiting PBN Unit 1 axial weld and plate material and PBN Units 1 and 2 circumferential welds.

In accordance with 10 CFR Part 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements," Paragraph III.B.3, the applicant requested approval to revise the RV material surveillance capsule withdrawal schedule for Capsule "A" from 43 EFPY to the first refueling outage that meets or exceeds 51 EFPY with a projected fluence of 8.07×10^{19} n/cm^2 (E > 1 MeV) to bound the projected 80-year (72 EFPY) neutron fluence for the PBN Units 1 and 2. The proposed change to the RV material surveillance capsule withdrawal schedule from the PBN Units 1 and 2 Technical Requirements Manual Section 2.2, Table 1, is described in SLRA Appendix A and contains revisions identified by deletions and additions of text.

The NRC staff reviewed these exceptions to GALL-SLR Report AMP XI.M31 and this proposed modification to the RV material surveillance capsule withdrawal schedule and finds them to be acceptable because:

(1) The proposed schedule meets the requirements of 10 CFR Part 50, Appendix H.

(2) Capsule "A" will be withdrawn and tested at a neutron fluence corresponding to the subsequent period of extended operation, thus providing data to assess TLAAs regarding RPV integrity for the subsequent period of extended operation.

The NRC staff noted that the applicant was a member of the Babcock & Wilcox Owners Group (B&WOG) RV working group. The B&WOG designed an RV material surveillance program, the Master Integrated Reactor Vessel Program (MIRVP). The Pressurized-Water Reactor Owners Group (PWROG) is now the vehicle for the previous B&WOG RV working group activities and the applicant is now a member of the PWROG. In the MIRVP, RPV materials from PWROG (former B&WOG RV working group) member plants are irradiated at host plants. Although the Reactor Vessel Material Surveillance AMP relies fully on plant-specific capsules and the MIRVP is not a part of the NRC-approved surveillance program, the applicant will use the MIRVP data as supplemental data.

The NRC staff finds that withdrawal and testing of Capsule "A" under the revised RV material surveillance withdrawal schedule at 72 EFPY provides reasonable assurance of adequate aging management of RPV embrittlement for PBN Units 1 and 2 during the SLR period.

The NRC 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 its supplements, 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.M31. The staff also reviewed the exceptions against the corresponding program elements in GALL-SLR Report AMP XI.M31 and finds them acceptable because, when implemented, the Reactor Vessel Material Surveillance AMP described in SLRA Section B.2.3.19 will be consistent with the program element criteria defined in GALL-SLR Report AMP XI.M31.

Operating Experience. SLRA Section B.2.1.19 summarizes operating experience related to the Reactor Vessel Material Surveillance AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Reactor Vessel Material Surveillance AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.19, provides the UFSAR supplement for the Reactor Vessel Material Surveillance AMP. The NRC staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Reactor Vessel Material Surveillance AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also concludes that the withdrawal and testing of Capsule "A" at 51 EFPY, in 2035, is a necessary part in the staff finding that the AMP is acceptable. 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), provided that Capsule "A" is withdrawn and tested as described in the Reactor Vessel Material Surveillance AMP. 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).

3.0.3.2.23 One-Time Inspection

SLRA Section B.2.3.20 states that the One-Time Inspection AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M32, "One-Time Inspection." The applicant amended this SLRA section by letter dated April 21, 2021.

Staff Evaluation. During its audit, the NRC 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.M32.

The NRC staff also reviewed the portions of the “scope of program,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of these six enhancements follows.

Enhancement 1. SLRA Section B.2.3.20 includes enhancements to the “scope of program” program element, which relates to verification of the effectiveness of the PBN Lubricating Oil Analysis AMP, steel components exposed to water environments that do not include corrosion inhibitors as a preventive action, one-time volumetric inspections on each of the SG transition cone field welds on both units, and one-time inspections of the PBN Unit 1 SG divider plate assemblies. The NRC staff reviewed these enhancements against the corresponding program elements in GALL-SLR Report AMP XI.M32 and finds them acceptable because, when implemented, this program element will be consistent with the GALL-SLR Report recommendations.

Enhancement 2. SLRA Section B.2.3.20 includes an enhancement to the “parameters monitored or inspected” program element, which relates to verification of the effectiveness of the PBN Lubricating Oil Analysis AMP by performing a visual examination, or other appropriate nondestructive examination, to verify that degradation due to the applicable aging effects is not occurring. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M32 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations.

Enhancement 3. SLRA Section B.2.3.20 includes an enhancement to the “detection of aging effects” program element, which relates to including a representative sample of each component population and, where practical, focusing on the bounding or lead components most susceptible to aging due to time in service and severity of operating conditions. Additionally, the enhancement specifies that the sample size is 20 percent of the population or a maximum of 25 components at each unit. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M32 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations.

Enhancement 4. SLRA Section B.2.3.20 includes an enhancement to the “monitoring and trending” program element, which relates to inspection results for each material, environment, and aging effect and that the results are compared to those obtained during previous inspections, when available. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M32 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations.

Enhancement 5. SLRA Section B.2.3.20 includes enhancements to the “acceptance criteria” program element, which relate to considering both the results of observed degradation during current inspections and the results of projecting observed degradation of the inspections for each material, environment, and aging effect combination; basing acceptance criteria on applicable ASME Code or other appropriate standards, design basis information, or vendor-specified requirements and recommendations; projecting observed degradation to the end of the subsequent period of extended operation (when practical), to ensure that the projected degradation will not (a) affect the intended function of an SSC, (b) result in a potential leak, or (c) result in heat transfer rates below that required by the CLB to meet design limits; and entering inspection results into the corrective actions program for future monitoring and trending when measurable degradation has occurred but acceptance criteria have been met. The NRC staff reviewed these enhancements against the corresponding program elements in GALL-SLR Report AMP XI.M32 and finds them acceptable because, when implemented, this program element will be consistent with the GALL-SLR Report recommendations.

Enhancement 6. SLRA Section B.2.3.20 includes an enhancement to the "corrective actions" program element, which relates to ensuring that if the cause of the aging effect for each applicable material and environment is not corrected by repair or replacement for all components constructed of the same material and exposed to the same environment, additional inspections are conducted if one of the inspections does not meet acceptance criteria. Additionally, where an aging effect identified during an inspection does not meet acceptance criteria or projected results of the inspections of a material, environment, and aging effect combination do not meet the acceptance criteria, a periodic inspection program is developed. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M32 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations.

The NRC 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.M32. In addition, the staff reviewed the enhancements associated with the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.20 summarizes operating experience related to the One-Time Inspection AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the One-Time Inspection AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.20, provides the UFSAR supplement for the One-Time Inspection AMP. The NRC 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 implementing the One-Time Inspection AMP no later than 6 months before the subsequent period of extended operation, or no later than the last refueling outage before the subsequent period of extended operation for managing the effects of aging for applicable components. The staff also noted that the applicant committed to continuing the existing One-Time Inspection AMP, including the enhancements 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.

<u>Conclusion</u>. Based on its review of the applicant's One-Time Inspection AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when the enhancements are 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).

3.0.3.2.24 ASME Code Class 1 Small-Bore Piping

SLRA Section B.2.3.22 states that the ASME Code Class 1 Small-Bore Piping AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M35, "ASME Code Class 1 Small-Bore Piping." The applicant amended this SLRA section by letter dated April 21, 2021.

<u>Staff Evaluation</u>. During its audit, the NRC staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "preventive actions" program element of the applicant's program in the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M35. The staff reviewed aspects of the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements not associated with the enhancements identified in the SLRA.

The NRC staff also reviewed the portions of the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements associated with the enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these enhancements follows.

<u>*Enhancements*</u>. SLRA Section B.2.3.22 includes enhancements to the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements, which relate to creating new procedures to: (a) perform the new one-time inspections of small-bore piping using the program methods, frequencies, and acceptance criteria included in new program procedures, (b) evaluate results to determine if additional or periodic examinations are required, and (c) perform any additional required inspections. The applicant stated that this AMP previously augmented the applicant's Inservice Inspection (ISI) Program for its initial license renewal, and that the new procedures will be enhanced to support subsequent license renewal.

The NRC staff reviewed the enhancements against the corresponding program elements in the GALL-SLR Report AMP and finds them acceptable because they are administrative in nature and update plant procedures and, when implemented, will make the program consistent with the GALL-SLR Report AMP.

The NRC 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. In addition, the staff reviewed the enhancements associated with the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.22 summarizes operating experience related to the ASME Code Class 1 Small-Bore Piping AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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 on the subsequent period of extended operation.

In December 2020, the NRC issued IN 2007-21, Supplement 1, "Pipe Wear Due to Interaction of Flow-Induced Vibration and Reflective Metal Insulation" (ADAMS Accession No. ML20225A204). IN-2007-21, Supplement 1, provided recent information related to wear of nuclear power plant piping caused by flow-induced vibration.

In February 2021, the applicant evaluated the recent above-referenced industry operating experience on abrasive wear between SS reflective metal insulation (RMI) end caps and ASME Class 1 piping. The evaluation concluded that RMI is used on ASME Code Class 1 piping at PBN, when needed, per PBN design specifications. While the particular specification specifically states that the insulation shall be installed, designed, and attached such that normal vibration will not cause deterioration or damage, this recent industry operating experience could be applicable to PBN. Therefore, the applicant stated that, starting with the fall 2021 outage for PBN Unit 2, and the spring 2022 outage for PBN Unit 1, the licensee will perform walkdowns and inspection of containment Class 1 small-bore piping to determine locations where RMI is used and will open and inspect locations of interest.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the ASME Code Class 1 Small-Bore Piping AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.22, provides the UFSAR supplement for the ASME Code Class 1 Small-Bore Piping AMP. The NRC 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 commitment to implement the new ASME Code Class 1 Small-Bore Piping AMP within 6 years before 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 its review of NextEra's ASME Code Class 1 Small-Bore Piping AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that with them, 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 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).

3.0.3.2.25 External Surfaces Monitoring of Mechanical Components

SLRA Section B.2.3.23 states that the External Surfaces Monitoring of Mechanical Components AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M36, “External Surfaces Monitoring of Mechanical Components.”

Staff Evaluation. During its audit, the NRC 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.M36.

The NRC staff also reviewed the portions of the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of these seven enhancements follows.

Enhancement 1. SLRA Section B.2.3.23 includes an enhancement to the “scope of program” program element, which relates to revising procedures to inspect heat exchanger surfaces exposed to air for evidence of reduction of heat transfer due to fouling. Additionally, the enhancement relates to specifying in procedure(s) that, in situations where the similarity of the internal and external environments is such that the external surface condition is representative of the internal surface condition, external inspections of components may be credited for managing loss of material and cracking of internal surfaces for metallic and cementitious components, loss of material, cracking of internal surfaces for polymeric components, and hardening or loss of strength of internal surfaces for elastomeric components. When credited, the program provides a basis to establish that the external and internal surface condition and environment are sufficiently similar. In addition, procedures will also be revised to clarify that aging effects associated with below-grade components that are accessible during normal operations or refueling outages, for which access is not restricted, are managed by the External Surfaces Monitoring of Mechanical Components AMP. The NRC staff reviewed these enhancements against the corresponding program elements in GALL-SLR Report AMP XI.M36 and finds them acceptable because, when they are implemented, they will be consistent with the GALL-SLR.

Enhancement 2. SLRA Section B.2.3.23 includes an enhancement to the “preventive action” program element, which relates to revising procedures to include an item in the walkdown checklist to inspect insulation metallic jacketing for any damage that would permit in-leakage of moisture. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M36 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR.

Enhancement 3. SLRA Section B.2.3.23 includes an enhancement to the "parameters monitored or inspected" program element, which relates to revising procedures to: (a) explain that visual inspections of cementitious components will check for indications of loss of material, spalling, scaling, and cracking, (b) explain that periodic visual or surface examinations are used to manage cracking in SS or aluminum components, (c) add inspection parameters for metallic components that are listed in B.2.3.23, (d) include inspections for elastomeric and polymeric components, which are monitored through a combination of visual inspection and manual or physical manipulation of the material, noting that the sample size for manipulation is at least 10 percent of the available surface area, (e) explain that flexing of polyvinyl chloride (PVC) piping exposed directly to 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) is conducted to detect potential reduction in impact strength as indicated by a crackling sound or surface cracks when flexed, and (f) include specifying that accumulation of debris on in-scope components is monitored. The NRC staff reviewed these enhancements against the corresponding program elements in GALL-SLR Report AMP XI.M36 and finds them acceptable because, when implemented, they will be consistent with the GALL-SLR.

Enhancement 4. SLRA Section B.2.3.23 includes enhancements to the "detection of aging effects" program element, which relate to revising procedures to: (a) inspect a sample of heating, ventilation, and air conditioning (HVAC) closure bolting that is within reach, to ensure that it is not loose, (b) specify that inspections are to be performed by personnel qualified in accordance with site procedures and programs and that inspections are to be conducted in accordance with the ASME Code, when required, (c) include inspections for loss of material, cracking, changes in material properties, hardening or loss of strength (of elastomeric components), reduced thermal insulation resistance, loss of preload for HVAC closure bolting, and reduction of heat transfer due to fouling at an inspection frequency of every refueling outage for all in-scope non-SS and nonaluminum components, which includes metallic and polymeric insulation jacketing (insulation when not jacketed). Non-ASME Code inspections and tests should include inspection parameters for items such as lighting, distance offset, surface coverage, and presence of protective coatings. Surfaces that are not readily visible during plant operations and refueling outages should be inspected when they are made accessible and at such intervals as would ensure the components' intended functions are maintained. In addition, the procedures should include specifying that surface examinations, or ASME Code Section XI VT-1 examinations (including those inspections conducted on non-ASME Code components), are to be conducted every 10 years to detect cracking of SS and aluminum components; are to be conducted on 20 percent of the surface area unless the component is measured in linear feet, such as piping, when any combination of 1-foot-length sections can be used to meet the recommended extent of 25 inspections. The provisions of GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," may be incorporated for these inspections. Lastly, they should specify alternative inspection methods and additional component information and minimum inspection sample size. The NRC staff reviewed these enhancements against the corresponding program elements in GALL-SLR Report AMP XI.M36 and finds them acceptable because, when implemented, they will be consistent with the GALL-SLR.

Enhancement 5. SLRA Section B.2.3.23 includes enhancements to the "monitoring and trending" program element, which relate to revising procedures to formalize sampling-based inspections. The results of sampling-based inspections will be evaluated against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the intended functions of the components throughout the subsequent period of extended operation, based on the projected rate and extent of degradation. Additionally, the program owner will interface with the fleet corrosion monitoring action program to identify problem areas and track resolution of deficiencies. The NRC staff reviewed these enhancements against the corresponding program elements in GALL-SLR Report AMP XI.M36 and finds them acceptable because, when implemented, they will be consistent with the GALL-SLR.

Enhancement 6. SLRA Section B.2.3.23 includes enhancements to the “acceptance criteria” program element, which relate to revising procedures to: (a) add an evaluation to project the degree of observed degradation to the end of the subsequent period of extended operation or the next scheduled inspection, whichever is shorter, (b) specify where practical, acceptance criteria that are quantitative (e.g., minimum wall thickness, percent shrinkage allowed in an elastomeric seal). For quantitative analyses, the required minimum wall thickness to meet applicable design standards will be used. Where qualitative acceptance criteria are used, the criteria will be clear enough to reasonably ensure that a singular decision is derived based on the observed condition of the SSCs (e.g., cracks are absent in rigid polymers, the flexibility of an elastomeric sealant is sufficient to ensure that it will properly adhere to the surface), and (c) include guidance from EPRI 1007933, “Aging Assessment Field Guide,” and 1009743 “Aging Identification and Assessment Checklist,” on the evaluation of materials and criteria for their acceptance when performing visual/tactile inspections. The NRC staff reviewed these enhancements against the corresponding program elements in GALL-SLR Report AMP XI.M36 and finds them acceptable because, when implemented, they will be consistent with the GALL-SLR.

Enhancement 7. SLRA Section B.2.3.23 includes enhancements to the “corrective actions” program element, which relate to revising procedures to specify that additional inspections will be performed if any sampling-based inspections to detect cracking in aluminum and SS components do not meet the acceptance criteria, unless the cause of the aging effect for each applicable material and environment is corrected by repair or replacement. There will be no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging effect combination inspected, whichever is less. The additional inspections will be completed within the interval (e.g., 10-year inspection interval) in which the original inspection was conducted. If any subsequent inspections do not meet acceptance criteria, an extent-of-condition and extent-of-cause analysis will be conducted to determine the further extent of inspections required. Additional samples will be inspected for any recurring degradation to ensure that corrective actions appropriately address the associated causes. The additional inspections will include inspections of components with the same material, environment, and aging effect combination at both PBN Units 1 and 2. The NRC staff reviewed these enhancements against the corresponding program elements in GALL-SLR Report AMP XI.M36 and finds them acceptable because, when implemented, they will be consistent with the GALL-SLR.

The NRC 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.M36. In addition, the staff reviewed the enhancements associated with the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.23 summarizes operating experience related to the External Surfaces Monitoring of Mechanical Components AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of previously unknown or recurring age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the External Surfaces Monitoring of Mechanical Components AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.23, provides the UFSAR supplement for the External Surfaces Monitoring of Mechanical Components AMP. The NRC 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. In SLRA Appendix A, Table 16-3, the staff noted that the applicant committed to continuing the existing External Surfaces Monitoring of Mechanical Components AMP and implementing the listed program enhancements no later than 6 months before 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 its review of the applicant's External Surfaces Monitoring of Mechanical Components AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that with them, 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).

3.0.3.2.26 Flux Thimble Tube Inspection

SLRA Section B.2.3.24 states that the Flux Thimble Tube Inspection AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M37, "Flux Thimble Tube Inspection."

Staff Evaluation. During its audit, the NRC staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "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.M37.

The NRC staff also reviewed the portions of the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements associated with the enhancement to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of this enhancement follows.

Enhancement. SLRA Section B.2.3.24 includes an enhancement to the "corrective actions" program element, which relates to flux thimble tubes that cannot be inspected over the entire tube length. If these thimble tubes are also subject to wear due to restriction or other defects, and they cannot be shown by analysis to be satisfactory for continued service, they must be removed from service. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M37 and finds it acceptable because it is consistent with GALL-SLR Report AMP XI.M37 and establishes an inspection program to monitor thimble tube performance consistent with NRC Bulletin 88-09 "Thimble Tube Thinning in Westinghouse Reactors."

The NRC 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.M37. In addition, the staff reviewed the enhancement associated with the "corrective actions" program element and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.24 summarizes operating experience related to the Flux Thimble Tube Inspection AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Flux Thimble Tube Inspection AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.24, provides the UFSAR supplement for the Flux Thimble Tube Inspection AMP. The NRC 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 finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Flux Thimble Tube AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, with the enhancements 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).

3.0.3.2.27 Lubricating Oil Analysis

SLRA Section B.2.3.26 states that the Lubricating Oil Analysis AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M39, "Lubricating Oil Analysis."

Staff Evaluation. During its audit, the NRC 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.M39.

The NRC staff also reviewed the portions of the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria," program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these enhancements follows.

Enhancement 1. SLRA Section B.2.3.26 includes an enhancement to the "scope of program" program elements, which relates to including the management of aging effects associated with in-scope piping and the reactor coolant pump system and their components exposed to an environment of hydraulic oil and lubricating oil respectively and managing other components exposed to lubricating oil environments in the scope of the program. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 2. SLRA Section B.2.3.26 includes an enhancement to the "preventive actions," "parameters monitored or inspected," "detection of aging effects," and "monitoring and trending" program elements, which relates to maintaining contaminants in the in-scope lubricating oil and hydraulic oil systems within acceptable limits through sampling and testing for moisture and particle count in accordance with industry standards, and reviewing lubricating oil analysis to determine any unusual or adverse trends associated with the oil sample. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 3. SLRA Section B.2.3.26 includes an enhancement to the "detection of aging effects" program element, which relates to revising or developing the procedures to include the sampling and testing of old oil changes consistent with the equipment manufacturer's recommendations or industry standard; the hydraulic fluid will be tested for water content if the oil is not clear or bright and for particulate count. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 4. SLRA Section B.2.3.26 includes an enhancement to the "acceptance criteria" and "corrective action" program elements, which relates to revising the procedures to clarify the need to specifically monitor and trend water in addition to particulates and identify phase-separated water as not acceptable. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

The NRC staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the amended 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.M30. In addition, the staff reviewed the enhancements associated with the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.26 summarizes operating experience related to the Lubricating Oil Analysis AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Lubricating Oil Analysis AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.26, provides the UFSAR supplement for the Lubricating Oil Analysis AMP. The NRC 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.M39. The staff also noted that the applicant committed to ongoing implementation of the existing Lubricating Oil Analysis AMP 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 its review of the applicant's Lubricating Oil Analysis AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and concluded that their implementation before the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that NextEra 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).

3.0.3.2.28 Buried and Underground Piping and Tanks

SLRA Section B.2.3.27 states that the Buried and Underground Piping and Tanks AMP is an existing program with enhancements that will be consistent with the program elements in the

GALL-SLR Report AMP XI.M41, “Buried and Underground Piping and Tanks,” except for the exceptions identified in the SLRA. The applicant amended this SLRA section by letters dated April 21, 2021, and November 4, 2021.

Staff Evaluation. During its audit, the NRC 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.M41.

For the “preventive actions” program element, the NRC staff determined the need for additional information regarding whether cathodic protection will be provided for buried steel piping and tanks, which resulted in the issuance of RAIs. RAI B.2.3.27-1, RAI B.2.3.27-1a, and the applicant’s responses are documented in ADAMS Accession Nos. ML21208A189, ML21223A308, ML21273A022, and ML21274A053. The staff’s evaluation of these RAIs follows:

Cathodic Protection for Buried Steel Piping. In its responses to RAI B.2.3.27-1 and RAI B.2.3.27-1a, the applicant stated, in part, the following:

- “[t]he buried steel piping in the scope of the PBN Buried and Underground Piping and Tanks AMP includes service water, fire protection and fuel oil.” (RAI B.2.3.27-1a)
- “[n]o activities are currently planned to increase the coverage of cathodic protection system to 100 percent of the buried SLR-scope piping.” (RAI B.2.3.27-1)
- “PBN will commit to performing SLR inspections of buried piping in accordance with NUREG-2191, Table XI.M41-2, Preventive Action Category E, rather than Category C.” (RAI B.2.3.27-1)
- “since the fire protection piping was installed per the requirements of NFPA 24 [“Standard for the Installation of Private Fire Service Mains and Their Appurtenances”] and the piping will be subject to periodic flow testing in accordance with NFPA 25 [“Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems”] section 7.3.1, per NUREG-2191, Section XI.M41, Element 2 Item g.iii, preventive actions beyond those in NFPA 24 need not be provided. Therefore, a [cathodic protection] system is unnecessary for the buried fire main piping. Additionally, the external surface of this piping will be periodically inspected as part of the PBN Buried and Underground Piping and Tanks AMP.” (RAI B.2.3.27-1a)

The NRC staff finds the applicant’s basis for not providing cathodic protection for buried steel fire protection system piping acceptable because, consistent with GALL-SLR Report AMP XI.M41 recommendations, preventive actions beyond those in NFPA 24 need not be provided for fire mains installed in accordance with NFPA 24 if the system undergoes a periodic flow test in accordance with NFPA 25. However, concerning in-scope buried steel service water and fuel oil piping, the staff noted the following: (a) Preventive Action Category E applies when a cathodic protection system has been installed but fails to meet any of the criteria of Preventive Action Category C piping; (b) it was not the staff’s intent that Preventive Action Category E would be used where cathodic protection was not installed; and (c) the coverage of the cathodic protection system with respect to in-scope buried steel service water and fuel oil piping had not been quantified by the applicant. Without this information (i.e., coverage of the cathodic protection system with respect to in-scope buried steel service water and fuel oil piping), the staff could not make a reasonable assurance finding with respect to whether the inspection quantities prescribed in GALL-SLR Report Table XI.M41-2, “Inspection of Buried and

Underground Piping and Tanks," for Preventive Action Category E are appropriate. The staff discussed this concern with the applicant during a public meeting on October 19, 2021 (ADAMS Accession No. ML21281A077).

Following the public meeting, the applicant provided a supplemental response (by letter dated November 4, 2021), which stated that: (a) the approximate length of in-scope buried steel fuel oil piping is 3,305 ft; (b) the approximate length of in-scope buried steel fuel oil piping covered by the cathodic protection system is 1,500 ft; (c) the approximate length of in-scope buried steel service water piping is 325 ft; and (d) the approximate length of in-scope buried steel service water piping covered by the cathodic protection system is 151 ft. In addition, the applicant revised SLRA Section B.2.3.27 to take an exception to the guidance for Preventive Action Category E that all buried steel piping have some level of cathodic protection (see Exception 2 below). Furthermore, the applicant committed to perform at least three inspections of non-cathodically protected steel piping in each 10-year interval (see Enhancement 10 below).

Based on the supplemental response, the NRC staff noted that approximately 45 percent of in-scope buried steel service water and fuel oil piping is covered by the cathodic protection system. Although Preventive Action Category E was not intended for instances where the cathodic protection system only provides partial coverage (i.e., 45 percent), the staff finds the applicant's approach acceptable for the following reasons:

- As noted by the applicant in its response to RAI B.2.3.27-4 dated August 11, 2021, all buried piping (except for a portion of the fire protection piping, which is addressed by the staff below in RAI B.2.3.27-2) is wrapped and/or coated and lined per the original construction requirements. This is further supported by NUREG-1839, "Safety Evaluation Report Related to the License Renewal of the Point Beach Nuclear Plant, Units 1 and 2" (ADAMS Accession No. ML053420137), Section 3.0.3.2.7, "Buried Services Monitoring Program," where the staff noted (based on the applicant's response to an RAI) that piping specifications used for the design and installation of service water and fuel oil piping systems specify that coatings and wrappings were to be used for buried pipe.
- The soil analyses performed in 2009 and 2012 (summarized by the applicant in its response to RAI B.2.3.27-1a dated October 1, 2021) indicated noncorrosive soil conditions per GALL-SLR Report AMP XI.M41 guidance (i.e., soil corrosivity index was less than 10 points per AWWA C105, "Polyethylene Encasement for Ductile-Iron Pipe Systems," Table A.1, "Soil Test Evaluation").
- Based on its review of operating experience in the SLRA, and review of the response to RAI B.2.3.27-1a which summarized the results of eight buried steel piping inspections (seven of which were performed on non-cathodically protected piping), the staff: (a) did not identify any instances of significant external surface corrosion of buried steel piping; and (b) noted that the external coating types consisted of coal-tar epoxy, coal-tar enamel, bituminous, or asphaltic coatings, which are consistent with the coating types recommended in the "preventive actions" program element of GALL-SLR Report AMP XI.M41.
- In addition to the inspections conducted under Preventive Action Category E (i.e., five inspections in each 10-year inspection period), two additional inspections of uncoated/unwrapped buried fire protection piping in each 10-year inspection period (see Enhancement 9 below) will provide further insights into whether loss of material due to general, pitting, crevice, or microbiologically-influenced corrosion is progressing in an adverse manner for buried steel piping.

- The applicant's approach to focus inspections on non-cathodically protected steel piping (i.e., at least five out of seven inspections in each 10-year interval will be conducted on non-cathodically protected piping) is reasonable given its greater susceptibility to degradation when compared to cathodically protected piping.

Cathodic Protection for Buried Steel Tanks. In its response to RAI B.2.3.27-1, the applicant stated the following: (a) the only buried tank exposed to soil at PBN is the emergency fuel oil storage tank, T-072, which is partially buried; (b) T-072 is not cathodically protected and no activities are planned to install cathodic protection for this tank; (c) a bitumastic coating is provided for the tank; (d) the results of the most recent visual and volumetric examinations, performed in August 2020, show that for the locations with the greatest wall loss rate, the projected time until minimum wall thickness may be reached was greater than 20 years; and (e) the tank will be reinspected and reevaluated on a 10-year interval. In addition, in its response to RAI B.2.3.27-4, the applicant revised SLRA Section B.2.3.27 and SLRA Appendix A, Table 16-3, to clarify that examinations of T-072 are conducted from the external surface of the tank using visual techniques and from the internal surface of the tank using volumetric techniques with a minimum of 25 percent of the tank surface area examined. Furthermore, in its response to RAI B.2.3.27-1a dated October 1, 2021, the applicant stated "UT wall thickness measurements were obtained for the [T-072] tank from the interior. The corrosion rate was determined to be 0.31 mils/yr [mpy]."

During its evaluation of the applicant's responses to RAI B.2.3.27-1 and RAI B.2.3.27-4, the NRC staff noted that: (a) GALL-SLR Report AMP XI.M41 includes a cathodic protection acceptance criterion of 1 mpy for steel components as an alternative to the -850 mV criterion; and (b) NACE SP0169-2013, "Control of External Corrosion on Underground or Submerged Metallic Piping Systems," states that a commonly used benchmark for effective external corrosion control is 1 mpy. The staff finds the applicant's justification for not providing cathodic protection for T-072 acceptable for the following reasons: (a) the external surface of T-072 is coated in accordance with the "preventive actions" program element of GALL-SLR Report AMP XI.M41; (b) based on corrosion rate data provided by the applicant, the corrosion rate for the subject tank is less than 1 mpy, which is a commonly used benchmark for effective external corrosion control; and (c) based on the most recent visual and volumetric examinations performed in August 2020, internal volumetric examinations and external visual examination performed on a 10-year inspection frequency provides the staff reasonable assurance that the intended function of the T-072 will be maintained during the subsequent period of extended operation.

For the "preventive actions" and" "detection of aging effects" program elements, the NRC staff determined the need for additional information regarding why additional inspections, beyond those recommended in GALL-SLR Report AMP XI.M41, are not appropriate for buried fire protection system piping (based on there being uncoated buried piping in the fire protection system), which resulted in the issuance of an RAI. RAI B.2.3.27-2 and the applicant's response are documented in ADAMS Accession Nos. ML21208A189 and ML21223A308.

In its response, the applicant stated that: (a) the general buried piping inspections recommended by NUREG-2191, Table XI.M41-2, Preventive Action Category E will be supplemented by additional inspections for the uncoated buried fire protection piping; and (b) continuous pressure monitoring of the fire water system is currently performed by the PBN Fire Water System AMP and will continue to be performed through the subsequent period of extended operation so that loss of system pressure is immediately detected and corrected when acceptance criteria are exceeded. In addition, the applicant revised SLRA Section B.2.3.27 and

SLRA Appendix A, Table 16-3, to include a new enhancement (see Enhancement 9 below) to clarify the following: (a) inspections will be performed on the uncoated or unwrapped portions of the buried fire protection system piping no earlier than 10 years prior to the subsequent period of extended operation and at least every 10 years during the subsequent period of extended operation; and (b) the inspections include at least two 10-foot segments of uncoated or unwrapped fire protection piping. The NRC staff finds the applicant's response and changes to SLRA Section B.2.3.27 and SLRA Appendix A, Table 16-3 acceptable because the combination of (a) continuous pressure monitoring of the fire water system and (b) two inspections of uncoated or unwrapped fire protection piping in each 10-year interval provides the staff reasonable assurance that the intended function of the uncoated/unwrapped fire protection piping will be maintained during the subsequent period of extended operation.

For the "detection of aging effects" program element, the NRC staff determined the need for additional information regarding how inspections of the EDG fuel oil storage tanks (i.e., T-175A and T-175B) and emergency fuel oil storage tank (i.e., T-072) will account for the potential for corrosion at air-to-soil, air-to-concrete, or soil-to-concrete interfaces, which resulted in the issuance of an RAI. RAI B.2.3.27-3 and the applicant's response are documented in ADAMS Accession Nos. ML21208A189 and ML21223A308. The staff's evaluation of this RAI follows:

EDG Fuel Oil Storage Tanks T-175A and T-175B. In its response, the applicant stated that: (a) these tanks are in the underground vault portion of the diesel generator building; and (b) these tanks do not have any interfaces where an external environment transitions to another environment. In addition, the applicant revised SLRA Table 3.3.2-8, "Emergency Power System – Summary of Aging Management Evaluation," to reflect that the subject tanks are only exposed to an underground environment (i.e., concrete external environment was deleted). The NRC staff finds the applicant's response and changes to SLRA Table 3.3.2-8 acceptable because the external surfaces of tanks T-175A and T-175B are not exposed to air-to-soil, air-to-concrete, or soil-to-concrete interfaces; therefore, the staff concerns described in RAI B.2.3.27-3 are moot.

Emergency Fuel Oil Storage Tank T-072. In its response, the applicant stated that: (a) a portion of the tank is located within the fuel oil pumphouse, where it is in contact with the underground uncontrolled pumphouse air, as well as the concrete wall; (b) the other portion of the tank is located on the other side of the concrete wall, where it is buried in soil that meets certain backfill specifications; and (c) the tank has backfill soil-to-concrete and underground uncontrolled air-to-concrete transition interfaces. In addition, the applicant revised SLRA Section B.2.3.27 (see Enhancement 15 below) and SLRA Appendix A, Table 16-3 to clarify the following: (a) the internal surfaces of the tank will be inspected using volumetric techniques; and (b) volumetric wall thickness measurements will also be recorded for the tank interfaces with the air-to-concrete and concrete-to-soil exterior environment transitions. The NRC staff finds the applicant's response and changes to Section B.2.3.27 and SLRA Appendix A, Table 16-3 acceptable because internal volumetric examinations will be performed at air-to-concrete and concrete-to-soil external interface regions to account for the increased potential for corrosion in these areas.

For the "detection of aging effects" program element, the NRC staff determined the need for additional information regarding why factors other than cathodic protection efficacy are used for meeting the criteria for (and transitioning from) Preventive Action Category C, which resulted in the issuance of an RAI. RAI B.2.3.27-4 and the applicant's response are documented in ADAMS Accession Nos. ML21208A189 and ML21223A308.

In its response, the applicant stated the following:

> Since not all of the buried piping within the scope of SLR is cathodically protected and no activities are planned to increase the cathodic protection coverage to 100 percent, a clarification is added to state that buried SLR-scope piping will be classified as Category E, unless a reevaluation based on future [operating experience] and soil conditions, as defined in NUREG-2191, Table XI.M41-2, determines that another Preventive Action Category, such as Category F, is more applicable. Preventive Action Category C will not be used.

During its evaluation of the applicant's response to RAI B.2.3.27-4, the NRC staff noted that the response did not quantify the coverage of cathodic protection system with respect to in-scope buried steel piping. Without this information, the staff could not determine if the inspection quantities prescribed in GALL-SLR Report Table XI.M41-2 for Preventive Action Category E are appropriate for in-scope buried steel piping. In lieu of issuing follow-up RAI B.2.3.27-4a, the staff's concerns with respect to RAI B.2.3.27-4 were merged into follow-up RAI B.2.3.27-1a. The staff's evaluation of the applicant's response to RAI B.2.3.27-1a is discussed above.

The NRC staff also reviewed the portions of the "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements associated with the exceptions and enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these two exceptions and these 26 enhancements follows (the exceptions and enhancements listed in SLRA Section B.2.3.27 are bulletized not numbered; the numbering below for these exceptions and enhancements follows the order in which the bullets appear in SLRA Section B.2.3.27 (as amended)).

Exception 1. SLRA Section B.2.3.27 includes an exception to the "preventive actions" and "acceptance criteria" program elements related to performing cathodic protection testing and evaluations in accordance with NACE SP0169-2013 (with the exception of Section 6, "Criteria and Other Considerations for Cathodic Protection," which will be performed in accordance with NACE SP0169-2007, "Control of External Corrosion on Underground or Submerged Metallic Piping Systems"). The NRC staff reviewed this exception against the corresponding program elements in GALL-SLR Report AMP XI.M41 and finds it acceptable because as documented in the staff's evaluation of Enhancements 1 and 23 below, the applicant clarified that: (a) the -850 millivolt (mV) instant-off (relative to a copper/copper sulfate reference electrode (CSE)) cathodic protection acceptance criterion will be used at PBN, consistent with GALL-SLR Report Table XI.M41-3, "Cathodic Protection Acceptance Criteria"; and (b) a limiting critical potential of -1,200 mV will be used for in-scope buried piping provided with cathodic protection, consistent with the "preventive actions" program element of GALL-SLR Report AMP XI.M41.

Exception 2. As amended by letter dated November 4, 2021, SLRA Section B.2.3.27 includes an exception to the "preventive actions" program element related to not providing cathodic protection for all buried steel piping within the scope of SLR. The NRC staff notes that this exception was provided in response to RAI B.2.3.27-1a. The staff's evaluation of RAI B.2.3.27-1a (and the applicant's approach to not provide cathodic protection for all buried steel piping within the scope of SLR) is documented above.

Enhancement 1. As amended by letter dated April 21, 2021, SLRA Section B.2.3.27 includes an enhancement to the "preventive actions" program element which relates to performing cathodic protection testing and evaluations in accordance with NACE SP0169-2013 (with the exception of Section 6, which will be performed in accordance with NACE SP0169-2007). The subject enhancement, as amended by letter April 21, 2021, also states: (a) the cathodic protection system will meet the requirements of GALL-SLR Section XI.M41, including the polarized potential criteria of NUREG-2191 (i.e., -850 mV instant-off); and (b) the cathodic protection system shall also include a limiting critical potential of -1,200 mV, similar to that stated in NACE SP0169-2007, Section 6.2.3.2.1. The NRC staff reviewed this enhancement and finds it acceptable because as noted in the staff's evaluation of Exception 1 above, use of the -850 mV instant-off cathodic protection acceptance criterion and the -1,200 mV limiting critical potential is consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 2. SLRA Section B.2.3.27 includes an enhancement to the "preventive actions" program element which relates to requiring new or replaced backfill to meet the requirements of NACE SP0169-2007, Section 5.2.3, or NACE RP0285-2002, "Corrosion Control of Underground Storage Tank Systems by Cathodic Protection," Section 3.6. The NRC staff reviewed this enhancement and finds it acceptable because the stated requirements for new backfill are consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 3. SLRA Section B.2.3.27 includes an enhancement to the "parameters monitored or inspected" program element which relates to performing visual inspections of the external surfaces of controlled low strength material backfill (where such backfill is used) to detect potential cracks that could admit groundwater to the surface of the component. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 4, 5, and 6 are implemented, the parameters monitored or inspected for buried components will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 4. SLRA Section B.2.3.27 includes an enhancement to the "parameters monitored or inspected" program element which relates to conditions where volumetric examination or pit depth gages/calipers may be used for measuring wall thickness. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 3, 5, and 6 are implemented, the parameters monitored or inspected for buried components will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 5. SLRA Section B.2.3.27 includes an enhancement to the "parameters monitored or inspected" program element which relates to utilizing a method that has been determined to be capable of detecting cracking when inspecting for cracking in steel components. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 3, 4, and 6 are implemented, the parameters monitored or inspected for buried components will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 6. SLRA Section B.2.3.27 includes an enhancement to the "parameters monitored or inspected" program element which relates to monitoring pipe-to-soil potential and the cathodic protection current for steel piping and tanks in contact with soil to determine the effectiveness of cathodic protection systems. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 3, 4, and 5 are implemented, the parameters monitored or inspected for buried components will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 7. As amended by letter dated August 11, 2021, SLRA Section B.2.3.27 includes an enhancement to the "detecting of aging effects" program element which relates to performing inspections of buried piping in accordance with GALL-SLR Report Table XI.M41-2 Category E steel, unless a reevaluation based on future operating experience and soil conditions, as defined in GALL-SLR Report, Table XI.M41-2, determines that another Preventive Action Category is more applicable. The NRC staff reviewed this enhancement and finds it acceptable because using plant-specific operating experience and the results of soil corrosivity testing to determine if transitioning from Preventive Action Category E to Preventive Action Category F is appropriate is consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 8. As amended by letter dated August 11, 2021, SLRA Section B.2.3.27 includes an enhancement to the "detecting of aging effects" program element which relates to performing soil sample analyses in accordance with GALL-SLR Report, Table XI.M41-2, to confirm that soil is not corrosive for the respective piping material type. The NRC staff reviewed this enhancement and finds it acceptable because the applicant's methodology related to soil corrosivity testing is consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 9. As amended by letter dated August 11, 2021, SLRA Section B.2.3.27 includes an enhancement to the "detecting of aging effects" program element which relates to performing additional inspections of uncoated or unwrapped portions of buried fire protection system piping. The NRC staff notes that the subject enhancement was provided in response to RAI B.2.3.27-2. The staff's evaluation finding RAI B.2.3.27-2 (and this enhancement) acceptable is documented above.

Enhancement 10. As amended by letter dated November 4, 2021, SLRA Section B.2.3.27 includes an enhancement to the "detecting of aging effects" program element which relates to performing at least three inspections of non-cathodically protected steel piping in each 10-year interval beginning no earlier than 10 years prior to the subsequent period of extended operation and at least every 10 years during the subsequent period of extended operation. The NRC staff notes that the subject enhancement was provided in response to RAI B.2.3.27-1a. The staff's evaluation finding RAI B.2.3.27-1a (and the applicant's approach to perform three inspections of non-cathodically protected buried steel piping in each 10-year interval) acceptable is documented above.

Enhancement 11. SLRA Section B.2.3.27 includes an enhancement to the "detecting of aging effects" program element which relates to performing surface and/or volumetric nondestructive testing if evidence of wall loss beyond minor surface scale is observed. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 7, 8, 9, 10, 12, 13, 14, and 15 are implemented, the "detection of aging effects" program element will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 12. SLRA Section B.2.3.27 includes an enhancement to the "detecting of aging effects" program element which relates to revising procedures to state that site-specific conditions can result in transitioning to a higher number of inspections than originally planned at the beginning of a 10-year interval. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 7, 8, 9, 10, 11, 13, 14, and 15 are implemented, the "detection of aging effects" program element will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 13. SLRA Section B.2.3.27 includes an enhancement to the "detecting of aging effects" program element which relates to criteria for determining piping inspection location. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 7, 8, 9, 10, 11, 12, 14, and 15 are implemented, the "detection of aging effects" program element will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 14. SLRA Section B.2.3.27 includes an enhancement to the "detecting of aging effects" program element which relates to conditions where alternatives to visual examination of piping (as described in GALL-SLR Report pages XI.M41-9 and XI.M41-10) may be conducted. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 7, 8, 9, 10, 11, 12, 13, and 15 are implemented, the "detection of aging effects" program element will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 15. As amended by letter dated August 11, 2021, SLRA Section B.2.3.27 includes an enhancement to the "detecting of aging effects" program element which relates to performing examinations of buried tank T-072 from the external surface of the tank using visual techniques and from the internal surface of the tank using volumetric techniques. The NRC staff reviewed this enhancement and finds it acceptable because: (a) the inspections are consistent with guidance provided in the GALL-SLR Report AMP XI.M41 for buried tanks; and (b) as documented in the staff's evaluation of RAI B.2.3.27-3 above, internal volumetric examinations will be performed at air-to-concrete and concrete-to-soil external interface regions to account for the increased potential for corrosion in these areas.

Enhancement 16. SLRA Section B.2.3.27 includes an enhancement to the "monitoring and trending" program element which relates to trending potential difference and current measurements to identify changes in the effectiveness of the cathodic protection systems and/or coatings. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 17 and 18 are implemented, the "monitoring and trending" program element will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 17. SLRA Section B.2.3.27 includes an enhancement to the "monitoring and trending" program element which relates to trending wall thickness measurements when follow-up examinations are conducted. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 16 and 18 are implemented, the "monitoring and trending" program element will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 18. SLRA Section B.2.3.27 includes an enhancement to the "monitoring and trending" program element which relates to evaluating inspection and test results against acceptance criteria to confirm that the sampling bases will maintain the components' intended functions throughout the subsequent period of extended operation based on the projected rate and extent of degradation. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 16 and 17 are implemented, the "monitoring and trending" program element will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 19. SLRA Section B.2.3.27 includes an enhancement to the "acceptance criteria" program element which states that for coated piping or tanks, there is either no evidence of coating degradation or the type and extent of coating degradation is evaluated as insignificant by a qualified individual (e.g., NACE Coating Inspector Program Level 2 or 3 inspector qualification). The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 20, 21, 22, and 23 are implemented, the “acceptance criteria” program element will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 20. SLRA Section B.2.3.27 includes an enhancement to the “acceptance criteria” program element which relates to clarifying that measured wall thickness is evaluated using trend data and projected to continue to meet minimum wall thickness requirements through the end of the subsequent period of extended operation. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 19, 21, 22, and 23 are implemented, the “acceptance criteria” program element will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 21. SLRA Section B.2.3.27 includes an enhancement to the “acceptance criteria” program element which relates to including no evidence that backfill caused damage to the respective component coatings or the surface of the component as an acceptance criterion. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 19, 20, 22, and 23 are implemented, the “acceptance criteria” program element will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 22. SLRA Section B.2.3.27 includes an enhancement to the “acceptance criteria” program element which relates to including as an acceptance criterion that cracks in cementitious backfill that could admit groundwater to the surface of the component are not acceptable. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 19, 20, 21, and 23 are implemented, the “acceptance criteria” program element will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 23. As amended by letter dated April 21, 2021, SLRA Section B.2.3.27 includes an enhancement to the “acceptance criteria” program element which relates to utilizing the cathodic protection acceptance criterion in GALL-SLR Report Table XI.M41-3 (i.e., −850 mV relative to a CSE, instant-off). The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 19, 20, 21, and 22 are implemented, the “acceptance criteria” program element will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 24. SLRA Section B.2.3.27 includes an enhancement to the “corrective actions” program element which relates to revising procedures to include an extent-of-condition evaluation when damage to coatings has been evaluated as significant and the damage was caused by nonconforming backfill. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 25 and 26 are implemented, the “corrective actions” program element will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 25. SLRA Section B.2.3.27 includes an enhancement to the “corrective actions” program element which relates to performing additional inspections when wall thickness extrapolated to the end of the subsequent period of extended operation does not meet minimum wall thickness requirements. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 24 and 26 are implemented, the “corrective actions” program element will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 26. SLRA Section B.2.3.27 includes an enhancement to the “corrective actions” program element which relates to performing additional inspections when coatings, backfill, or the condition of exposed piping does not meet acceptance criteria. The NRC staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 24 and 25 are implemented, the “corrective actions” program element will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

The NRC 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 applicant’s responses to RAIs B.2.3.27-1, B.2.3.27-1a, B.2.3.27-2, B.2.3.27-3, and B.2.3.27-4, and the applicant’s supplemental responses, 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 exceptions associated with the “preventive actions” and “acceptance criteria” program elements, and their justification, and finds that the AMP, with the exceptions, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.27 summarizes operating experience related to the Buried and Underground Piping and Tanks AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant’s plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective actions 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.

During its audit, the NRC staff identified operating experience (i.e., how aging management of the external surfaces of submerged fire water system piping associated with operating experience example 1 in SLRA Section B.2.3.16, “Fire Water System,” will be addressed) where the need for additional information was identified. The applicant provided a supplement on April 21, 2021, in which it stated that: (a) fire protection supply piping has been found to be submerged at the above ground to below ground transition pits inside the pumphouse; and (b) this condition has been reoccurring, so an external raw water environment is added to the ductile iron piping in the fire protection system in SLRA Table 3.3.2-6, “Fire Protection System – Summary of Aging Management Evaluation.” During its review, the staff noted that SLRA Table 3.3.2-6 was revised to reflect that loss of material and loss of material due to selective leaching on the external surfaces of ductile iron piping exposed to raw water (i.e., a submerged environment) will be managed by the External Surfaces Monitoring of Mechanical Components and Selective Leaching AMPs, respectively. The staff finds the applicant’s supplemental response acceptable because: (a) managing loss of material (associated with AMR item 3.3.1-64 and generic note E) using the External Surfaces Monitoring of Mechanical Components AMP is acceptable according to SE Section 3.3.2.1.2; and (b) managing loss of material due to selective leaching (associated with AMR item 3.3.1-72 and generic note A) using the Selective Leaching AMP is consistent with GALL-SLR Report recommendations.

Based on its audit and review of the application, as supplemented by letter dated April 21, 2021, the NRC staff finds that the conditions and operating experience at the plant are bounded by those for which the Buried and Underground Piping and Tanks AMP was evaluated.

UFSAR Supplement. As amended by letters dated April 21 and August 11, 2021, SLRA Appendix A, Section 16.2.2.27, provides the UFSAR supplement for the Buried and Underground Piping and Tanks AMP. The NRC 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 the following: (a) ongoing implementation of the existing Buried and Underground Piping and Tanks AMP for managing the effects of aging for applicable components during the subsequent period of extended operation; and (b) starting inspections no earlier than 10 years 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 its review of the applicant's Buried and Underground Piping and Tanks AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the exceptions and enhancements, and finds that, with the exceptions and enhancements 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).

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

SLRA Section B.2.3.28 states that the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP is a new program that will be consistent with the program elements in the GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," as modified by SLR-ISG-Mechanical-2020-XX, except for the exception identified in the SLRA. The NRC staff noted that, subsequent to the applicant's submittal of its SLRA, draft SLR-ISG-Mechanical-2020-XX was issued as final SLR-ISG-2021-02-MECHANICAL. The applicant amended this SLRA section by letter dated April 21, 2021.

Staff Evaluation. During its audit, the NRC 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.M42, as modified by SLR-ISG-2021-02-MECHANICAL.

The NRC staff also reviewed the portions of the "detection of aging effects" 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. SLRA Section B.2.3.28 includes an exception to the "detection of aging effects" program element related to performing opportunistic inspections, in lieu of periodic inspections, of the internal coating applied to the T-175A and T-175B EDG fuel oil storage tanks. The NRC staff reviewed the exception with respect to managing the following aging effects: (a) loss of material, and (b) loss of coating integrity.

With respect to managing loss of material, the NRC staff finds the exception acceptable because: (a) wall thickness testing of other carbon steel fuel oil tanks has indicated that no appreciable material loss has occurred over more than 40 years of service, and (b) due to the double wall tank design, regular leak chase monitoring is used to identify through-wall leaks, consistent with guidance provided in GALL-SLR Report AMP XI.M41 for managing loss of material in double wall tanks. However, during its audit, the staff determined the need for additional information about how loss of coating integrity (which can result in downstream effects such as reduction in flow, reduction in pressure, or reduction of heat transfer) will be managed. The applicant provided a supplemental response on April 21, 2021, which revised the subject exception to include the following statement:

> Flaking, peeling, or delamination of the internal coating would be identified as particulates suspended in the fuel oil samples that are taken quarterly. Coating particulates could also be identified in the fuel oil filters, which have pressure indicators that would identify if the filters were becoming clogged prior to the potential loss of function of the downstream components.

With respect to managing loss of coating integrity, the NRC staff reviewed the revised exception and finds it acceptable because the combination of quarterly fuel oil sampling and differential pressure monitoring across the fuel oil filters provides reasonable assurance that loss of coating integrity will be adequately managed.

The NRC 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 21, 2021, 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.M42. The staff also reviewed the exception between the applicant's program and GALL-SLR Report XI.M42 associated with the "detection of aging effects" program element, and its justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects.

<u>Operating Experience</u>. SLRA Section B.2.3.28 summarizes operating experience related to the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

During its audit (specifically, topic 2 associated with the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP), the NRC staff identified operating experience for which it determined the need for additional information (i.e., basis for why the inspection frequencies cited in GALL-SLR Report Table XI.M42-1, "Inspection Intervals for Internal Coatings/Linings for Tanks, Piping, Piping Components, and Heat Exchangers," are appropriate for the component cooling water (CCW) heat exchangers, in lieu of the more frequent triennial inspections noted by the staff during its audit). The applicant provided a supplement on April 21, 2021, to address the staff's concern. In its supplemental response, the applicant modified SLRA Section B.2.3.28 to state the following:

> The inspection frequency of the CCW heat exchangers will not be reduced prior to or upon entering the [subsequent period of extended operation] unless the results from subsequent inspections of the internal coatings of the heat exchangers justify changing the inspection interval as determined by the plant's corrective action program and Table XI.M42-1, Note 5 of NUREG-2191.

The NRC staff finds the applicant's supplement acceptable because extension of the inspection interval to the frequencies cited in GALL-SLR Report Table XI.M42-1 (i.e., every 4 or 6 years), based on the results of inspections, is consistent with GALL-SLR Report AMP XI.M42 recommendations.

Based on its audit and review of the application, as modified by letter dated April 21, 2021, the NRC staff finds that the conditions and operating experience at the plant are bounded by those for which the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.28, provides the UFSAR supplement for the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP. The NRC 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 implementing the new Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP no later than 6 months before the subsequent period of extended operation, or no later than the last refueling outage before the subsequent period of extended operation, for managing the effects of aging for applicable components. In addition, the staff noted that the applicant committed to performing the baseline inspections no earlier than 10 years or no later than 6 months before the subsequent period of extended operation, or no later than the last refueling outage before 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 its review of the applicant's Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP, the NRC 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).

3.0.3.2.30 ASME Section XI, Subsection IWE

SLRA Section B.2.3.29, as amended, states that the ASME Section XI, Subsection IWE AMP is an existing program with enhancements that will be consistent with the program elements in the

GALL-SLR Report AMP XI.S1, “ASME Section XI, Subsection IWE.” The applicant amended this SLRA section by letters dated April 21, 2021, and August 11, 2021.

Staff Evaluation. During its audit, the NRC 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.S1.

The original SLRA as well as Supplement 1 stated that the program was consistent as modified by SLR-ISG-Structures-2020-XX, “Updated Aging Management Criteria for Structures Portions of the Subsequent License Renewal Guidance” (ADAMS Accession No. ML20156A338). This statement was corrected by the applicant in its response to RAI B.2.3.29-1, dated August 11, 2021, to state that the Subsection IWE AMP, with enhancements, will be consistent with the 10 elements of the GALL-SLR Report AMP XI.S1. The NRC staff found the revised consistency statement acceptable because there were no changes made to the GALL-SLR Report AMP XI.S1 in SLR-ISG-Structures-2020-XX and, therefore, the previous consistency statement was incorrect.

For the “detection of aging effects,” the NRC staff determined the need for additional information, which resulted in the issuance of RAIs. RAI B.2.3.29-2 and RAI B.2.3.29-3, and the applicant’s responses are documented in ADAMS Accession No. ML21223A308.

In its response to RAI B.2.3.29-2, the applicant revised the enhancement and related Commitment No. 33(f) related to performing a one-time supplemental volumetric examination of the containment liner to make it independent of the process, program, or method by which the triggering operating experience is identified. The applicant also stated that the schedule for completing the one-time volumetric examination in both PBN units, if the triggering operating experience is identified in either unit, will be determined in its corrective actions program in a manner that ensures that the intended function of the liner will be maintained. The NRC staff finds the applicant’s response and changes to the enhancement and Commitment No. 33(f) acceptable because: (a) the one-time volumetric examination will be performed based on the occurrence of the triggering operating experience without regard to the process, program, or method by which it is identified, which makes it consistent with the GALL-SLR recommendation, and (b) the implementation schedule for conducting the one-time examination in both PBN units, if the triggering operating experience occurs in either unit, will be determined in the applicant’s corrective actions program such that the intended function of the liner is maintained.

In its response to RAI B.2.3.29-3, the applicant revised Enhancements 4 and 5, and corresponding Commitment Nos. 33(d) and 33(e), related to performing supplemental surface examinations or enhanced visual examinations to detect cracking, to explicitly explain that the EVT-1 enhanced visual examination technique will also be used as an alternative to surface examination methods.

The NRC staff finds the applicant’s response and changes to the enhancements and Commitment Nos. 33(d) and 33(e) acceptable because the EVT-1 enhanced visual examination is an acceptable method that is capable of detecting cracking due to cyclic loading or SCC consistent with the recommendations of the GALL-SLR Report.

The NRC staff also reviewed the portions of the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” and “corrective actions” program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these seven enhancements follows.

Enhancement 1. SLRA Section B.2.3.29 includes an enhancement (which corresponds to Commitment No. 33(a) in SLRA Appendix A, Table 16-3) to the "preventive actions" program element that relates to preventive actions for maintaining the integrity of replacement bolting. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S1 and finds it acceptable because, when implemented, the revised plant procedures will provide guidance for preventive actions for proper selection and storage of replacement bolting and coating material and lubricants, and appropriate installation torque consistent with industry standards, to ensure that bolting integrity is maintained, which is consistent with the recommendations of GALL-SLR Report AMP XI.S1.

Enhancement 2. SLRA Section B.2.3.29 includes an enhancement (which corresponds to Commitment No. 33(b) in SLRA Appendix A, Table 16-3) to the "preventive actions" program element, which relates to preventive actions for American Society for Testing and Materials (ASTM) A325 and ASTM A490 or equivalent structural bolting. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S1 and finds it acceptable because, when implemented, plant procedures will specify preventive actions for storage, lubricants, and the SCC potential of ASTM A325 and ASTM A490 or equivalent twist-off structural bolting in accordance with Section 2 of the Research Council for Structural Connections' publication, "Specification for Structural Joints Using ASTM A325 or A490 Bolts," which is consistent with the recommendations in the GALL-SLR Report AMP.

Enhancement 3. SLRA Section B.2.3.29 includes an enhancement (which corresponds to Commitment No. 33(c) in SLRA Appendix A, Table 16-3) to the "parameters monitored or inspected" program element, which relates to inspecting pressure-retaining bolting for loosening and material condition. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S1 and finds it acceptable because, when implemented, it will monitor containment pressure-retaining boundary bolting for loosening and material condition that could affect containment structural and leak-tight integrity, as recommended in the GALL-SLR Report AMP.

Enhancement 4. SLRA Section B.2.3.29, as amended by Supplement 1, dated April 21, 2021, and the response to RAI B.2.3.29-3, dated August 11, 2021 (evaluated above), includes an enhancement (which corresponds to Commitment No. 33(d) in SLRA Appendix A, Table 16-3, as amended) to the "detection of aging effects" program element that relates to performing periodic surface examinations or EVT-1 enhanced visual examinations to detect cracking at intervals no greater than 10 years. The enhancement applies to all non-piping containment penetrations (e.g., hatches, electrical penetrations) that do not have a CLB fatigue analysis and are not subject to appropriate local leak rate testing. The NRC staff reviewed this enhancement, as revised by the response to RAI B.2.3.29-3, against the corresponding program element in GALL-SLR Report AMP XI.S1 and finds it acceptable because, when implemented: (a) the AMP will perform supplemental surface examinations or EVT-1 examinations, once in a 10-year interval, for steel, non-piping containment penetrations that have no CLB fatigue analysis (and are not subject to Type B local leak rate testing capable of detecting cracking), to detect and manage cracking due to cyclic loading, (b) the inspection methods that will be used are consistent with the recommendations of the GALL-SLR Report to detect cracking in pressure-retaining components subject to cyclic loading, and (c) the frequency of examination of once in a 10-year interval is reasonable because there has been no identified plant-specific operating experience of cracking in these components.

Enhancements 5 and 7. SLRA Section B.2.3.29, as amended by Supplement 1 dated April 21, 2021, and the response to RAI B.2.39-3, dated August 11, 2021 (evaluated above), includes two enhancements (which correspond to Commitment No. 33(e) in SLRA Appendix A, Table 16-3, as amended) to the “detection of aging effects” and “corrective actions” program elements, respectively, that relate to conducting supplemental one-time surface examinations or EVT-1 enhanced visual examinations to confirm the absence of cracking due to cyclic loading or SCC in potentially susceptible containment high-temperature (above 60 °C (140 °F)) penetration components of SS or dissimilar metal welds. This one-time inspection, performed by qualified personnel, will comprise: (a) a representative sample (two) of the SS penetrations or dissimilar metal welds associated with high-temperature SS piping systems in frequent use on each PBN unit, and (b) the SS fuel transfer tube on each PBN unit. If cracking is detected as a result of the supplemental one-time inspections, additional inspections will be conducted in accordance with the applicant’s corrective actions program. This will include one additional penetration with dissimilar metal welds associated with high temperature SS piping for each PBN unit until cracking is no longer detected. Periodic inspection of these components for cracking will be added to the ASME Section XI, Subsection IWE AMP if necessary, based on the inspection results. The NRC staff reviewed these enhancements and corresponding commitment, as amended by Supplement 1 and the response to RAI B.2.3.29-3, against the corresponding program elements in GALL-SLR Report AMP XI.S1, and finds them acceptable because, when implemented: (a) they will require a one-time supplemental examination, within the 5 years before the subsequent period of extended operation, of the SS fuel transfer tube and a representative sample of dissimilar metal welds of susceptible containment high temperature penetrations in each PBN unit to confirm the presence or absence of cracking due to SCC or cyclic loading, (b) if absence of the aging effects cannot be confirmed based on evaluation of examination results, a periodic supplemental examination will be added to the AMP, (c) the examination methods that will be used (surface or EVT-1 examination) for one-time (and periodic if necessary) inspection and sampling size for the one-time inspection are consistent with that recommended in the GALL-SLR Report AMP XI.M32 for detecting cracking due to SCC or cyclic loading of pressure-retaining components, and (d) the one-time inspection approach is acceptable since there is no plant-specific operating experience thus far of cracking in these components.

Enhancement 6. SLRA Section B.2.3.29, as amended by Supplement 1, dated April 21, 2021, and the response to RAI B.2.39-2, dated August 11, 2021 (evaluated above), includes an enhancement (which corresponds to Commitment No. 33(f) in SLRA Appendix A, Table 16-3) to the “detection of aging effects” program element that relates to conducting a one-time volumetric examination of the containment liner if triggered by the plant-specific operating experience of corrosion initiated on the inaccessible side. From a review of plant-specific operating experience and related statement in the amended SLRA, the NRC staff noted that the triggering operating experience has not occurred to date at PBN. The staff reviewed this enhancement, as revised by response to RAI B.2.3.29-2, against the corresponding program element in GALL-SLR Report AMP XI.S1 and finds it acceptable because, when implemented: (a) it will include, consistent with the GALL-SLR recommendations, actions, sampling criteria (random and focused areas), and statistically based acceptance criteria consistent with GALL-SLR Report AMP XI.S1 recommendations, and (b) the schedule for conducting the examination in both PBN units, if the triggering operating experience occurs in either unit, will be determined by the applicant’s corrective actions program in a manner that ensures that the intended function of the containment liner is maintained.

The NRC staff conducted an audit to verify the applicant’s claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, supplements, and responses to

RAIs B.2.3.29-1 through B.2.3.29-3, 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 or will be consistent with enhancements with the corresponding program elements of GALL-SLR Report AMP XI.S1. In addition, the staff reviewed the enhancements associated with the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.29 summarizes operating experience related to the ASME Section XI, Subsection IWE AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant’s plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program beyond that incorporated during the development or staff review of the SLRA. The staff, however, identified an issue that lacked clarity with regard to industry operating experience described in IN 2014-07, “Degradation of Leak-Chase Channel Systems for Floor Welds of Metal Containment Shell and Concrete Containment Metallic Liner” (ADAMS Accession No. ML14070A114), and RIS 2016-07, “Containment Shell or Liner Moisture Barrier Inspection” (ADAMS Accession No. ML16068A436), for which it determined the need for additional information, which resulted in the issuance of an RAI. RAI B.2.3.29-4 and the applicant’s responses are documented in ADAMS Accession No. ML21223A308.

In its response to RAI B.2.3.29-4, the applicant explained that the seal-welded leak chase channel caps are accessible and level with the floor and are examined as accessible surfaces each inspection period in accordance with Table IWE-2500-1, Examination Category E-A, Item E1.11. The applicant also stated that the leak chase channel caps are included in SLRA Table 3.5.2-1 as part of component type “Liner plate anchors and attachments (accessible)” corresponding to SRP-SLR Table 3.5-1, item 3.5-1, 035, and explained this by adding a plant-specific note 14 to this line item in SLRA Table 3.5.2-1.

The NRC staff finds the applicant’s response to RAI B.2.3.29-4 and changes to the SLRA acceptable because the applicant explained that the leak chase channel caps are included in the ASME Section XI, Subsection IWE AMP and are subject to general visual examination every inspection period in accordance with Table IWE-2500-1, item E1.11. This inspection method and frequency aligns with that recommended in IN 2014-07 and RIS 2016-07 for such components that serve a moisture barrier function.

Based on its audit and review of the application as amended, and review of the applicant’s responses to RAIs B.2.3.29-1 through B.2.3.29-4, the NRC staff finds that the conditions and operating experience at the plant are bounded by those for which the ASME Section XI, Subsection IWE AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.29, as amended by Supplement 1 dated April 21, 2021, provides the UFSAR supplement for the ASME Section XI, Subsection IWE AMP. The NRC 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 existing ASME Section XI, Subsection IWE AMP 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 implementing the seven enhancements no later than 6 months before the subsequent period of extended operation, or no later than the last refueling outage before the subsequent period of extended operation and starting the one-time inspections for cracking due to SCC or cyclic loading no earlier than 5 years before the subsequent period of extended operation.

The NRC staff finds that the information in the UFSAR supplement, as amended by letter dated April 21, 2021, is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's ASME Section XI, Subsection IWE AMP, as amended, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when the enhancements are 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).

3.0.3.2.31 ASME Section XI, Subsection IWL

SLRA Section B.2.3.30 states that the ASME Section XI, Subsection IWL AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.S2, "ASME Section XI, Subsection IWL."

Staff Evaluation. During its audit, the NRC 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.S2.

The NRC staff also reviewed the portions of the "monitoring and trending," and "acceptance criteria" program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these two enhancements follows.

Enhancement 1. SLRA Section B.2.3.30 includes an enhancement to the "monitoring and trending" program element, which relates to comparing previous results to current inspection results and to recording quantitative measurements and qualitative information for trending purposes. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S2 and finds it acceptable because, when implemented, it will align the applicant's program with the GALL-SLR Report recommendation to record and trend inspection results for all applicable parameters monitored.

Enhancement 2. SLRA Section B.2.3.30 includes an enhancement to the "acceptance criteria" program element, which relates to augmenting existing procedures to ensure inspection results are compared to previous results to determine if degradation is passive and the second-tier acceptance criteria of American Concrete Institute (ACI) 349.3R can be applied. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S2 and finds it acceptable because, when implemented, it will align the applicant's program with the GALL-SLR Report recommendation to use the second-tier acceptance criteria from ACI 349.3R.

The NRC 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 its audit, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," 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.S2. In addition, the staff reviewed the enhancements associated with the "monitoring and trending" and "acceptance criteria" program elements and finds that, when implemented, they will make the AMP consistent with the GALL-SLR Report and adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.30 summarizes operating experience related to the ASME Section XI, Subsection IWL AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the ASME Section XI, Subsection IWL AMP was evaluated.

UFSAR Supplement. SLRA Appendix Section 16.2.2.30 provides the UFSAR supplement for the ASME Section XI, Subsection IWL AMP. The NRC 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 existing ASME Section XI, Subsection IWL AMP 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 its review of the applicant's ASME Section XI, Subsection IWL AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, with the enhancements 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).

3.0.3.2.32 ASME Section XI, Subsection IWF

SLRA Section B.2.3.31 states that the ASME Section XI, Subsection IWF AMP is an existing program with enhancements and an exception that will be consistent with the program elements in the GALL-SLR Report AMP XI.S3, “ASME Section XI, Subsection IWF,” except for the exception identified in the SLRA. The applicant amended this SLRA section by letter dated April 21, 2021.

<u>Staff Evaluation</u>. During its audit, the NRC 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.S3.

For the “preventive actions” program element, the NRC staff determined the need for additional information, which resulted in the issuance of an RAI. RAI B.2.3.31-1 and the applicant’s response are documented in ADAMS Accession No. ML21223A308.

In its response, the applicant revised the enhancement and corresponding Commitment No. 35(d) to state that, in addition to molybdenum disulfide, other lubricants containing sulfur will also be not used, in support of its statement that it has initiated procedural changes to prohibit the use of these lubricants.

The NRC staff finds the applicant’s response to RAI B.2.3.31-1 and changes to the “preventive actions” program element enhancement acceptable because the revised enhancement and Commitment No. 35(d) makes the “preventive actions” program element consistent with that in GALL-SLR AMP XI.S3 with regard to the use of molybdenum disulfide and other lubricants in high-strength bolting.

For the “detection of aging effects” program element, the NRC staff determined the need for additional information, which resulted in the issuance of an RAI. RAI B.2.3.31-2 and the applicant’s response are documented in ADAMS Accession No. ML21223A308.

In its response, the applicant revised the program enhancement and corresponding Commitment No. 35(i) to state that a representative sample of high-strength bolting greater than 1-inch diameter in ASME Class 1, 2, and 3 supports will be subject to volumetric examination, to detect cracking due to SCC, before the start of the subsequent period of extended operation in addition to once every 10-years during the subsequent period of extended operation. The inspection sample for each unit will comprise 20 percent of the high-strength bolts for each material-environment combination up to a maximum of 25 bolts. The applicant also stated that, if additional high-strength bolting is installed, this sample will continue to represent the most susceptible locations since molybdenum disulfide and other thread lubricants containing sulfur will be prohibited from use at PBN before entering the subsequent period of extended operation in accordance with Commitment No. 35(d), as revised by the response to RAI B.2.3.31-1.

The NRC staff finds the applicant’s response to RAI B.2.3.31-2 and changes to the AMP and SLR commitment acceptable because: (1) by performing volumetric examinations before the start of the subsequent period of extended operation, the program will identify cracking due to SCC and will allow for corrective actions to occur to prevent brittle failure before the first inspection interval of the subsequent period of extended operation, (2) the program is using a sample size that is consistent with other sampling programs and is sufficient to detect aging, and (3) the use of molybdenum disulfide and other sulfur-containing lubricants will be prohibited before the start of the subsequent period of extended operation, which lowers the likelihood of contaminants that could cause cracking due to SCC.

The NRC staff also reviewed the portions of the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements associated with the exception and enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of the one exception and 11 enhancements follows.

Exception. SLRA Section B.2.3.31, as amended by Supplement 1, dated April 21, 2021, includes an exception to the “scope of program” program element related to the applicant’s ASME Section XI, Subsection IWF AMP not including inspection of supports for Class metallic containment (MC) components in its scope. The NRC staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because Class MC supports at PBN are part of the steel containment liner and its integral attachments and are, therefore, examined within the scope of the ASME Section XI, Subsection IWE AMP.

Enhancement 1. SLRA Section B.2.3.31 includes an enhancement to the “scope of program” program element, which relates to evaluating acceptability of inaccessible areas based on conditions found in accessible areas. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, the program will evaluate the acceptability of inaccessible areas when conditions in accessible areas indicate the presence of, or result in, degradation to such inaccessible areas, which is consistent with the recommendation in GALL-SLR Report AMP XI.S3.

Enhancement 2. SLRA Section B.2.3.31 includes an enhancement to the “scope of program” program element, which relates to including vibration isolation elements within the scope of the program. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will include within the scope of the program vibration isolation elements of Class 1, 2, and 3 piping and component supports, which is consistent with the recommendation in the GALL-SLR Report AMP XI.S3.

Enhancement 3. SLRA Section B.2.3.31 includes an enhancement to the “preventive actions” program element, which relates to specifying bolting material, installation torque or tension, and use of lubricants and sealant for replacement bolting in accordance with industry standards EPRI NP-5769, EPRI 104213, and NUREG-1339. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, the program will include actions for proper selection of bolting material and lubricants and appropriate installation torque consistent with industry standards recommended in the GALL-SLR Report AMP XI.S3.

Enhancement 4. SLRA Section B.2.3.31, as amended by Supplement 1, dated April 21, 2021, and the response to RAI B.2.3.31-1 (evaluated above), includes an enhancement to the “preventive actions” program element, which relates to the disuse of molybdenum disulfide thread lubricants and other lubricants containing sulfur in structural bolting, and actions for storage, lubricants, and SCC. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report recommendations to prohibit the use of molybdenum disulfide and other lubricants containing sulfur as a preventive measure against cracking due to SCC in high-strength bolting, and for ASTM A325, A490, and their respective twist-off bolting preventive actions for storage, lubricants and SCC will be used in accordance with the industry standard recommended in the GALL-SLR Report AMP XI.S3.

Enhancement 5. SLRA Section B.2.3.31 includes an enhancement to the "parameters monitored or inspected" program element, which relates to bolted connections being inspected for loss of integrity due to self-loosening. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will include monitoring of bolted connections for loss of integrity due to self-loosening, which is consistent with the recommendation in the GALL-SLR Report AMP XI.S3.

Enhancement 6. SLRA Section B.2.3.31 includes an enhancement to the "parameters monitored or inspected" program element, which relates to monitoring elastomeric or polymeric vibration isolation elements for applicable aging effects. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will monitor vibration isolation elements for aging effects of cracking, loss of material, and hardening consistent with the recommendation in the GALL-SLR Report AMP XI.S3.

Enhancement 7. SLRA Section B.2.3.31 includes an enhancement to the "detection of aging effects" program element, which relates to a one-time inspection of an additional 5 percent of the sample size specified in Table IWF-2500-1 for Class 1, 2, and 3 supports. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will provide inspections of component supports not previously inspected by the program to ensure that the routinely inspected sample is representative of the aging of the remaining population of supports, consistent with recommendations in the GALL-SLR Report AMP XI.S3.

Enhancement 8. SLRA Section B.2.3.31 includes an enhancement to the "detection of aging effects" program element, which relates to managing aging of elastomeric vibration isolation elements. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will use tactile inspection methods (e.g., feeling, prodding) capable of detecting hardening to indicate loss of vibration isolation function, consistent with recommendations in the GALL-SLR Report AMP XI.S3.

Enhancement 9. SLRA Section B.2.3.31, as amended by Supplement 1, dated April 21, 2021, and the response to RAI B.2.3.31-2 (evaluated above), includes an enhancement to the "detection of aging effects" program element, which relates to performing volumetric examinations comparable to Table IWB-2500-1 (Examination Category B-G-1) to detect cracking due to SCC in high-strength bolting greater than 1 inch in diameter in ASME Class 1, 2, or 3 component supports. The amended enhancement also states that a volumetric examination will be performed, before entering the subsequent period of extended operation and on a 10-year interval during the subsequent period of extended operation, on a sample that will consist of 20 percent of high-strength bolting population (for a material/environment combination), up to a maximum of 25 bolts per PBN unit. The applicant also stated that, even if additional high-strength bolting is installed, this sample will represent the most susceptible locations since the applicant will prohibit molybdenum disulfide and other sulfur-containing lubricants. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will ensure that a representative sample of susceptible high-strength bolting is volumetrically examined for cracking due to SCC before entering the subsequent period of extended operation and once in every 10-year interval during the subsequent period of extended operation. The volumetric examination method and sample size are consistent with GALL-SLR Report recommendations in AMP XI.S3 and provide reasonable assurance that SCC is not occurring for the entire population of susceptible high-strength bolts during the subsequent period of extended operation.

Enhancement 10. SLRA Section B.2.3.31 includes an enhancement to the "monitoring and trending" program element, which relates to increasing or modifying the component support inservice inspection (ISI) sample of Class 1, 2, and 3 piping component supports, when a component within the inspection sample is repaired to an as-new condition. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will ensure that the program inspects a sample that is representative of the aging effects of the remaining population of supports, consistent with recommendations in the GALL-SLR Report AMP XI.S3.

Enhancement 11. SLRA Section B.2.3.31 includes an enhancement to the "acceptance criteria" program element, which relates to specifying additional unacceptable conditions. The NRC staff reviewed this enhancement against the corresponding program element in the GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will include other unacceptable conditions, in addition to that specified in ASME Section XI, Subsection IWF, consistent with recommendations in the GALL-SLR Report AMP XI.S3.

The NRC 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.2.3.31-1 and B.2.3.31-2, 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, or consistency with enhancements, with the GALL-SLR Report are or will be consistent with the corresponding program elements of GALL-SLR Report AMP XI.S3. The staff also reviewed the exception to the GALL-SLR Report AMP XI.S3 associated with the "scope of program" program element, and its justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.31, as amended by Supplement 1, dated April 21, 2021, summarizes operating experience related to the ASME Section XI, Subsection IWF AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, and review of the applicant's responses to RAIs B.2.3.31-1 and B.2.3.31-2, the staff finds that the conditions and operating experience at the plant are bounded by those for which the ASME Section XI, Subsection IWF AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.31, provides the UFSAR supplement for the ASME Section XI, Subsection IWF AMP. The NRC 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 existing ASME Section XI, Subsection IWF AMP for managing the effects of aging for applicable components during the subsequent period of extended operation. Further, the staff noted that the applicant committed to implementing the enhancements no later than 6 months or the last refueling outage before the subsequent period of extended operation, and to start one-time inspections no earlier than 5 years before the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description.

Conclusion. Based on its review of the applicant's ASME Section XI, Subsection IWF AMP, as amended, the NRC 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 the enhancements and finds that, when 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).

3.0.3.2.33 Masonry Walls

SLRA Section B.2.3.33 states that the Masonry Walls AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.S5, "Masonry Walls." The applicant amended this SLRA section by letter dated April 21, 2021.

Staff Evaluation. During its audit, the NRC 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.S5.

The NRC staff also reviewed the portions of the "parameters monitored or inspected," "monitoring and trending," and "acceptance criteria" program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these three enhancements follows.

Enhancement 1. SLRA Section B.2.3.33 includes an enhancement to the "parameters monitored or inspected" program element, which relates to monitoring and inspecting for spalling, scaling, shrinkage, and/or separation, as well as loss of material at the mortar joints, and gaps between the supports and masonry walls. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S5 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to monitor and inspect for spalling, scaling, shrinkage, and/or separation, as well as loss of material at the mortar joints, and gaps between the supports and masonry walls that could potentially impact the intended function or potentially invalidate its evaluation basis.

Enhancement 2. SLRA Section B.2.3.33 includes an enhancement to the "monitoring and trending" program element, which relates to including specific monitoring, measurement, and trending of widths and lengths of cracks and of gaps between supports and masonry walls. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S5 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to ensure that observed degradation is measured, trended, and projected and that the intended functions are maintained throughout the subsequent period of extended operation.

Enhancement 3. SLRA Section B.2.3.33 includes an enhancement to the "acceptance criteria" program element, which relates to ensuring that observed degradation is assessed against the evaluation basis. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S5 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to ensure that observed degradation will be assessed to confirm that the degradation has not invalidated the original evaluation assumptions or impacted the capability to perform the intended functions.

The NRC 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, the staff finds that the "scope of program," "preventive actions," and "detection of aging effects" 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.X5. In addition, the staff reviewed the enhancements associated with the "parameters monitored or inspected," "monitoring and trending," and "acceptance criteria" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.33 summarizes operating experience related to the Masonry Walls AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Masonry Walls AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.33, provides the UFSAR supplement for the Masonry Walls AMP. The NRC 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 Masonry Walls AMP 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 continuing the existing Masonry Walls Program and to implementing the enhancements by no later than 6 months before 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 its review of the applicant's Masonry Walls AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when 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).

3.0.3.2.34 Structures Monitoring

SLRA Section B.2.3.34 states that the Structures Monitoring AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.S6, "Structures Monitoring" (except for the staff-identified exception discussed below). The applicant amended this SLRA section by letters dated April 21, 2021, July 8, 2021, August 11, 2021, and November 8, 2021.

Staff Evaluation. During its audit, the NRC 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.S6.

For the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements, the NRC staff determined the need for additional information, which resulted in the issuance of RAIs. RAI B.2.3.34-1, RAI B.2.3.34-1a and the applicant's responses are documented in ADAMS Accession Nos. ML21223A308 and ML21308A282.

In its latest response, the applicant clarified that post-installed epoxy *adhesive* anchors are not installed as structural commodity items in-scope for SLR at PBN. Instead, the applicant uses an epoxy *resin-based grout*, that has been qualified for use in safety-related applications, as an alternative to Portland cement-based grout for installing baseplates for new equipment, and for upgrading or replacing existing equipment baseplates (including newly grouted anchors). The applicant also stated that the only locations where anchors are embedded using epoxy resin-based grout at PBN are under the support plates of the Service Water pump and the CCW pump, where high temperatures (in excess of 120°F) are not normally experienced, radiation exposure is not a concern, and ultraviolet exposure is minimal. However, to address industry operating experience (e.g., IN 83-40, "Need to Environmentally Qualify Epoxy Grouts and Sealers" (ADAMS Accession No. ML082700114)) regarding the use of epoxy grouts under certain environments, the applicant revised the "preventive actions" program element in SLRA Section B.2.3.34 to prohibit the use of epoxy resin-based grout for safety-related applications in locations where normal temperatures exceed 120°F, or in posted high radiation areas as defined in 10 CFR Part 20. The applicant further stated that preventive actions implemented for epoxy resin-based grout include proper storage, qualification of selected epoxy resin-based grout, and use of the manufacturer's installation instructions and site procedures to ensure proper installation.

The applicant also stated that the epoxy compound (resin plus hardener) constituent of the installed grout is a polymer, which could be affected (in addition to high temperatures, radiation exposure, and ultraviolet exposure) by other aging mechanisms like creep that may also contribute to a reduction of anchor capacity. To address this aging mechanism, the applicant revised the "detection of aging effects" program element in the SLRA to include a periodic inspection for tightness (e.g., torque checks) in all anchors within the scope of subsequent license renewal that are embedded in the epoxy resin-based grout during normally scheduled inspections, which occur at least once every 5 years, to ensure that proper installation is maintained and to verify that preload has not been lost due to creep. The applicant stated that the program already includes the inspection of concrete structures for increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete degradation for other types of concrete embedded anchors. This inspection will also apply to epoxy resin-based grouted anchors. Therefore, the applicant revised SLRA Table 3.5.2-13 to include an AMR line item that addresses the aging effects specific to epoxy resin-based grout (i.e., reduction in anchor capacity, loss of preload). The applicant further stated that a review of plant-specific operating experience did not identify any incidents or observations involving the epoxy resin-based grout in use at PBN. However, to ensure that proper installation of the anchors embedded in epoxy resin-based grout has been maintained, the applicant will perform the first inspection for tightness (torque check) no later than the last refueling outage prior to the subsequent period of extended operation.

During its evaluation of the applicant's response to RAI B.2.3.34-1a, the NRC staff noted that the Structures Monitoring AMP was enhanced to include additional inspection techniques to supplement the visual inspections and to ensure that aging effects associated with degradation due to creep can be monitored and detected. The staff also noted that these components are visually inspected for similar aging effects as those identified by other GALL-SLR items for anchors and grout. The staff further noted that the program will include preventive actions to prohibit the use of epoxy resin-based grout in future safety-related applications where a high temperature and/or high radiation environment exists. The staff finds the applicant's response and changes to SLRA Section 3.5.2.1.13, SLRA Table 3.5.2-13 and Table 16-3 (item no. 38), and SLRA Section B.2.3.34 acceptable because: (a) existing anchors that are embedded using epoxy resin-based grout are not exposed to an environment with high temperatures (in excess of 120°F) and/or radiation, (b) the program will prohibit the use of epoxy resin-based grout for safety-related applications in environments where high temperature and/or high radiation exists, (c) the use of periodic inspections for tightness to supplement the visual inspections will ensure that the aging effects associated with creep for epoxy resin-based grouted anchors can be detected and adequately managed before a loss of intended function, (d) visual inspections will ensure that other typical aging effects associated with grouted anchors will also be detected and adequately managed before a loss of intended function, (e) a review of plant-specific operating experience has not identified a loss of function for these anchors, and (f) the applicant will perform an initial inspection for tightness in existing epoxy resin-based grouted anchors to confirm the absence of degradations prior to entering the subsequent period of extended operation.

The NRC staff also reviewed the portions of the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements associated with exceptions and enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of this 1 exception and 17 enhancements follows.

Exception. During its review of SLRA Section B.2.3.34, the NRC staff identified a difference in the "scope of program," "parameters monitored or inspected," and "acceptance criteria" program elements. In this difference, the staff noted that the Structures Monitoring AMP will not consider the GALL-SLR Report recommendations associated with managing the aging effects of sliding surfaces. As stated by the applicant in Attachment 29 to letter dated April 21, 2021, sliding surfaces will be managed by the ASME Section XI, Subsection IWF AMP. The staff reviewed this difference against the corresponding program elements in GALL-SLR Report AMP XI.S6 and finds it acceptable because the sliding surfaces within the scope of subsequent license renewal will be properly managed by the ASME Section XI, Subsection IWF AMP and there are no sliding surfaces within the scope of the Structures Monitoring AMP.

Enhancement 1. SLRA Section B.2.3.34 includes an enhancement to the "scope of program" program element which relates to adding stainless steel and aluminum structural components as a materials and component combination that will be inspected by the Structures Monitoring AMP. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to include all structural components in the scope of subsequent license renewal that are not covered by other structural AMPs to ensure that they are being adequately managed for the subsequent period of extended operation.

Enhancement 2. SLRA Section B.2.3.34 includes an enhancement to the "scope of program" program element which relates to adding the polystyrene foam component that is mounted to the underside of manhole covers as an elastomer material that will be inspected by the Structures Monitoring AMP. The NRC staff reviewed this enhancement, as revised by letter dated April 21, 2021, against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to include all structural components in the scope of license renewal that are not covered by other structural AMPs to ensure that they are being adequately managed for the subsequent period of extended operation.

Enhancement 3. SLRA Section B.2.3.34 includes an enhancement to the "preventive actions" program element which relates to including preventive actions to ensure bolting integrity by

- specifying proper selection of bolting material and lubricants, and appropriate installation torque or tension to prevent or minimize the aging effects associated with high-strength bolts
- ensuring that selection and storage of high-strength bolting is performed in accordance with applicable industry specifications and
- preventing the use of molybdenum disulfide and other lubricants containing sulfur

The NRC staff reviewed this enhancement, as revised by the letters dated April 21, 2021 and August 11, 2021, against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations for ensuring that preventive actions are in place, in accordance with applicable industry guidelines and specifications, for the proper selection and storage of bolting material and lubricants, and to ensure that adequate bolting integrity is maintained by using appropriate installation torque or tension.

Enhancement 4. SLRA Section B.2.3.34 includes an enhancement to the "parameters monitored or inspected" program element which relates to including the inspection of the following parameters:

- Increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete and grout degradation in concrete and grouted structures (including epoxy resin-based grout)
- Loss of material, blistering, and loss of strength for elastomers and polymers (including the polystyrene inserts used in manhole covers)
- Pitting and crevice corrosion and evidence of cracking due to SCC in stainless steel and aluminum components
- Confirmation of the absence of water in-leakage through concrete
- Localized distortion of the biological shield wall liner as a leading indicator of radiation induced volumetric expansion of the underlying concrete
- Loss of form in earthen berms

The NRC staff reviewed this enhancement, as revised by letters dated July 8, 2021, August 11, 2021, and November 4, 2021, against the corresponding program element in GALL-SLR Report AMP XI.S6 and SRP-SLR Section A.1.2.3.3 and finds it acceptable because when it is implemented it will ensure that the parameters being monitored or inspected by the Structures Monitoring AMP are capable of detecting the presence and extent of the degradation associated with the aging effect. This enhancement is also consistent with the GALL-SLR Report recommendations which ensure that parameters to be monitored or inspected are commensurable with industry codes, standards, and guidelines and considers industry and plant-specific operating experience

Enhancement 5. SLRA Section B.2.3.34 includes an enhancement to the "detection of aging effects" program element which relates to including applicable guidance on inspections for pitting and crevice corrosion, and evidence of cracking due to SCC for stainless steel and aluminum components. Since this is a plant-specific enhancement, the NRC staff reviewed this enhancement against the corresponding criteria in SRP-SLR Section A.1.2.3.4. The staff finds this enhancement acceptable because when it is implemented it will ensure that the aging effects for stainless steel and aluminum components that function as a structural support will be detected and adequately managed before a loss of intended function.

Enhancement 6. SLRA Section B.2.3.34 includes an enhancement to the "detection of aging effects" program element which relates to including applicable guidance on metal enclosure bus inspection for loss of material in external bus duct enclosure surfaces and structural supports, and elastomer degradations in exterior housing, boots, and sealant. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to ensure that the aging effects for metal enclosure bus and elastomer components will be detected and adequately managed before a loss of intended function.

Enhancement 7. SLRA Section B.2.3.34 includes an enhancement to the "detection of aging effects" program element which relates to performing an engineering evaluation, more frequent inspections, or destructive testing of affected concrete when leakage is identified. The enhancement also relates to performing an analysis of the leakage for pH level, along with mineral, chloride, sulfate, and iron content in the water, when leakage volume allows. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to ensure that indications of groundwater infiltration or through-concrete leakage are assessed for aging effects during the subsequent period of extended operation.

Enhancement 8. SLRA Section B.2.3.34 includes an enhancement to the “detection of aging effects” program element which relates to updating applicable procedures to ensure that degradations that could cause a loss of anchor capacity due to creep in structural supports applications employing epoxy resin-based grout is being detected using periodic inspections for tightness (e.g., torque checks, as applicable), as a supplemental inspection to visual inspections, for all anchors within the scope of subsequent license renewal that are embedded in epoxy resin-based grout. The enhancement also relates to performing this supplemental inspection during normally scheduled walkdowns (at least once every 5 years) to ensure that proper installation is maintained and to verify that preload has not been lost due to creep. Since this is a plant-specific enhancement, the NRC staff reviewed this enhancement, as revised by letter dated November 4, 2021, against the corresponding criteria in SRP-SLR Section A.1.2.3.4. The staff finds it acceptable because when it is implemented it will supplement the periodic visual inspections with inspections that will detect loss of tightness to ensure that the aging effects due to creep can be detected and adequately managed before a loss of intended function.

Enhancement 9. SLRA Section B.2.3.34 includes an enhancement to the “detection of aging effects” program element which relates to specifying that the responsible engineer shall be a registered professional engineer or a degreed civil or structural engineer with at least ten years of experience in the design, construction, and inspection of concrete structures. The NRC staff reviewed this enhancement, as revised by the letter dated April 21, 2021, against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to ensure that inspector qualifications are consistent with industry guidelines (e.g., ACI 349.3R).

Enhancement 10. SLRA Section B.2.3.34 includes an enhancement to the “detection of aging effects” program element which relates to specifying that accessible areas subject to similar conditions (material, environment, etc.) may be inspected in lieu of inaccessible areas and including the guidance for evaluating the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to the inaccessible areas. The NRC staff reviewed this enhancement, as revised by the letter dated April 21, 2021, against the corresponding program elements in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation for sites with nonaggressive groundwater or soil environments to ensure that the acceptability of inaccessible areas is evaluated when degradation to such inaccessible areas could be expected when considering the existing condition of accessible areas exposed to similar conditions.

Enhancement 11. SLRA Section B.2.3.34 includes an enhancement to the “detection of aging effects” program element which relates to specifying that VT-3 examinations will be supplemented with volumetric examination to detect cracking for non-ASME high-strength bolting with a diameter greater than one inch. The enhancement also relates to using a representative sample of bolts consisting of 20% of the population (for a similar material/environment combination), up to a maximum of 25 bolts, during each 10-year inspection interval. Since this is a plant-specific enhancement, the NRC staff reviewed this enhancement, as revised by the letter dated August 11, 2021, against the corresponding criteria in SRP-SLR Section A.1.2.3.4. The staff finds it acceptable because: (a) the inspection population is based on a similar environment and material combination, (b) the sample size is similar to that recommended in GALL-SLR AMP XI.M18 for closure bolting in environments where leakage is difficult to detect, and (c) the use of volumetric examination to detect cracking in high-strength bolting with a diameter greater than one inch will ensure that the aging effects can be detected and adequately managed before a loss of intended function.

Enhancement 12. SLRA Section B.2.3.34 includes an enhancement to the “monitoring and trending” program element which relates to ensuring that a quantitative baseline inspection has been conducted for all structures within the scope of subsequent license renewal prior to entering the subsequent period of extended operation. The NRC staff reviewed this enhancement, as revised by the letter dated April 21, 2021, against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to ensure that quantitative baseline inspection data, that can be monitored and trended, is available prior to the subsequent period of extended operation.

Enhancement 13. SLRA Section B.2.3.34 includes an enhancement to the “acceptance criteria” program element which relates to including the acceptance criteria for the inspection of stainless steel and aluminum components, and to perform an evaluation when stainless steel and aluminum surfaces exhibit evidence of SCC, pitting, or crevice corrosion. Since this is a plant-specific enhancement, the NRC staff reviewed this enhancement against the corresponding guidance in SRP-SLR Section A.1.2.3.6 and finds it acceptable because when it is implemented it will ensure that inspection results are evaluated based on acceptance criteria that ensure that the need for corrective actions is identified before a loss of intended function.

Enhancement 14. SLRA Section B.2.3.34 includes an enhancement to the “acceptance criteria” program element which relates to including no loss of material, no blistering, and no indications of loss of strength (e.g., cracking, dimensional change, shrinkage, discoloration, or hardening) as the acceptance criteria for elastomers and polymers (including for the polystyrene inserts for manhole covers). The NRC staff reviewed this enhancement, as revised by letter dated August 11, 2021, against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to ensure that criteria are directed at the identification and evaluation of degradations that may affect the ability of the structure or component to perform its intended function.

Enhancement 15. SLRA Section B.2.3.34 includes an enhancement to the “acceptance criteria” program element which relates to ensuring that loose bolts and nuts are not acceptable unless accepted by engineering evaluation. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to ensure that loose bolts and nuts are not acceptable unless accepted by engineering evaluation to ensure that its intended function is maintained.

Enhancement 16. SLRA Section B.2.3.34 includes an enhancement to the “acceptance criteria” program element which relates to including as the acceptance criteria for structural sealant that observed loss of material, cracking, and hardening will not result in loss of sealing. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because it aligns with the GALL-SLR Report recommendation for structural sealant acceptance criteria to ensure that its intended function is maintained.

Enhancement 17. SLRA Section B.2.3.34, as revised by letter dated August 11, 2021, includes an enhancement to the “acceptance criteria” program element which relates to including no evidence of settlement, slope instability, or erosion as the acceptance criteria of earthen berm structures. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to ensure that criteria are directed at the identification and evaluation of degradations that may affect the ability of the structure or component to perform its intended function.

The NRC 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 RAI 3.3.1, 263-1; RAI 3.5.2.11-1; RAI 3.5-1, 068-1; RAI B.2.3.34-1 (all documented in ADAMS Accession No. ML21223A308); and RAI B.2.3.34-1a (ADAMS Accession No. ML21308A282), 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.S6, with the exception of a staff-identified difference between the applicant’s program and GALL-SLR Report XI.S6. The staff also reviewed the staff-identified differences between the applicant’s program and GALL-SLR Report XI.S6 associated with the “scope of program,” “parameters monitored or inspected,” and “acceptance criteria” program elements, and its justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.34 summarizes operating experience related to the Structures Monitoring AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant’s plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective actions program database and the program inspection reports; 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Structures Monitoring AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.34, provides the UFSAR supplement for the Structures Monitoring AMP. The NRC 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 and adequately captures the plant-specific actions of the program. The staff also noted that the applicant committed to ongoing implementation of the existing Structures Monitoring AMP for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed (Commitment No. 38) to implement the proposed enhancements by no later than six months prior to the subsequent period of extended operation, and to perform the first inspection for tightness (torque check) of all anchors within the scope of subsequent license renewal that are embedded in epoxy resin-based grout by 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, as amended by letter dated November 19, 2021, is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Structures Monitoring AMP, the NRC 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 the enhancements and finds that, with the exception and the enhancements 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).

3.0.3.2.35 Inspection of Water-Control Structures Associated with Nuclear Power Plants

SLRA Section B.2.3.35 states that the Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants." The applicant amended this SLRA section by letter dated April 21, 2021.

Staff Evaluation. During its audit, the NRC 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," and "acceptance criteria" program elements of the applicant's program in the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.S7.

The NRC staff also reviewed the portions of the "preventive actions," "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these five enhancements follows.

Enhancement 1. SLRA Section B.2.3.35 includes an enhancement to the "preventive actions" program element, which relates to the proper selection of bolting material and lubricants and the appropriate installation torque or tension to prevent or minimize loss of bolting preload and cracking of high-strength bolting. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to include preventive actions that provide reasonable assurance that structural bolting integrity is maintained.

Enhancement 2. SLRA Section B.2.3.35 includes an enhancement to the "parameters monitored or inspected" program element, which relates to confirming the absence of water leakage by monitoring concrete structures. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to monitor and inspect concrete structures for indications of through-wall water leakage.

Enhancement 3. SLRA Section B.2.3.35 includes an enhancement to the "detection of aging effects" program element, which relates to including provisions for special inspections immediately following the occurrence of significant natural phenomena, such as large floods, earthquakes, tornados, or intense local rainfalls. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to include provisions for special inspections immediately following the occurrence of significant natural phenomena.

Enhancement 4. SLRA Section B.2.3.35 includes an enhancement to the "detection of aging effects" program element, which requires engineering evaluation, more frequent inspections, or destructive testing of affected concrete to validate existing concrete properties and determine pH, if water leakage is identified. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to assess indications of groundwater infiltration or through-concrete leakage for aging effects.

Enhancement 5. SLRA Section B.2.3.35 includes an enhancement to the "acceptance criteria" program element, which revises implementing procedures to note that loose bolts and nuts are unacceptable unless they are determined to be acceptable by engineering evaluation or corrective actions. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to only accept loose bolts and nuts based on engineering evaluation or corrective actions.

The NRC 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 amendments, the staff finds that the "scope of program," and "monitoring and trending" 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.X7. In addition, the staff reviewed the enhancements associated with the "preventive actions," "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

<u>Operating Experience</u>. SLRA Section B.2.3.35 summarizes operating experience related to the Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP was evaluated.

<u>UFSAR Supplement</u>. SLRA Appendix A, Section 16.2.2.35, provides the UFSAR supplement for the Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP. The

NRC 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 existing Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP 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.

<u>Conclusion</u>. Based on its review of the applicant's Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when 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).

3.0.3.2.36 Protective Coating Monitoring and Maintenance

SLRA Section B.2.3.36 states that the Protective Coating Monitoring and Maintenance AMP is an existing program that, with enhancements, will be consistent with the program elements in the GALL-SLR Report AMP XI.S8, "Protective Coating Monitoring and Maintenance," as modified by SLR-ISG-Structures-2020-XX. The NRC staff noted that, subsequent to the applicant's submittal of its SLRA, draft SLR-ISG-Structures-2020-XX was issued as final SLR-ISG-2021-03-STRUCTURES, "Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance" (ADAMS Accession No. ML20181A381).

<u>Staff Evaluation</u>. During its audit, the NRC 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.S8, as modified by SLR-ISG-2021-03-STRUCTURES.

The NRC staff also reviewed the portions of the "detection of aging effects," "monitoring and trending," and "operating experience" program elements associated with the enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of the enhancements follows.

<u>*Enhancement 1*</u>. SLRA Section B.2.3.36 includes an enhancement to the "detection of aging effects" program element to revise procedures to specify that follow-up inspections be performed by individuals trained and certified in the applicable reference standards of ASTM Guide D5498. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S8 and finds it acceptable because, when implemented, it will be consistent with the recommendations in the GALL-SLR Report.

<u>*Enhancement 2*</u>. SLRA Section B.2.3.36 includes an enhancement to the "detection of aging effects" program element to revise procedures to specify that thorough visual inspections be carried out on all coatings near sumps or screens associated with the emergency core cooling

systems. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S8 and finds it acceptable because, when implemented, it will be consistent with the recommendations in the GALL-SLR Report.

Enhancement 3. SLRA Section B.2.3.36 includes an enhancement to the “monitoring and trending” program element to revise procedures to include coating specifications in the list of pre-inspection documentation available to the inspection team. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S8 and finds it acceptable because, when implemented, it will be consistent with the recommendations in the GALL-SLR Report.

Enhancement 4. SLRA Section B.2.3.36 includes an enhancement to the “operating experience” program element to revise procedures to reference guidance of Regulatory Position C.4 of Regulatory Guide 1.54, Revision 3 for Maintenance of Service Level I Coatings. The NRC staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S8 and finds it acceptable because, when implemented, it will be consistent with the recommendations in the GALL-SLR Report.

The NRC 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.S8. In addition, the staff reviewed the enhancements associated with the “detection of aging effects,” “monitoring and trending,” and “operating experience” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.36 summarizes operating experience related to the Protective Coating Monitoring and Maintenance AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant’s plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Protective Coating Monitoring and Maintenance AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.36, provides the UFSAR supplement for the Protective Coating Monitoring and Maintenance AMP. The NRC 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 existing Protective Coating Monitoring and Maintenance AMP 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 its review of the applicant's Protective Coating Monitoring and Maintenance AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancements and concluded that their implementation before the subsequent period of extended operation will make the AMP 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).

3.0.3.2.37 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

SLRA Section B.2.3.37 states that the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.E1, "Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." The applicant amended SLRA Section B.2.2.37, as well as Appendix A, Sections 16.2.2.37 and 16.4, Table 16-3, by letter dated April 21, 2021.

Staff Evaluation. During its audit, the NRC 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.E1.

The NRC staff also reviewed the portions of the "detection of aging effects" program element associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these two enhancements follows.

Enhancement 1. SLRA Section B.2.3.37 includes an enhancement to the "detection of aging effects" program element to add the requirement to review plant-specific operating experience for cumulative aging effects in previously identified and mitigated adverse localized environments applicable to electrical insulation in in-scope cables and connections during the original period of extended operation. This enhancement also adds the requirement to confirm that the dispositioned corrective actions continue to support the intended functions of in-scope cables and connections during the subsequent period of extended operation. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E1 and finds it acceptable because evaluating plant-specific operating experience and confirming that dispositioned corrective actions continue to support the intended functions of in-scope cables and connections are consistent with GALL-SLR Report AMP XI.E1.

Enhancement 2. SLRA Section B.2.3.37 includes an enhancement to the "detection of aging effects" program element to recommend that, if cable testing is warranted for a large number of cables and connections, use sampling methodology consistent with the guidance of GALL-SLR Report AMP XI.E1. The NRC staff reviewed this enhancement against the corresponding program element in GALL-SLR Report XI.E1 and finds it acceptable because testing a sample of a population of a large number of cables and connections identified as potentially degraded is consistent with GALL-SLR Report AMP XI.E1.

The NRC 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.E1. In addition, the staff reviewed the enhancements associated with the “detection of aging effects” program element and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.37 summarizes operating experience related to the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant’s plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience 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 AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section A16.2.2.37, provides the UFSAR supplement for the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP. The NRC 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 implementing the program enhancements no later than 6 months before 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 its review of the applicant’s Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP, the NRC staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when 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).

3.0.3.2.38 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits

SLRA Section B.2.3.38 states that the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits AMP is an existing program, previously part of the Cable Conditioning Monitoring AMP, and will be consistent with the 10 elements of GALL-SLR Report AMP 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 its audit, the NRC staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “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.E2.

The NRC staff noted that this AMP did not include high-range radiation monitoring system cables and connections. During the audit, the staff requested that the applicant explain why it did not include the high-range radiation monitoring system cables and connections as part of the AMP. In response to this staff question, the applicant explained that the high-range radiation monitoring system cables and connections are subject to 10 CFR 50.49, “Environmental qualification of electric equipment important to safety for nuclear power plants”; therefore, this equipment is addressed under SLRA B.2.2.4, “Environment Qualification of Electric Equipment.” The staff finds the applicant’s response acceptable because the high-range radiation monitoring system cable and connections are not in the scope of SLRA B.2.3.38.

The NRC 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.2.3.38 summarizes operating experience related to the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant’s plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience 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 AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.38, provides 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 AMP. The NRC 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 implementing the program no later than 6 months before 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 its 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 AMP, the NRC 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 reviewed the UFSAR for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.39 Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualifications Requirements

SLRA Section B.2.3.39 describes the new Electrical Insulation for Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP as consistent with the program elements in the 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 SLR-ISG-2021-04-ELECTRICAL. The applicant supplemented this SLRA section, as well as Appendix A Section 16.2.2.39, by letter dated April 21, 2021.

Staff Evaluation. During its audit, the NRC 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.E3A, as modified by SLR-ISG-2021-04-ELECTRICAL.

The NRC 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.E3A, as modified by SLR-ISG-2021-04-ELECTRICAL.

Operating Experience. SLRA Section B.2.3.39 summarizes operating experience related to the Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP. The NRC staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed the applicant's plant operating experience information to:

(a) identify examples of age-related degradation, as documented in the applicant's corrective actions 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.

The NRC staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience 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 AMP was evaluated.

UFSAR Supplement. SLRA Appendix A, Section 16.2.2.39, provides the UFSAR supplement for the Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP. The NRC 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. The staff also noted that the applicant committed to implementing the program no later than 6 months before 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 its review of the applicant's Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP, the NRC 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).

3.0.4 QA Program Attributes Integral to Aging Management Programs

The regulations at 10 CFR 54.21(a)(3) require subsequent license renewal 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 Final Safely Analysis Report 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 RLSB-1.

3.0.4.1 Summary of Technical Information in Application

SLRA Appendix A, Section 16.1.3, "Quality Assurance Program and Administrative Controls," and SLRA Appendix B, Section B.1.3, "Quality Assurance Program and Administrative Controls," describe the elements of corrective action, confirmation process, and administrative controls that are applied to the AMPs for both safety-related and nonsafety-related components.

SLRA Appendix A, Section 16.1.3, states, in part:

> The [NextEra] Quality Assurance (QA) Program for PBN 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 [NextEra] 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 NextEra Quality Assurance (QA) Program for PBN 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 NextEra 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.

3.0.4.2 Staff Evaluation

The NRC staff reviewed SLRA Appendix A, Section 16.1.3, and SLRA Appendix B, Section B.1.3, which describe how the applicant's existing QA Program includes the quality assurance-related elements (corrective action, 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 its 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 NRC staff's review of SLRA Appendix A, Section 16.1.3, and SLRA Appendix B, Section B.1.3, the staff concludes 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 licensee will adequately manage aging in a way that maintains intended function(s) consistent with the CLB 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 A, Section 16.1.4, "Operating Experience Program," and SLRA Appendix B, Section B.1.4, "Operating Experience," describe the consideration of operating experience for AMPs. These sections state that the applicant systematically reviews plant-specific and industry operating experience concerning aging management and age-related degradation to ensure that the subsequent license renewal AMPs will be effective in managing the aging effects for which they are credited. Operating experience 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 operating experience, 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 operating experience that the effects of aging may not be adequately managed.

AMPs should be informed by the review of operating experience on an ongoing basis, regardless of the AMP's implementation schedule.

3.0.5.2.2 Consideration of Future Operating Experience

The NRC staff reviewed SLRA Appendix A, Section 16.1.4, and SLRA Appendix B, Section B.1.4, to determine how the applicant will use future operating experience to ensure that the AMPs are effective. The staff evaluated the applicant's operating experience review activities, as described in the SLRA. The staff's evaluations with respect to these SRP-SLR sections follow in SE Sections 3.0.5.2.3 and 3.0.5.2.4, respectively.

3.0.5.2.3 Acceptability of Existing Programs

SRP-SLR Section A.4.2, "Position," describes existing programs generally acceptable to the NRC staff for the capture, processing, and evaluating of operating experience 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 Appendix B to 10 CFR Part 50 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 (ADAMS Accession No. 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 operating experience program should rely on active participation in the Institute of Nuclear Power Operations (INPO) operating experience 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 A, Section 16.1.4, and SLRA Appendix B, Section B.1.4, state that the applicant uses its operating experience program to systematically capture and review operating experience from plant-specific and industry sources. The SLRA also states that the operating experience program meets the requirements of NUREG-0737. The SLRA further states that the operating experience program interfaces and relies on active participation in the INPO operating experience program. Based on this information, the NRC staff determined that the applicant's operating experience 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 Appendix B to 10 CFR Part 50 and NUREG-0737, Item I.C.5, should not preclude the consideration of operating experience on age-related degradation and aging management.

SLRA Appendix A, Section 16.1.4, and SLRA Appendix B, Section B.1.4, state that operating experience 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 Appendix B to 10 CFR Part 50, and the operating experience program, which is consistent with NUREG-0737, Item I.C.5. The SLRA also states that the ongoing evaluation of operating experience 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 NRC staff determined that the processes implemented under the applicant's QA, corrective actions, and operating experience programs would not preclude consideration of age-related operating experience, 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 under Appendix B to 10 CFR Part 50 to include nonsafety-related SCs. SLRA Appendix A, Section 16.1.4 states that the applicant's QA Program includes nonsafety-related SCs, which the NRC 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 16.1.3, and SLRA Appendix B, Section B.1.3, relative to the application of the QA Program to nonsafety-related SSCs.

<u>Consideration of Guidance Documents as Industry Operating Experience</u>. 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 operating experience and evaluated accordingly.

SLRA Appendix A, Section 16.1.4, and SLRA Appendix B, Section B.1.4, state that the sources of external operating experience include the INPO operating experience program, GALL-SLR Report revisions, and other NRC review and guidance documentation.

The NRC staff finds that the applicant will consider an appropriate breadth of industry operating experience for impacts on its aging management activities, which includes sources that the staff considers to be the primary sources of external operating experience information. Based on the completion of the staff's review and the consistency of consideration of guidance documents as industry operating experience with the guidance in SRP-SLR Section A.4.2, the staff finds the program acceptable.

<u>Screening of Incoming Operating Experience</u>. SRP-SLR Section A.4.2 states that all incoming plant-specific and industry operating experience should be screened to determine whether it involves age-related degradation or impacts to aging management activities.

SLRA Appendix A, Section 16.1.4, and SLRA Appendix B, Section B.1.4, state that internal and external operating experience is captured and systematically reviewed on an ongoing basis and that the operating experience program provides for evaluation of site-specific and industry operating experience 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. The NRC staff finds that the applicant's operating experience review processes will include screening of all new operating experience to identify and evaluate items that have the potential to impact the aging management activities. Based on the completion of the staff's review and the consistency of screening of incoming operating experience with the guidance in SRP-SLR Section A.4.2, the staff finds the program acceptable.

<u>Identification of Operating Experience Related to Aging</u>. SRP-SLR Section A.4.2 states that coding should be used within the plant corrective actions program to identify operating

experience 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 A, Section 16.1.4, and SLRA Appendix B, Section B.1.4, state that the corrective actions program identifies either plant-specific operating experience related to aging or industry operating experience related to aging, allowing the tracking and trending of this information.

Based on the completion of the NRC staff's review and the consistency of the identification of operating experience related to aging with the guidance in SRP-SLR, Section A.4.2, the staff finds the program acceptable.

Information Considered in Operating Experience Evaluations. SRP-SLR Section A.4.2 states that operating experience 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 operating experience evaluation finds that the effects of aging may not be adequately managed.

SLRA Appendix A, Section 16.1.4, 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 NRC staff determined that the applicant's evaluations of age-related operating experience include the assessment of appropriate information to determine potential impacts on the aging management activities. The staff also determined that the applicant's operating experience program, in conjunction with the corrective actions program, would implement any changes necessary to manage the effects of aging, as determined through its operating experience evaluations. Therefore, the staff finds that the information considered in the applicant's operating experience evaluations and the use of the operating experience program and the corrective actions program to ensure that the effects of aging are adequately managed is consistent with the guidance in SRP-SLR Section A.4.2.

Evaluation of AMP Implementation Results. 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 operating experience is found in health reports, program assessments, and the 10 CFR Part 50, Appendix B, corrective actions program. In addition, SLRA Appendix A, Section 16.1.4, 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 operating experience that the effects of aging may not be adequately managed. SLRA Appendix B, Section B1.4, states that the operating experience 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 operating experience assessments would be performed on a periodic basis not to exceed 5 years.

Based on the completion of the NRC staff’s review and the consistency of the applicant’s treatment of AMP implementation results as operating experience with the guidance in SRP-SLR Section A.4.2, the staff finds the 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 operating experience. 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 A, Section 16.1.4, states that the operating experience program provides for training to those responsible for activities including screening, evaluating, and processing operating experience items related to aging management and age-related degradation.

Based on the completion of the NRC staff’s review and the consistency of the scope of personnel included in the applicant’s training program with the guidance in SRP-SLR Section 4.2, the staff finds the program acceptable.

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

SLRA Appendix A, Section 16.1.4, and SLRA Appendix B, Section B.1.4, state that the applicant’s operating experience program actively participates in the INPO operating experience program. Based on the completion of the NRC staff’s review and the consistency of the applicant’s reporting of operating experience to the industry with the guidance in SRP-SLR Section 4.2, the staff finds the program acceptable.

Schedule for Implementing the Operating Experience Review Activities. SRP-SLR Section A.4.2 states that the operating experience 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 operating experience program described in the UFSAR supplement. SLRA Appendix A, Section 16.1.4, and SLRA Appendix B, Section B.1.4, state that the operating experience program will be implemented on an ongoing basis throughout the terms of the subsequent renewed licenses. SLRA Appendix A, Section 16.1.4, provides the UFSAR supplement summary description of the applicant’s enhanced programmatic activities for the ongoing review of operating experience. Upon issuance of the subsequent renewed licenses in accordance with 10 CFR 54.3(c), this summary description will be incorporated into the CLB, and, at that time, the applicant will be obligated to conduct its operating experience review activities accordingly.

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

Based on its review of the SLRA, the NRC staff determined that the applicant's programmatic activities for the ongoing review of operating experience are acceptable for: (a) the systematic review of plant-specific and industry operating experience 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 operating experience that the effects of aging may not be adequately managed. Based on the completion of the staff's review and the consistency of the applicant's operating experience review activities with the guidance in SRP-SLR Section A.4.2, the staff finds the applicant's programmatic activities for the ongoing review of operating experience acceptable.

3.0.5.2.5 Conclusion

Based on its review of the SLRA, the NRC staff determined that the applicant's programmatic activities for the ongoing review of operating experience are acceptable for: (a) the systematic review of plant-specific and industry operating experience 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 operating experience that the effects of aging may not be adequately managed. Based on the staff's review and the consistency of the applicant's operating experience review activities with the guidance in SRP-SLR Section 4.2, the staff finds the applicant's programmatic activities for the ongoing review of operating experience 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 A, Section 16.1.4, provides the UFSAR supplement summary description of the applicant's programmatic activities for the ongoing review of operating experience that will ensure that plant-specific and industry operating experience related to aging management will be used effectively.

Based on its review, the NRC 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 operating experience 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 its review of the applicant's programmatic activities for the ongoing review of operating experience, the NRC staff finds that the applicant has demonstrated that operating experience will be reviewed to ensure that the effects of aging will be adequately managed so that the intended functions will remain 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 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 Vessel, 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 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,” is 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, below, summarizes the NRC 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 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)
3.1-1, 004	Not applicable to Point Beach (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 (see SE Section 3.1.2.2.1)
3.1-1, 007	Not applicable to PWRs (see SE Section 3.1.2.2.1)
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 Section 3.1.2.2.2)
3.1-1, 013	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.3, item 1)
3.1-1, 014	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.3, item 2)
3.1-1, 015	Not applicable to Point Beach (see SE Section 3.1.2.2.3, item 3)
3.1-1, 016	Not applicable to PWRs (see SE Section 3.1.2.2.4, item 1)
3.1-1, 017	Not applicable to PWRs (see SE Section 3.1.2.2.4, item 2)
3.1-1, 018	Not applicable to Point Beach (see SE Section 3.1.2.2.5)
3.1-1, 019	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.6, item 1)
3.1-1, 020	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.6, item 2)
3.1-1, 021	Not applicable to PWRs (see SE Section 3.1.2.2.7)
3.1-1, 022	Not applicable to Point Beach (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)

Component Group (SRP-SLR Item No.)	Staff Evaluation
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 Used. Addressed by 3.1-1, 055c (see SE Section 3.1.2.2.9)
3.1-1, 029	Not applicable to PWRs (see SE Section 3.1.2.2.12)
3.1-1, 030	Not applicable to PWRs
3.1-1, 031	Not applicable to PWRs
3.1-1, 032	Consistent with the GALL-SLR Report
3.1-1, 033	Consistent with the GALL-SLR Report
3.1-1, 034	Not applicable to Point Beach
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 (see SE Section 3.1.2.2.12)
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
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 Point Beach (see SE Section 3.1.2.2.9)
3.1-1, 051b	Not applicable to Point Beach (see SE Section 3.1.2.2.9)
3.1-1, 052a	Not applicable to Point Beach (see SE Section 3.1.2.2.9)
3.1-1, 052b	Not applicable to Point Beach (see SE Section 3.1.2.2.9)
3.1-1, 052c	Not applicable to Point Beach (see SE Section 3.1.2.2.9)
3.1-1, 053a	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.9)
3.1-1, 053b	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.9)
3.1-1, 053c	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.9)
3.1-1, 054	Consistent with the GALL-SLR Report
3.1-1, 055a	Not applicable to Point Beach (see SE Section 3.1.2.2.9)
3.1-1, 055b	Not applicable to Point Beach (see SE Section 3.1.2.2.9)
3.1-1, 055c	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.9)
3.1-1, 056a	Not applicable to Point Beach (see SE Section 3.1.2.2.9)
3.1-1, 056b	Not applicable to Point Beach (see SE Section 3.1.2.2.9)
3.1-1, 056c	Not applicable to Point Beach (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 Point Beach (see SE Section 3.1.2.2.9)
3.1-1, 058b	Not applicable to Point Beach (see SE Section 3.1.2.2.9)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1-1, 059a	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.9)
3.1-1, 059b	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.9)
3.1-1, 059c	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.9)
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 Point Beach
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 Point Beach
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 Point Beach
3.1-1, 074	Consistent with the GALL-SLR Report
3.1-1, 075	Not applicable to Point Beach
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 applicable to Point Beach
3.1-1, 079	Not applicable to PWRs
3.1-1, 080	Consistent with the GALL-SLR Report
3.1-1, 081	Not applicable to Point Beach
3.1-1, 082	Not applicable to Point Beach
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	Not applicable to Point Beach
3.1-1, 087	Consistent with the GALL-SLR Report (see SE Section 3.1.2.1)
3.1-1, 088	Consistent with the GALL-SLR Report
3.1-1, 089	Not applicable to Point Beach
3.1-1, 090	Not applicable to Point Beach
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 Point Beach
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 (see SE Section 3.1.2.2.13)
3.1-1, 100	Not applicable to PWRs

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1-1, 101	Not applicable to PWRs
3.1-1, 102	Not applicable to PWRs
3.1-1, 103	Not applicable to PWRs (see SE Section 3.1.2.2.12)
3.1-1, 104	Not applicable to PWRs
3.1-1, 105	Not applicable to Point Beach (see SE Section 3.1.2.2.15)
3.1-1, 106	Not applicable to Point Beach
3.1-1, 107	Not applicable to Point Beach
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	Not Used (see SE Section 3.1.2.2.3)
3.1-1, 115	Not applicable to Point Beach (see SE Section 3.1.2.2.15)
3.1-1, 116	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.10, item 1)
3.1-1, 117	Not applicable to Point Beach (see SE Section 3.1.2.2.10, item 2)
3.1-1, 118	Not Used. Addressed by 3.1-1, 053a; 3.1-1, 053b; or 3.1-1, 053c (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 (see SE Section 3.1.2.2.14)
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
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	Consistent with the GALL-SLR Report (see SE Section 3.5.2.1.6)
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 Point Beach
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 Point Beach (see SE Section 3.1.2.2.6, item 3)

The NRC 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 3.1.2.1 discusses AMR results for components that the applicant states are either not applicable to PBN 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.

(3) 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 NRC staff's review of 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 its 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.

The NRC staff notes that the applicant changed the designation for item 3.1-1, 087 from "Not applicable" in the original submittal to "Consistent with NUREG-2191" as part of Supplement 3, Revision 1, dated July 26, 2021. The staff finds this change acceptable.

Additionally, SE Section 3.1.2.1.1 documents the NRC 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, 034; 3.1-1, 051a; 3.1-1, 051b; 3.1-1, 052a; 3.1-1, 052b; 3.1-1, 045c; 3.1-1, 055a; 3.1-1, 055b; 3.1-1, 056a; 3.1-1, 056b; 3.1-1, 056c; 3.1-1, 058a; 3.1-1, 058b; 3.1-1, 065; 3.1-1, 068; 3.1-1, 073; 3.1-1, 075; 3.1-1, 078; 3.1-1, 081; 3.1-1, 082; 3.1-1, 086; 3.1-1, 089, 3.1-1, 090; 3.1-1, 093; 3.1-1, 105; 3.1-1, 106; 3.1-1, 107; 3.1-1, 114; 3.1-1, 115; 3.1-1, 117; 3.1-1, 134; 3.1-1, 137; and 3.1-1, 139, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not used or not applicable to PBN. The NRC 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 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; 3.1-1, 030; 3.1-1, 031; 3.1-1, 041; 3.1-1, 043; 3.1-1, 060; 3.1-1, 063; 3.1-1, 079; 3.1-1, 084; 3.1-1, 085; 3.1-1, 091; 3.1-1, 094; to 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 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 NRC staff reviewed the SRP-SLR, confirmed that these items only apply to BWRs, and finds that these items are not applicable to PBN because it is a pressurized-water reactor (PWR).

For the following SLRA Table 3.1-1 items, the applicant claims that the corresponding items in the GALL-SLR Report are not used because they are addressed by other SLRA Table 1 items: 3.1-1, 028 (addressed by 3.1-1, 055c), 3.1-1, 083 (addressed by 3.1-1, 012), and 3.1-1, 118 (addressed by 3.1-1, 053a; 3.1-1, 053b; or 3.1-1, 053c; see SE Section 3.1.2.2.9). The NRC staff reviewed the SLRA and confirmed that the aging effects will be addressed by other SLRA Table 1 items. Therefore, the staff finds the applicant's proposal to use alternate items acceptable.

3.1.2.2 Aging Management Review Results for which Further Evaluation Is Recommended by the GALL-SLR Report

In SLRA Section 3.1.2.2, the applicant further evaluates aging management for the RCS 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 3.1.2.2. The following subsections document the staff's review.

3.1.2.2.1 Cumulative Fatigue Damage

SLRA Section 3.1.2.2.1 states that the TLAAs on cumulative fatigue damage in reactor coolant system components are evaluated in accordance with 10 CFR 54.21(c)(1) and addressed in SLRA Sections 4.3.1, 4.3.2, and 4.3.4. This is consistent with SRP-SLR Section 3.1.2.2.1 and is, therefore, acceptable. The NRC staff's evaluation of the TLAAs for RCS components is documented in SE Sections 4.3.1, 4.3.2, and 4.3.4.

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

<u>Item 1</u>. SLRA Section 3.1.2.2.2, item 1, states that loss of material due to general, pitting, and crevice corrosion could occur in the steel PWR SG upper and lower shell and transition cones exposed to secondary feedwater and steam. The SRP-SLR states that the existing program relies on control of water chemistry to mitigate corrosion and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP to detect loss of material. The SRP-SLR indicates that the extent and schedule of the existing SG inspections are designed to ensure that flaws cannot attain a depth sufficient to threaten the integrity of the welds. As referenced in the SRP-SLR, IN 90-04, "Cracking of the Upper Shell-to-Transition Cone Girth Welds in Steam Generators," indicates that the program may not be sufficient to detect pitting and crevice corrosion while industry operating experience shows general and pitting corrosion of the shell is known to exist. Therefore, the SRP-SLR recommends performing augmented inspection to manage this aging effect. The SRP-SLR notes that this issue is limited to Westinghouse Model 44 and 51 SGs, where a high-stress region exists at the shell-to-transition cone weld. Acceptance criteria are described in BTP RLSB-1 (Appendix A.1 of the SRP-SLR).

In SLRA Section 3.1.2.2.2, the applicant stated that the PBN Unit 2 SGs are of a Westinghouse Model Δ47 design. The NRC staff reviewed the UFSAR and verified the steam generator design. Therefore, this item is not applicable to the PBN Unit 2 steam generators.

SLRA Section 3.1.2.2.2, item 1, associated with SLRA Table 3.1-1, item 3.1-1, 012, addresses loss of material due to general, pitting, and crevice corrosion, which could occur in the PWR steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam. The applicant stated in the SLRA that PBN Unit 1 steam generators are Westinghouse Model 44 steam generators. It discussed IN 90-04 and stated that volumetric examinations of the shell-to-transition cone girth welds, required by Section XI of the ASME Code, may not be sufficient to differentiate isolated cracks from inherent geometric conditions. The applicant also stated that it has followed recommendations in IN 90-04 by using enhanced examination techniques as described. It further stated that the continued implementation of the Water Chemistry Program, AMP B.2.3.2, and the SG periodic inspections required by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program, AMP B.2.3.1, will effectively manage loss of material for the SG upper and lower shell and transition cone exposed to secondary feedwater and steam before loss of intended function.

The NRC staff evaluated the applicant's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP and Water Chemistry AMP as documented in SE Section 3.0.3.2.5 and 3.0.3.1.6, respectively. In its review of components associated with SLRA Table 3.1-1, item 3.1-1, 012, 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 these programs is acceptable because: (1) the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP includes enhanced examination techniques to confirm that the integrity of the SG shell is adequately maintained by detecting and monitoring potential flaws, (2) the Water Chemistry AMP monitors and controls the secondary water chemistry conditions to minimize environmental effects on aging degradation in these components, and (3) the use of these programs is consistent with the guidance in the GALL-SLR Report.

Based on the AMPs identified, the NRC staff determined that the applicant's AMPs meet the criteria in SRP-SLR Section 3.1.2.2.2, item 1. For the items associated with SLRA Section 3.1.2.2.2, item 1, 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).

<u>Item 2</u>. SLRA Section 3.1.2.2.2, item 2, states that loss of material due to general, pitting, and crevice corrosion could occur in the steel PWR SG shell assembly exposed to secondary feedwater and steam. The SRP-SLR further states that the existing program relies on control of secondary water chemistry to mitigate corrosion. According to the SRP-SLR, some applicants have replaced only the bottom part of their recirculating SGs, generating a cut in the middle of the transition cone, and, consequently, a new transition cone closure weld. The SRP-SLR recommends that volumetric examinations be performed in accordance with the requirements of ASME Code Section XI, for upper shell and lower shell-to-transition cones with gross structural discontinuities for managing loss of material due to general, pitting, and crevice corrosion in the welds for Westinghouse Model 44 and 51 SGs, where a high-stress region exists at the shell-to-transition cone weld.

SRP-SLR Section 3.1.2.2.2 states that the new continuous circumferential weld, resulting from cutting the transition cone as discussed above, is a different situation from the steam generator transition cone welds containing geometric discontinuities. The SRP-SLR states that control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations of stagnant flow conditions. The SRP-SLR notes that the new transition area weld is a field weld as opposed to having been made in a controlled manufacturing facility, and the surface conditions of the transition weld may result in flow conditions more conducive to initiation of general, pitting, and crevice corrosion than those of the upper and lower transition cone welds. The SRP-SLR indicates that crediting the ISI Program for the new steam generator transition cone weld may not be a sufficient basis for managing loss of material in this weld, as the ISI criteria would only perform a VT-2 visual leakage examination as part of the system leakage test performed in accordance with ASME Code Section XI requirements.

In addition, ASME Code Section XI does not require licensees to remove insulation when performing visual examination on non-borated treated water systems. The SRP-SLR states that the effectiveness of the Water Chemistry AMP should be verified to ensure that loss of material due to general, pitting, and crevice corrosion is not occurring. For the new continuous circumferential weld, the SRP-SLR recommends further evaluation to verify the effectiveness of the Water Chemistry AMP. SRP-SLR Section 3.1.2.2.2 states that a one-time inspection at susceptible locations is an acceptable method to determine whether an aging effect is not occurring, or an aging effect is progressing very slowly, such that the component's intended function will be maintained during the subsequent period of extended operation. Furthermore, this issue is limited to replacing recirculating SGs with a new transition cone closure weld.

SLRA Section 3.1.2.2.2, item 2, associated with SLRA Table 3.1-1, item 3.1-1, 012, addresses loss of material due to general, pitting, and crevice corrosion affecting the PWR SG upper and lower shell and transition cone exposed to secondary feedwater and steam. In 1983, the lower assemblies of the PBN Unit 1 Model 44 SGs were replaced with Westinghouse Model 44F SG lower assemblies. The SGs were cut in the middle of the transition cone and reassembled with a circumferential closure weld performed in the field connecting the upper and lower steam generator sections. In 1996, the Westinghouse Model Δ47 steam generators were installed in PBN Unit 2. The upper and lower assemblies of the Westinghouse Model Δ47 steam generators were brought into containment separately, which also required the installation of a circumferential closure weld performed in the field connecting their upper and lower steam generator sections. The PBN Unit 1 and Unit 2 steam generator internal surface conditions of the new circumferential field welds may result in flow conditions more conducive to initiation of general, pitting, and crevice corrosion.

The applicant indicated that, for the new transition cone closure welds, a one-time inspection at susceptible locations is an acceptable method to determine whether an aging effect is not occurring, or an aging effect is progressing very slowly, such that the component’s intended function will be maintained during the subsequent period of extended operation. The applicant stated that the One-Time Inspection Program, AMP B.2.3.20, will use enhanced surface examination to inspect the continuous circumferential transition cone closure weld on each SG. The examination will provide essentially 100 percent coverage of each weld before the subsequent period of extended operation. The applicant explained that this one-time inspection, along with the continued implementation of the Water Chemistry Program, AMP B.2.3.2, and the SG periodic inspections required by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program, AMP B.2.3.1, will effectively manage loss of material for the steel SG components before loss of intended function.

The NRC staff’s evaluations of the applicant’s One-Time Inspection AMP and Water Chemistry AMP are documented in SE Section 3.0.3.2.21 and 3.0.3.2.6, respectively. In its review of components associated with SLR Table 3.1-1, item 3.1-1, 012, the staff finds that the applicant has met the further evaluation criteria and that its proposal to manage the effects of aging using these programs is acceptable because: (1) the One-Time Inspection AMP includes surface examinations to confirm the integrity of the SG transition cone weld and verify the effectiveness of the Water Chemistry AMP, (2) the SG periodic inspections required by the ISI Program will effectively manage loss of material for the steel SG components before loss of intended function, (3) the Water Chemistry AMP monitors and controls the secondary water chemistry conditions to minimize environmental effects on age-related degradation in these components, and (4) the use of these programs is consistent with the guidance in the GALL-SLR Report.

Based on the AMPs identified, the NRC staff determined that the applicant's AMPs meet the criteria in SRP-SLR Section 3.1.2.2.2, item 2. For the items associated with SLRA Section 3.1.2.2.2, 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 subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

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 loss of fracture toughness due to neutron irradiation embrittlement is an aging effect and mechanism evaluated by a TLAA that is addressed in SLRA Section 4.2, "Reactor Vessel Neutron Embrittlement." The NRC staff noted that SLRA Section 3.1.2.2.3, item 1, is consistent with the acceptance criteria in SRP-SLR Section 3.1.2.2.3.1 and the review procedures in SRP-SLR Section 3.1.3.2.3.1, and is, therefore, acceptable. The staff's evaluation of the TLAA for the RPV beltline and extended beltline neutron fluence is documented in SE Section 4.2.

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 RV beltline, shells, nozzles, and welds exposed to reactor coolant and neutron flux, which will be managed by the Neutron Fluence Monitoring and Reactor Vessel Material Surveillance AMPs. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.3, item 2.

In its review of components associated with AMR item 3.1.1-014, the NRC staff finds that the applicant has met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging for the RV beltline, shells, nozzles, and welds using the Neutron Fluence Monitoring and Reactor Vessel Material Surveillance AMPs is acceptable because it is consistent with AMR item IV.A2.RP-229 in the GALL-SLR Report. The staff's evaluations of the Neutron Fluence Monitoring and Reactor Vessel Material Surveillance AMPs are documented in SE Sections 3.0.3.2.2 and 3.0.3.2.22, respectively. The staff's evaluation regarding the TLAA for RV neutron embrittlement is documented in SE Section 4.2.

Based on the AMPs identified, the NRC staff concludes that the applicant's 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, Subsection 3, associated with SLRA Table 3.1-1, AMR item 3.1-1, 015, addresses the reduction of ductile fracture toughness in PWR RVI components exposed to a reactor coolant with a neutron flux environment, which is managed using the generic reduction of ductility TLAA in B&WOG Topical Report No. B&W-2248A (ADAMS Accession No. ML003708443). The applicant stated that this item is not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.3, item 1, and finds it acceptable because: (1) the Table 1 AMR item in SRP-SLR Table 3.1-1, item 015, and the corresponding Table 2 GALL-SLR Report AMR item in GALL-SLR item IV.B4.RP-376 determine that the applicable TLAA is only applicable to Babcock and Wilcox PWRs, and (2) the UFSAR notes that the PWRs in PBN Units 1 and 2 were designed by Westinghouse.

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, associated with SLRA Table 3.1-1 AMR item 3.1-1, 016, addresses cracking due to SCC and intergranular (IG)SCC for the SS and nickel-alloy RV top head enclosure flange leakage detection lines exposed to air-indoor uncontrolled and reactor coolant leakage. The applicant stated that this item is not applicable because it is for a BWR plant only. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.4, item 1, and finds it acceptable because, as stated in the SRP-SLR, this issue is only associated with a BWR plant and PBN is a PWR plant.

Item 2. The NRC staff reviewed SLRA Section 3.1.2.2.4, item 2, associated with SRP-SLR Table 3.1-1, item 3.1-1, 017, against the criteria in SRP-SLR Section 3.1.2.2.4. The applicant stated that this item is not applicable to PBN Units 1 and 2, which are PWR units. The staff noted that the associated item in SLRA is applicable to BWRs only. The staff confirmed that this item is associated only with 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 NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.5 and finds that the reactor pressure vessels are not subject to underclad cracking because the manufacturer of these vessels did not use welding processes, post-weld heat treating practices, or materials that contributed to these cracking conditions, as described in NUREG-1839. Furthermore, the staff noted that the reactor pressure vessels were fabricated using single layer cladding which was applied using one-wire cladding processes with low heat input that did not exhibit underclad reheat cracking in evaluations of either test samples or actual nozzle cutouts. Additionally, the staff finds that the replacement RV closure heads for PBN Units 1 and 2 (replaced in 2004 and 2005, respectively) are not subject to underclad cracking because precautions were taken to preclude the potential for underclad cracking (i.e., preclude the formation of segregated areas on the surface to be clad, the presence of stresses in the underclad heat affected zone, and the presence of coarse grain areas in the cladding heat affected zone (HAZ)).

3.1.2.2.6 Cracking Due to Stress Corrosion Cracking

Item 1. SLRA Section 3.1.2.2.6, Item 1, associated with SLRA Table 3.1-1, Item 3.1-1, 019, 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 PBN BMI guide tubes are being managed by the Water Chemistry AMP and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP.

The criteria in SRP-SLR Section 3.1.2.2.6.1 state that cracking due to an SCC mechanism could occur in PWR RV BMI guide tubes exposed to a reactor coolant environment. SRP-SLR

Section 3.1.2.2.6.1 also states that the GALL-SLR Report recommends further evaluation to ensure that this aging effect is adequately managed during the subsequent period of extended operation.

In its review of the RV BMI guide tubes, which are associated with SLRA Table 3.1-1, item 3.1-1, 019, the NRC staff noted that the RV BMI guide tubes are made of SS with a normal operating environment of reactor coolant. In addition, the applicant stated that SCC of the RV BMI guide tubes will be managed by the Water Chemistry AMP and the inspection will be implemented by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP. The staff noted that the GALL-SLR Report includes entries for SS exposed to a borated water environment. These entries indicate that an AERM is not present for this material and environment combination. In an unlikely scenario when there is cracking, visual examinations would identify any indication of borated water leakage, if present. Therefore, the staff finds that the applicant's proposal to use its Water Chemistry AMP and the ASME Section XI ISI, Subsections IWB, IWC, and IWD AMP is acceptable.

Based on the programs identified, the NRC staff determined that the applicant's programs meet the criteria in SRP-SLR Section 3.1.2.2.6, item 1. For the items associated with SLRA Section 3.1.2.2.6, item 1, 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 2. SLRA Section 3.1.2.2.6 associated with SLRA Table 3.1-1, AMR item 3.1-1, 020, addresses cracking due to SCC for the CASS Class 1 reactor coolant piping and piping components exposed to the reactor coolant, which will be managed by the Water Chemistry AMP. The applicant stated that NUREG-0313, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping," issued January 1988, describes industry experience where SCC of CASS components occurred in BWRs primarily due to susceptible CASS components being exposed to BWR water chemistry with high levels of oxygen and other contaminants. The applicant stated that its review of industry and plant-specific operating experience did not identify any occurrence of SCC in the CASS piping and piping components exposed to PWR reactor coolant.

SRP-SLR Section 3.1.2.2.6, item 2, states that, although the Water Chemistry AMP is generally effective in mitigating SCC, cracking due to SCC could occur in CASS components that do not meet NUREG-0313 guidance on ferrite and carbon contents. SRP-SLR recommends further evaluation of a plant-specific program for CASS Class 1 reactor coolant piping and piping components to ensure that this aging effect is adequately managed. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.6, item 2. In its review of components associated with AMR item 3.1-1, 020, the staff finds that the applicant has met the further evaluation criteria because the applicant uses the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP to monitor these components for potential cracking. The staff's evaluation of the ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD AMP and the Water Chemistry AMP are documented in SE Section 3.0.3.2.5 and 3.0.3.2.6, respectively.

For the components associated with SLRA Section 3.1.2.2.6, item 2, the NRC 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 period of subsequent extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. SLRA Section 3.1.2.2.6, associated with SLRA Table 3.1-1, AMR item 3.1-1, 139, addresses cracking due to SCC in SS or nickel-alloy RV flange leak detection lines. The applicant stated that this item is not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.6, item 3, and finds it acceptable because as stated in the SRP-SLR Section 3.1.2.2.6, the aging effect of cracking in SS and nickel-alloy RV flange leak detection lines is not applicable and does not require management if: (a) the plant-specific operating experience does not reveal a history of SCC, and (b) a one-time inspection demonstrates that the aging effect is not occurring. During the staff's review of the applicant's operating experience, the staff did not find any plant-specific operating experience that would indicate a history of cracking due to SSC for this component. Additionally, the applicant states that the RV flange leak detection lines include a 3/16-inch diameter orifice in the RPV flange, which 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 leak detection lines are nonsafety-related, and their potential failure would not prevent satisfactory accomplishment of any safety-related functions.

3.1.2.2.7 Cracking Due to Cyclic Loading

The NRC staff reviewed SLRA Section 3.1.2.2.7, associated with SRP-SLR Table 3.1-1, 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 PBN Units 1 and 2, which are PWR units, because the associated item in SLRA Table 3.1-1 is applicable to BWRs only. 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, associated with SLRA Table 3.1-1, AMR item 3.1-1, 022, 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. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.8 and finds it acceptable because the applicant's steam generators do not have feedwater impingement plates and the associated supports.

3.1.2.2.9 Aging Management of Pressurized-Water Reactor Vessel Internals

SLRA Section 3.1.2.2.9, 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, 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, addresses management of cracking (due to SCC, irradiation-assisted stress corrosion cracking (IASCC), 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 are exposed to a reactor coolant with a neutron flux environment, which will be managed by either the applicant's Reactor Vessel Internals Program, AMP B.2.3.7, or a combination of the applicant's Reactor Vessel Internals Program and the Water Chemistry Program, AMP B.2.3.2.

The applicant amended SLRA Section 3.1.2.2.9, and the AMR line items associated with SLRA Section 3.1.2.2.9, in SLRA Supplement 3, Revision 1 to make SLRA Section 3.1.2.2.9 and the associated AMR line items consistent with the NRC staff's update of SRP-SLR Section 3.1.2.2.9 and the associated AMR line items for Westinghouse-design reactor internal components in SLR-ISG-2021-01-PWRVI. The staff reviewed the applicant's amendments of SLRA Section 3.1.2.2.9 made in SLRA Supplement 3, Revision 1, and found the changes to be acceptable because they make the applicant's revised AMR further evaluation basis in SLRA Section 3.1.2.2.9 consistent with the updated guidelines for PWR RVI components in SRP-SLR Section 3.1.2.2.9, as updated in Appendix C of SLR-ISG-2021-01-PWRVI.

The NRC staff reviewed the applicant's Table 1 AMR line items for the 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, inclusive of changes made to the items in SLRA Supplement 3, Revision 1) in comparison to the corresponding AMR item criteria in the SRP-SLR and GALL-SLR Reports, as updated in Appendices A and B.1 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 staff's evaluations of the applicable Table 1 (SLRA Table 3.1-1) and Table 2 (SLRA Table 3.1.2-2) AMR items are given in the following subsections.

Table 1 AMR Items for PWR RVI Components in SLRA Table 3.1-1 that Were Identified As Being Not Applicable to the PBN SLRA or Were Not Used for Development of the SLRA.

- *SLRA Item 3.1-1, 028 (As Amended in SLRA Supplement 3, Revision 1)—Not Used*. For Westinghouse-design PWRs, AMR item 028 in SRP-SLR Table 3.1-1 (as updated in SLR-ISG-2021-01-PWRVI) applies to aging management of loss of material due to wear and cracking due to SCC and fatigue in the CRGT support pins (split pins). In SLRA Supplement 3, Revision 1, the applicant made minor administrative edits to SLRA item 3.1-1, 028 to make the line item consistent with the revised version of SRP-SLR Table 3.1-1, item 028, in the referenced ISG. In its amended version of AMR item 3.1-1, 028, the applicant stated the line item is not applicable/not used because the applicant uses another SLRA Table 1 AMR item (SLRA item 3.1-1, 055c) for management of the CRGT spilt pins. The applicant explained that, for PBN, the CRGT split pins are defined as EPRI MRP "No Addition Measures" components and that the SLRA uses the applicable AMR items for Westinghouse-design "No Additional Measures" components, as reflected in SLRA Table 1 AMR item 3.1-1, 055c, for aging management of the CRGT split pins.

  In the referenced ISG, the NRC staff established a position that was consistent with the EPRI MRP's aging management basis for CRGT split pins in report MRP-227, Revision 1-A and indicates that Westinghouse-design CRGT split pins may be placed in the "No Additional Measures" category of the RVI Management Program if the split pins are fabricated from austenitic SS materials (as opposed to the use of SA-403 martensitic SS material as the material of fabrication). During the staff's audit of SLRA Section B.2.3.7, the staff verified that the applicant replaced its CRGT spilt pins with pins made from Type 316L austenitic stainless materials and that, based on this material of fabrication, the applicant includes the CRGT split pins in the "No Additional Measures" for the AMP. Therefore, the staff finds that the applicant's alternate use of SLRA item 3.1-1, 055c (and the corresponding AMR line item for "No Additional Measures" components in SLRA Table 3.1.2-2) is appropriate and acceptable for the CRGT split pins because the AMR basis meets the ISG's basis for placing the CRGT split pins in the "No Additional Measures" category of the Reactor Vessel Internals AMP.

- *SLRA Table 3.1-1, AMR Items 3.1-1, 051a; 3.1-1, 051b; 3.1-1, 052a; 3.1-1, 052b; 3.1-1, 052c; 3.1-1, 055a; 3.1-1, 055b; 3.1-1, 056a, 3.1-1, 056b; 3.1-1, 056c; 3.1-1, 058a; and 3.1-1, 058b—Not Applicable*. SLRA Section 3.1.2.2.9, associated collectively with SLRA Table 1 AMR items in the above subsection heading, addresses cracking, loss of material, loss of preload, loss of fracture toughness, and changes in dimension in specified commodity group categories of PWR RVI components that are made from SS or nickel-alloy materials and are exposed to a reactor coolant with a neutron flux environment. The applicant stated that these SLRA Table 1 AMR items are not applicable to the PBN SLRA.

The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Table 3.1-1, AMR items 051a, 051b, 052a, 052b, 052c, 055a, 055b, 056a, 056b, 056c, 058a, and 058b and verified that the specified SRP-SLR Table 1 AMR items (as updated inclusive of changes to the line items in Appendix A of SLR-ISG-2021-01-PWRVI) are only applicable to B&W-designed or Combustion Engineering (CE)-designed PWRs. Therefore, the staff finds the applicant's "not applicable" basis for these SLRA Table 1 AMR items to be acceptable because: (1) the referenced SLRA Table 1 AMR items in this SE subsection are only applicable to B&W or CE-designed PWRs, and (2) the UFSAR for PBN Units 1 and 2 verifies that the PWR units at PBN were designed by Westinghouse.

- *SLRA Item 3.1-1, 118 (As Amended in SLRA Supplement 3, Revision 1) – Not Used*. For PWR-designed plants, AMR item 118 in SRP-SLR Table 3.1-1 (as updated in SLR-ISG-2021-01-PWRVI) establishes use of the item for situations where the applicant is using its GALL-SLR-based PWR Vessel Internals AMP for aging management of cracking in a specified RVI component, but where the MRP-227, Revision 1-A management basis for the RVI component is adjusted on a plant-specific or component-specific basis (e.g., as a result of a gap analysis result for the component). In SLRA Supplement 3, Revision 1, the applicant made minor administrative edits to SLRA item 3.1-1, 118 to make the line item consistent with the revised version of SRP-SLR Table 3.1-1, item 118 in the referenced ISG. In its amended version of AMR item 3.1-1, 118, the applicant stated the line item is not applicable/not used because aging management of cracking (due to SCC, IASCC, cyclic loading, or fatigue) in the specified RVI components is addressed through use of alternative Table 1 AMR items (i.e., through use of either SLRA item 3.1-1, 053a; 3.1-1, 053b; or 3.1-1, 053c).

  During the NRC staff's audit of SLRA Section B.2.3.7, the staff verified that the applicant did not need to adjust any MRP-227, Revision 1-A, inspection protocols for "Primary," "Expansion," or "Existing Program" category RVI components susceptible to cracking or credit use of SLRA item 3.1-1, 118 for the specified components. Therefore, the staff finds that the applicant does not need to use SLRA item 3.1-1,118 for aging management of cracking because the staff has confirmed that the applicant uses the alternate items in SLRA Table item 3.1-1, 053a; 3.1-1, 053b; and 3.1-1, 053c to manage cracking in the specified "Primary," "Expansion," or "Existing Program" category RVI components that are identified in SLRA Table 3.1.2-2 as being susceptible to cracking (respectively, as updated inclusive of changes to the applicable SLRA Table 3.1.2-2 AMR items made in SLRA Supplement 3, Revision 1).

SLRA Table 1 AMR Items for PWR RVI Components that Were Identified as Being Applicable to the SLRA and Consistent with the SRP-SLR Report, as Updated Through Changes Made in SLRA Supplement 3, Revision 1. In SLRA Table 3.1-1, as amended in SLRA Supplement 3, Revision 1, the applicant noted that the following Table 1 AMR line items for RVI components are applicable to the SLRA and are consistent with the corresponding versions of the line items in Table 3.1-1 of the SRP-SLR Report, inclusive of any changes to the referenced Table 1 SRP-SLR items in Appendix A of SLR-ISG-2021-01-PWRVI: (a) item 3.1-1, 053a, (b) item 3.1-1, 053b, (c) item 3.1-1, 053c, (d) item 3.1-1, 055c, (e) item 3.1-1, 059a, (f) item 3.1-1, 059b, (g) item 3.1-1, 059c, and (h) item 3.1-1, 119. The NRC staff found the applicant's versions of these Table 1 AMR line items (inclusive of any changes made to the line items in SLRA Supplement 3, Revision 1) to be acceptable because the staff confirmed that the specified Table 1 AMR items are consistent with the corresponding Table 1 AMR line items for Westinghouse PWR RVI components in SRP-SLR Table 3.1-1, as updated, inclusive of changes made to the referenced SRP-SLR line items in the referenced ISG.

Table 2 AMR Items in SLRA Table 3.1.2-2 (Inclusive of Any Changes Made to the AMR Items in SLRA Supplement 3, Revision 1) that Are Cited for Aging Management of Specified PWR RVI Components and Claimed as Being Consistent with GALL-SLR (Inclusive of Any Changes Made to the Corresponding GALL-SLR Items in Appendix B.2 in SLR-ISG-2021-01-PWRVI). The NRC staff noted that, in SLRA Table 3.1.2-2, as amended in SLRA Supplement 3, Revision 1, the applicant included an AMR line item for the specified RVI component that was consistent with the corresponding AMR line item for the specified components in Table IV.B2 of the GALL-SLR Report or as updated in the staff's revision of a specific GALL-SLR line item in SLR-ISG-2021-01-PWRVI. The staff noted that these line items were also cross referenced to the Table 1 line item (i.e., SLRA Table 3.1-1) in SLRA items No. 3.1-1, 053a; 3.1-1, 053b; 3.1-1, 053c; 3.1-1, 054; 3.1-1, 055c; 3.1-1, 059a; 3.1-1, 059b; 3.1-1, 059c; or 3.1-1, 119. The staff found these AMR items (inclusive of any changes to the AMR items made in SLRA Supplement 3, Revision 1) to be acceptable because the staff verified that the component-specific AMR basis in the specified AMR item was consistent with the corresponding AMR item in the GALL-SLR Report (inclusive of any updates made to a specified and referenced GALL-SLR AMR item for GALL-SLR Table IV.B2, as updated in Appendix B.2 of the referenced ISG).

3.1.2.2.10 Loss of Material Due to Wear

Item 1. The NRC staff reviewed SLRA Section 3.1.2.2.10 against the criteria in SRP-SLR Section 3.1.2.2.10, which divided this degradation into items 1 and 2. For item 1, SRP-SLR Section 3.1.2.2.10 states that industry operating experience indicates that loss of material due to wear can occur in PWR control rod drive (CRD) head penetration nozzles made of nickel-alloy due to the interactions between the nozzle and the thermal sleeve centering pads of the nozzle. The CRD head penetration nozzles are also called CRD mechanism (CRDM) nozzles or CRDM head adapter tubes. SRP-SLR also states that the applicant should perform a further evaluation to confirm the adequacy of a plant-specific AMP or analysis (with any necessary inspections) for management of the aging effect. SRP-SLR indicates that the applicant may use the acceptance criteria, which are described in BTP RLSB-1 (Appendix A.1 of the SRP-SLR), to demonstrate the adequacy of a plant-specific AMP. Alternatively, the applicant may perform an analysis with any necessary inspections to confirm that loss of material due to wear does not affect the intended function(s) of these CRD head penetration nozzles, consistent with the CLB.

SLRA Section 3.1.2.2.10, item 1, associated with SLRA Table 3.1-1, item 3.1-1, 116, addresses the fact that loss of material due to wear can occur in PWR CRD head penetration nozzles made of nickel-alloy due to the interaction between the nozzle and the thermal sleeve centering pads of the nozzle. The applicant stated that wear interaction will not affect the intended functions of the CRDM head adapters as PBN has a 14×14 guide tube configuration with gaps between the guide funnel and upper guide tube that limits flange wear and prevents flange separation. For a plant with such a configuration, the current recommendations are to continue monitoring the industry operating experience for this issue. The applicant stated that it will inspect the RV heads in 2025 as part of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP and will include any relevant industry operating experience that has developed. As such, the effects of loss of material due to wear in the CRDM head penetrations is managed using the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP.

The NRC staff notes that MRP 2018-027 refers to the Westinghouse Nuclear Safety Advisory Letter (NSAL) 18-1 recommendation that recommends monitoring any relevant operating experience development. The applicant stated that, during the vessel head inspection in 2025, it will visually inspect the bottom of the thermal sleeve guide funnels for any wear indications. In addition, it will continue monitoring industry operating experience as recommended. The staff notes that the vessel head inspection will visually inspect the CRGTs to monitor the structural integrity of the thermal sleeves and CRD guide tube.

The NRC staff's evaluations of the applicant's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP are documented in SE Section 3.0.3.2.5. In its review of components associated with SLR Table 3.1-1, item 3.1-1, 116, 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 program is acceptable because: (1) the applicant will visually examine the thermal sleeve, and the inspection by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP is capable of detecting wear, (2) the applicant will continue monitoring relevant operating experience as recommended, and (3) the use of the program is consistent with the guidance in the GALL-SLR Report.

Based on the program identified, the NRC staff concludes that the applicant's program meets SRP-SLR Section 3.1.2.2.10, item 1. For those AMR items associated with SLRA Section 3.1.2.2.10, item 1, 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. SLRA Section 3.1.2.2.10, Subsection 2, associated with SLRA Table 3.1-1 AMR item 3.1-1, 117, addresses loss of material due to wear in SS or nickel-alloy control rod guide (CRG) head penetration thermal sleeves that are exposed to a reactor coolant environment. The applicant stated that this AMR item is not applicable because the site-specific design of the CRG head penetration thermal sleeve flange limits flange wear and prevents flange separation, as explained in NSAL 18-1. The applicant stated that, as discussed in the RVI gap analysis (Appendix C of the SLRA), it will continue to follow all guidelines that apply to aging management of the thermal sleeves.

The NRC staff reviewed the applicant's aging management basis for managing loss of material due to wear in the thermal sleeves, as discussed in SLRA Section 3.1.2.2.10, Subsection 2, and further explained by the applicant on page C-17 of the gap analysis for the SLRA, which the applicant includes in SLRA Appendix C. The staff noted that, in SLRA Appendix C, the applicant explained that the industry's upgraded aging management recommendations for the funnel-to-upper guide tube regions of the CRG head penetration thermal sleeves in the PBN units were included in NSAL 18-1.

The NRC staff noted that, in NSAL 18-1, and previously in Table 1 of Westinghouse Non-proprietary Class 3 Technical Bulletin No. TB-07-2, Revision 3, Westinghouse notes that the CRG head penetration thermal sleeves in the PBN units are not susceptible to this potential wear due to the specific design configurations of the thermal sleeves (as explained in Footnote 1 of Table 2 in NSAL 18-1). Thus, based on this confirmation and the relevant industry technical bulletin information, the staff concludes that the applicant has provided a sufficient basis for concluding that the loss of material issue discussed in SRP-SLR Section 3.1.2.2.10, item 1, and in SLRA Table item 3.1-1, 117 is not applicable to PBN; the applicant's basis is supported by the Westinghouse determination in NSAL 18-1 that wear is not a concern for the design of the CRGT thermal sleeves at PBN.

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 PWSCC for steel (with nickel-alloy cladding) or nickel-alloy SG primary side components: divider plate and tube-to-tube sheet welds exposed to reactor coolant. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Steam Generators, Water Chemistry, and One-Time Inspection AMPs to manage cracking due to PWSCC of the PBN Unit 1 SG nickel-alloy divider plate exposed to reactor coolant. The AMR item cites plant-specific note 1, which states, "Per Section 3.1.2.2.11, the Unit 1 divider plate aging effect of cracking is managed by the Steam Generators (B.2.3.10), Water Chemistry (B.2.3.2), and One-Time Inspection (B.2.3.20) AMPs." 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 Steam Generators and Water Chemistry AMPs. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.11.

<u>Item 1</u>. The PBN Unit 1 steam generators are Westinghouse Model 44F and have Alloy 600 divider plate assemblies. The PBN Unit 2 steam generators are Westinghouse Model Δ47F and have Alloy 690 divider plates and associated welds. As amended by letter dated April 21, 2021, SLRA Section 3.1.2.2.11 states that the PBN Unit 1 steam generators are conservatively assumed not to be bounded by the industry analysis in EPRI 3002002850 and, therefore, the applicant committed to performing a one-time inspection of the Unit 1 steam generator divider plate assemblies to verify the effectiveness of the Water Chemistry and Steam Generators AMPs and to verify the absence of PWSCC.

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 SRP-SLR states that, for plants with divider plate assemblies fabricated of Alloy 600 or Alloy 600-type weld materials, a plant-specific AMP is necessary if the industry analysis in EPRI 3002002850 is not bounding. In addition, the SRP-SLR states that the plant-specific AMP may include a one-time inspection capable of detecting cracking to verify the effectiveness of the Water Chemistry and Steam Generators AMPs and the absence of PWSCC in the divider plate assemblies.

The NRC staff finds that the applicant has met the further evaluation criteria for PBN Unit 2 because the divider plate assemblies are fabricated of Alloy 690 and Alloy 690-type weld materials and, therefore, a plant-specific AMP is not required. The divider plate assemblies fabricated of Alloy 600 or Alloy 600-type weld materials in PBN Unit 1 were conservatively assumed not to be bounded by the industry analyses in EPRI 3002002850, and a one-time inspection will be performed to verify the effectiveness of the Water Chemistry and Steam Generators AMPs and to verify the absence of PWSCC.

Based on the programs identified, the NRC 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 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. The PBN Unit 1 SGs have thermally treated Alloy 600 tubes and the PBN Unit 2 SGs have thermally treated Alloy 690 tubes. In addition, the tubesheets in the Unit 2 steam generators are clad with Alloy 690-type material. SLRA Section 3.1.2.2.11 states that plant-specific AMPs are not necessary for Unit 1 because it has a permanently approved H* alternative repair criterion for both the hot- and cold-leg side of the steam generators, while Unit 2 has thermally treated Alloy 690 steam generator 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 600 SG tubes with a permanently approved alternate tube repair criterion that applies to both the hot- and cold-leg side of the steam generators and thermally treated Alloy 690 steam generator tubes, with tubesheet cladding using Alloy 690-type material.

The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.11, item 2, and finds it acceptable because the applicant has a permanently approved H* alternate repair criterion for the PBN Unit 1 steam generators, which takes no credit for the portion of the tube greater than 20.6 inches below the top of the tubesheet (including the tube-to-tubesheet weld) to resist tube end cap pressure loads and removes the tube-to-tubesheet weld from a pressure boundary function. Consistent with SRP-SLR Section 3.1.2.2.11, item 2, the weld is no longer part of the reactor coolant pressure boundary and a plant-specific AMP is not necessary. In addition, the staff finds the applicant's claim acceptable for the PBN Unit 2 steam generators because the tubes are thermally treated Alloy 690 and the tubesheets are clad with Alloy 690-type material.

Based on the programs identified, the NRC 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 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).

3.1.2.2.12 Cracking Due to Irradiation-Assisted Stress Corrosion Cracking

SLRA Section 3.1.2.2.12, associated with SLRA Table 3.1-1, items 3.1-1, 029; 3.1-1, 041, and 3.1-1, 103, addresses IASCC for nickel-alloy and SS RVI components exposed to the BWR vessel environment. The applicant stated that this item is not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.12 and finds it acceptable because the applicant's RV design is not a BWR and thus the RV 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, associated with SLRA Table 3.1-1, item 3.1-1, 099, addresses loss of fracture toughness due to neutron irradiation or thermal aging embrittlement for nickel-alloy and SS RVI components exposed to the BWR vessel environment. The applicant stated that this item is not applicable. The NRC staff evaluated the applicant's claim against the criteria in

SRP-SLR Section 3.1.2.2.13 and finds it acceptable because the applicant's RV design is not a BWR and thus the RV 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, associated with SLRA Table 3.1-1, item 3.1-1, 120, 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. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.14 and 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, associated with SLRA Table 3.1-1, items 3.1-1, 105 and 3.1-1, 115, addresses: (a) loss of material due to general, crevice, or pitting corrosion for steel piping and piping components exposed to concrete (item 3.1-1, 105), and (b) loss of material due to crevice or pitting corrosion and cracking due to SCC for SS piping and piping components exposed to concrete (item 3.1-1, 115). The applicant stated that there are no RCS SS or steel piping or piping components within the scope of subsequent license renewal that are exposed to concrete. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.15 and finds it acceptable because, based on a review of the UFSAR, there are no steel or SS piping or piping components exposed to concrete in the RCS.

For those AMR items associated with SLRA Section 3.1.2.2.15, the NRC 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).

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

SLRA Section 3.1.2.2.16, associated with SLRA Table 3.1-1, item 3.1-1, 136, addresses loss of material due to pitting or crevice corrosion for SS and nickel-alloy piping and piping components exposed to air-indoor uncontrolled, which will be managed by the External Surfaces Monitoring of Mechanical Components AMP. The NRC staff also noted that item 3.1.1-136 addresses loss of material due to pitting and crevice corrosion for the internal surface of the SS pressurizer relief tank exposed to condensation in the nitrogen-filled section of the tank. The staff evaluated the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.16, item 3.1-1, 136. In its 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 AMP and the One-Time Inspection AMP for the pressurizer relief tank, is acceptable because these programs are recommended by the SRP-SLR.

3.1.2.2.17 Ongoing Review of Operating Experience

SE Section 3.0.5 documents the NRC 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 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 Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report," is a summary comparison of the applicant's AMR results with those provided in the GALL-SLR Report for the engineered safety features (ESF) components.

3.2.2 Staff Evaluation

Table 3.2-1, below, summarizes the NRC 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 Point Beach
3.2-1, 006	Not applicable to PWRs (see SE Section 3.2.2.2.3)
3.2-1, 007	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.4)
3.2-1, 008	Not applicable to Point Beach
3.2-1, 009	Consistent with the GALL-SLR Report
3.2-1, 010	Not applicable to Point Beach (see SE Section 3.2.2.1.1)
3.2-1, 011	Not applicable to Point Beach
3.2-1, 012	Not applicable to Point Beach
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 applicable to Point Beach
3.2-1, 017	Not applicable to Point Beach
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 (see SE Section 3.2.2.1.2)
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

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2-1, 023	Not applicable to Point Beach
3.2-1, 024	Not applicable to Point Beach
3.2-1, 025	Not applicable to Point Beach
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 Point Beach
3.2-1, 028	Not applicable to Point Beach
3.2-1, 029	Not applicable to Point Beach
3.2-1, 030	Consistent with the GALL-SLR Report
3.2-1, 031	Consistent with the GALL-SLR Report (see SE Section 3.2.2.1.2)
3.2-1, 032	Not applicable to Point Beach
3.2-1, 033	Consistent with the GALL-SLR Report
3.2-1, 034	Not applicable to Point Beach
3.2-1, 035	Consistent with the GALL-SLR Report
3.2-1, 036	Not applicable to Point Beach
3.2-1, 037	Not applicable to Point Beach
3.2-1, 038	Not applicable to Point Beach
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 applicable to Point Beach (see SE Section 3.2.2.2.10)
3.2-1, 043	Not applicable to Point Beach
3.2-1, 044	Consistent with the GALL-SLR Report
3.2-1, 045	Not applicable to Point Beach
3.2-1, 046	Not applicable to Point Beach
3.2-1, 047	Not applicable to Point Beach
3.2-1, 048	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.2)
3.2-1, 049	Consistent with the GALL-SLR Report
3.2-1, 050	Consistent with the GALL-SLR Report
3.2-1, 051	Not applicable to Point Beach
3.2-1, 052	Not applicable to Point Beach
3.2-1, 053	Not applicable to Point Beach
3.2-1, 054	Not applicable to PWRs
3.2-1, 055	Not applicable to Point Beach (see SE Section 3.2.2.2.9)
3.2-1, 056	Not applicable to Point Beach (see SE Section 3.2.2.2.10)
3.2-1, 057	Not applicable to Point Beach
3.2-1, 058	Not applicable to Point Beach
3.2-1, 059	Not applicable to Point Beach
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 applicable to Point Beach
3.2-1, 063	Consistent with the GALL-SLR Report
3.2-1, 064	Consistent with the GALL-SLR Report
3.2-1, 065	Not applicable to Point Beach
3.2-1, 066	Not applicable to Point Beach (see SE Section 3.2.2.2.7)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2-1, 067	Consistent with the GALL-SLR Report
3.2-1, 068	Not applicable to Point Beach
3.2-1, 069	Not applicable to Point Beach
3.2-1, 070	Consistent with the GALL-SLR Report
3.2-1, 071	Not applicable to Point Beach
3.2-1, 072	Not applicable to Point Beach
3.2-1, 073	Not applicable to Point Beach
3.2-1, 074	Not applicable to Point Beach
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 Point Beach
3.2-1, 077	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1, 078	Not applicable to Point Beach
3.2-1, 079	Consistent with the GALL-SLR Report
3.2-1, 080	Not applicable to Point Beach (see SE Section 3.2.2.2.4)
3.2-1, 081	Not applicable to Point Beach
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
3.2-1, 087	Not applicable to Point Beach
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 Point Beach
3.2-1, 091	Not applicable to Point Beach (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 Point Beach
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 Point Beach
3.2-1, 099	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.2)
3.2-1, 100	Not applicable to Point Beach (see SE Section 3.2.2.2.8)
3.2-1, 101	Not applicable to Point Beach (see SE Section 3.2.2.2.8)
3.2-1, 102	Not applicable to Point Beach (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 Point Beach
3.2-1, 105	Not applicable to Point Beach (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 Point Beach (see SE Section 3.2.2.2.8)
3.2-1, 110	Not applicable to Point Beach (see SE Section 3.2.2.2.8)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2-1, 111	Not applicable to Point Beach (see SE Section 3.2.2.2.10)
3.2-1, 112	Not applicable to Point Beach (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 Point Beach
3.2-1, 115	Not applicable to Point Beach
3.2-1, 116	Not applicable to Point Beach
3.2-1, 117	Not applicable to Point Beach
3.2-1, 118	Not applicable to Point Beach
3.2-1, 119	Not applicable to Point Beach (see SE Section 3.2.2.2.10)
3.2-1, 120	Not applicable to Point Beach
3.2-1, 121	Not applicable to Point Beach (see SE Section 3.2.2.2.10)
3.2-1, 122	Not applicable to Point Beach
3.2-1, 123	Not applicable to Point Beach
3.2-1, 124	Not applicable to Point Beach
3.2-1, 125	Not applicable to Point Beach
3.2-1, 126	Not applicable to Point Beach
3.2-1, 127	Not applicable to Point Beach
3.2-1, 128	Not applicable to Point Beach
3.2-1, 129	Consistent with the GALL-SLR Report
3.2-1, 130	Not applicable to Point Beach
3.2-1, 131	Not applicable to Point Beach
3.2-1, 132	Not applicable to Point Beach
3.2-1, 133	Not applicable to Point Beach
3.2-1, 134	Not applicable to Point Beach

The NRC 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 3.2.2.1 discusses AMR results for components that the applicant states are either not applicable to PBN 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 require 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 NRC staff’s review of AMR results listed in SLRA Tables 3.2.2-1 through 3.2.2-4 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 its 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's evaluation is documented in Section 3.2.2.1.2 below.

SE Section 3.2.2.1.1 documents the NRC staff's review of AMR items 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, item 3.2-1, 054, the applicant claims that the corresponding AMR item in the GALL-SLR Report is not applicable because the associated item is only applicable to BWRs. The NRC staff reviewed the SRP-SLR, confirmed that this item only applies to BWRs, and finds that this item is not applicable to PBN because it is a PWR. For SLRA Table 3.2-1, items 3.2-1, 005; 3.2-1, 008; 3.2-1, 010; 3.2-1, 011; 3.2-1, 012; 3.2-1, 016; 3.2-1, 017; 3.2-1, 023 through 3.2-1, 025; 3.2-1, 027 through 3.2-1, 029; 3.2-1, 032; 3.2-1, 034; 3.2-1, 036; 3.2-1-037; 3.2-1, 038; 3.2-1, 042; 3.2-1-043, 3.2-1, 045 through 3.2-1, 047; 3.2-1, 051 through 3.2-1, 053; 3.2-1, 055 through 3.2-1, 059; 3.2-1, 062; 3.2-1, 065; 3.2-1, 066; 3.2-1, 068; 3.2-1, 069; 3.2-1, 071 through 3.2-1, 074; 3.2-1, 076; 3.2-1, 078, 3.2-1, 080; 3.2-1, 081; 3.2-1-087; 3.2-1, 090; 3.2-1, 091; 3.2-1, 096; 3.2-1, 098; 3.2-1, 104; 3.2-1, 105; 3.2-1, 109 through 3.2-1, 112; 3.2-1, 114 through 3.2-1, 128; 3.2-1, 130 through 3.2-1, 134, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not used or not applicable to PBN. 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 SLRA Table 3.2-1, items 3.2-1, 006; 3.2-1, 054, the applicant claims that the corresponding AMR item in the GALL-SLR Report is not applicable because the associated item is only applicable to BWRs. The NRC staff reviewed the SRP-SLR, confirmed that this item only applies to BWRs, and finds that this item is not applicable to PBN because it is a PWR. SLRA Table 3.2-1, item 3.2.1-010 addresses loss of fracture toughness due to thermal aging embrittlement for CASS piping, and piping components exposed to treated borated water greater than 250 °C (greater than 482 °F) or treated water greater than 250 °C (greater than 482 °F) in the ESF systems. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because the staff verified from its review of the PBN UFSAR that there are no CASS piping and piping components exposed to treated borated water greater than 250 °C (greater than 482 °F) or treated water greater than 250 °C (greater than 482 °F) in the ESF systems.

3.2.2.1.2 Loss of Material Due to Pitting, Crevice Corrosion, and MIC; Cracking Due to Stress Corrosion Cracking

SLRA Table 3.2-1, AMR item 3.2.1, 020, addresses cracking due to SCC for SS, steel (with SS or nickel-alloy cladding) piping, piping components, and tanks exposed to treated borated water greater than 60 °C (140 °F). In addition, SLRA Table 3.2-1, AMR item 3.2.1, 031 addresses loss of material due to pitting, crevice corrosion, and MIC for SS heat exchanger components, piping, and piping components exposed to closed-cycle cooling water. For the SS residual heat removal (RHR) heat exchanger tube AMR items that cite generic note E, the SLRA, as amended by letter dated April 21, 2021, credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP to manage cracking and loss of material. The AMR items cite plant-specific note 1, which states "Eddy current testing is performed on the RHR heat exchanger tubes through the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.25) AMP based on plant-specific OE [operating experience]."

During its review of the GALL-SLR Report, the NRC staff noted the following: (a) volumetric examinations, such as eddy current testing, are used to quantify the extent of wall thinning or loss of material, (b) surface examinations use magnetic particle, liquid penetrant, or eddy current examinations to indicate the presence of surface discontinuities and flaws, and (c) as noted in GALL-SLR Report AMP XI.M38, surface examinations are conducted to manage cracking in SS components. Based on its review of the SS RHR heat exchanger tube AMR items that cite generic note E (associated with AMR items 3.2.1-20 and 3.2.1-31), the staff finds the applicant's proposal to manage the effects of aging using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP acceptable because, based on its review of the GALL-SLR Report, eddy current examinations are capable of managing cracking and loss of material for SS heat exchanger tubes.

3.2.2.2 Aging Management Review Results for which Further Evaluation Is Recommended by the GALL-SLR Report

In SLRA Section 3.2.2.2, the applicant further evaluated aging management for the ESF 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 3.2.2.2. The following subsections document the staff's review.

3.2.2.2.1 Cumulative Fatigue Damage

SLRA Section 3.2.2.2.1, associated with Table 3.2-1, item 3.2-1, 001, states that the TLAA on cumulative fatigue damage in the components of ESF is evaluated in accordance with 10 CFR 54.21(c)(1) and addressed in SLRA Section 4.3.3. This is consistent with SRP-SLR Section 3.2.2.2.1 and is, therefore, acceptable. The NRC staff's evaluation of the TLAA for the components of ESF is documented in SE Section 4.3.3.

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, associated with SLRA Table 3.2-1, AMR items 3.2.1-004, 3.2.1-048, 3.2.1-099, 3.2.1-106, and 3.2.1-107, addresses loss of material due to pitting and crevice corrosion for SS and nickel-alloy piping, piping components, and tanks, SS tanks within the scope of GALL-SLR AMP XI.M29, and insulated SS piping, piping components, and tanks exposed to air or condensation, which will be managed by the Outdoor and Large Atmospheric Metallic Storage Tanks, the External Surfaces Monitoring of Mechanical Components, and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMPs. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.2.2.2.2.

In its review of components associated with AMR items 3.2.1-004, 3.2.1-048, 3.2.1-099, 3.2.1-106, and 3.2.1-107, the NRC 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, the External Surfaces Monitoring of Mechanical Components, and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMPs 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 AMPs identified, the NRC staff determined that the applicant's AMPs meet 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, associated with Table 3.2-1, AMR item 3.2.1-112, addresses loss of material due to pitting and crevice corrosion for SS underground piping, piping components, and tanks. The applicant stated that this item is not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.2 and finds it acceptable because, based on a review of the UFSAR and SLRA, there are no SS underground piping, piping components, or tanks in the ESF systems.

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, associated with SLRA Table 3.2-1, item 3.2-1, 006 addresses loss of material and flow blockage in metallic flow orifice and spray nozzles exposed to uncontrolled air-indoor and condensation. The applicant stated that this item is not applicable. The NRC 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, the metallic flow orifice and spray nozzles are located in the drywell and suppression chamber spray system, which can be found only in a BWR plant and PBN is a PWR plant.

3.2.2.2.4 Cracking Due to Stress Corrosion Cracking in Stainless Steel Alloys

SLRA Section 3.2.2.2.4, associated with SLRA Table 3.2-1, AMR items 3.2.1-007, 3.2.1-103, and 3.2.1-108, addresses cracking due to SCC for SS piping, piping components, and tanks, SS tanks within the scope of GALL-SLR AMP XI.M29, and insulated SS piping, piping components, and tanks exposed to air or condensation, which will be managed by the Outdoor and Large Atmospheric Metallic Storage Tanks, the External Surfaces Monitoring of Mechanical Components, and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMPs. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.2.2.2.4.

In its review of components associated with AMR items 3.2.1-007, 3.2.1-103, and 3.2.1-108, the NRC 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, the External Surfaces Monitoring of Mechanical Components, and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMPs is acceptable because the periodic inspections conducted as part of these programs are capable of detecting whether cracking is occurring.

Based on the AMPs identified, the NRC staff determined that the applicant's programs meet 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 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).

SLRA Section 3.2.2.2.4, associated with Table 3.2-1, AMR item 3.2.1-080, addresses cracking due to SCC for SS underground piping, piping components, and tanks. The applicant stated that this item is not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.4 and finds it acceptable because, based on a review of the UFSAR and SLRA, there are no SS underground piping, piping components, or tanks in the ESF systems.

3.2.2.2.5 Quality Assurance for Aging Management of Nonsafety-Related Components

SE Section 3.0.4 documents the NRC 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 NRC 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, as modified by SLRA Supplement 2, is associated with SLRA Table 3.2-1, item 3.2-1, 066, for loss of material due to recurring internal corrosion in metallic piping components exposed to several water environments. The applicant stated that its review of operating experience documentation from the past 10 years did not find any instances that met the criteria of recurring internal corrosion in the ESF systems. Based on this review, the applicant stated that item 3.2.1, 066 was not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.7 and finds that it is acceptable because the staff also did not identify any examples of recurring internal corrosion in ESF systems during its review of documentation provided for PBN's operating experience information.

3.2.2.2.8 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

SLRA Section 3.2.2.2.8, associated with SLRA Table 3.2-1, AMR items 3.2-1, 100; 3.2-1, 101; 3.2-1, 102; 3.2-1, 109, and 3.2-1, 110, addresses cracking due to SCC for aluminum components. The applicant stated that these items are not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.8 and finds it acceptable because, based on a review of the UFSAR and SLRA, there are no in-scope aluminum components in the ESF systems.

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, associated with SLRA Table 3.2-1, item 3.2-1, 055, addresses loss of material due to general, crevice, or pitting corrosion for steel piping and piping components exposed to concrete. The applicant stated that there are no steel piping or piping components in the ESF systems within the scope of subsequent license renewal that are exposed to concrete. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.9 and finds it acceptable because, based on a review of the UFSAR, there are no steel components exposed to concrete in the ESF systems.

SLRA Section 3.2.2.2.9, associated with SLRA Table 3.2-1, item 3.2-1, 091, addresses loss of material due to crevice or pitting corrosion and cracking due to SCC for SS piping and piping components exposed to concrete. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.2.2.2.9.

SLRA Section 3.2.2.2.9 states "[s]tainless steel piping in the [e]ngineered [s]afety [f]eatures [s]ystems that is exposed to concrete is not susceptible to being exposed to groundwater and therefore has no aging effects that require management." In its review of components associated with item 3.2.1, 091, the NRC staff finds that the applicant has met the further evaluation criteria. The applicant's proposal that there are no aging effects requiring management is acceptable because, consistent with the further evaluation criteria, the components are not potentially exposed to groundwater.

For those AMR items associated with SLRA Section 3.2.2.2.9, the NRC 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).

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

SLRA Section 3.2.2.2.10, associated with SLRA Table 3.2-1, AMR items 3.2-1, 042; 3.2-1, 056; 3.2-1, 105; 3.2-1, 111; 3.2-1, 119, and 3.2-1, 121, addresses loss of material for aluminum components. The applicant stated that these items are not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.10 and finds it acceptable because, based on a review of the UFSAR and SLRA, there are no in-scope aluminum components in the ESF systems.

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 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," is a summary comparison of PBN's AMR with those evaluated in the GALL-SLR Report for the auxiliary systems components.

3.3.2 Staff Evaluation

Table 3.3-1, below, summarizes the NRC 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, 020 (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 applicable to Point Beach
3.3-1, 008	Not Used. Addressed by 3.3-1, 020
3.3-1, 009	Consistent with the GALL-SLR Report
3.3-1, 010	Not applicable to Point Beach
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, 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
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 Point Beach
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 Point Beach
3.3-1, 030a	Not applicable to Point Beach
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

Component Group (SRP-SLR Item No.)	Staff Evaluation
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 Point Beach
3.3-1, 044	Not applicable to Point Beach
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 Point Beach
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 Point Beach
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 Used. Addressed by 3.3-1, 249
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	Consistent with the GALL-SLR Report
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)
3.3-1, 065	Not applicable to Point Beach
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 Point Beach
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

Component Group (SRP-SLR Item No.)	Staff Evaluation
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 Point Beach
3.3-1, 090	Not applicable to Point Beach
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	Consistent with the GALL-SLR Report
3.3-1, 094	Not applicable to Point Beach (see SE Section 3.3.2.2.4)
3.3-1, 094a	Not applicable to Point Beach (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 Point Beach
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 Point Beach
3.3-1, 102	Not applicable to Point Beach
3.3-1, 103	Not applicable to Point Beach
3.3-1, 104	Not applicable to Point Beach
3.3-1, 105	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 106	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 107	Not applicable to Point Beach
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	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.3)
3.3-1, 112	Not Used (see SE Section 3.3.2.2.9)
3.3-1, 113	Not applicable to Point Beach
3.3-1, 114	Consistent with the GALL-SLR Report
3.3-1, 115	Not applicable to Point Beach
3.3-1, 116	Not applicable to Point Beach
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 (see SE Section 3.3.2.1.4)
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 Point Beach
3.3-1, 123	Not applicable to Point Beach

Component Group (SRP-SLR Item No.)	Staff Evaluation
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 (see SE Section 3.3.2.1.5)
3.3-1, 127	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.6 and 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 Point Beach
3.3-1, 134	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.9)
3.3-1, 135	Not applicable to Point Beach
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	Not applicable to Point Beach (see SE Section 3.3.2.2.3)
3.3-1, 147	Not applicable to Point Beach
3.3-1, 148	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 149	Not applicable to Point Beach
3.3-1, 150	Not applicable to Point Beach
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 Point Beach
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. Addressed by 3.3-1, 078
3.3-1, 158	Not applicable to Point Beach
3.3-1, 159	Not applicable to Point Beach
3.3-1, 160	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.7)
3.3-1, 161	Not applicable to Point Beach
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 Point Beach
3.3-1, 167	Not applicable to Point Beach

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3-1, 168	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 169	Consistent with the GALL-SLR Report
3.3-1, 170	Not applicable to Point Beach
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 Point Beach
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	Not applicable to Point Beach
3.3-1, 176	Not applicable to Point Beach
3.3-1, 177	Not applicable to Point Beach
3.3-1, 178	Not applicable to Point Beach
3.3-1, 179	Consistent with the GALL-SLR Report
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 Point Beach
3.3-1, 182	Not applicable to Point Beach
3.3-1, 183	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1, 184	Not applicable to Point Beach
3.3-1, 185	Not applicable to Point Beach
3.3-1, 186	Not applicable to Point Beach (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 Point Beach (see SE Section 3.3.2.2.8)
3.3-1, 193	Consistent with the GALL-SLR Report
3.3-1, 194	Not applicable to Point Beach
3.3-1, 195	Not applicable to Point Beach
3.3-1, 196	Not applicable to Point Beach
3.3-1, 197	Consistent with the GALL-SLR Report
3.3-1, 198	Consistent with the GALL-SLR Report
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	Not applicable to Point Beach (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 Point Beach
3.3-1, 208	Not applicable to Point Beach
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 Point Beach
3.3-1, 211	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, 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 Point Beach
3.3-1, 215	Not applicable to Point Beach
3.3-1, 216	Not applicable to Point Beach
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 Point Beach
3.3-1, 219	Not applicable to Point Beach
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	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.4)
3.3-1, 223	Not applicable to Point Beach (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 Point Beach
3.3-1, 227	Not applicable to Point Beach (see SE Section 3.3.2.2.10)
3.3-1, 228	Not Used (see SE Section 3.3.2.2.4)
3.3-1, 229	Not applicable to Point Beach
3.3-1, 230	Not applicable to Point Beach
3.3-1, 231	Not Used (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 Used (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 Point Beach
3.3-1, 237	Not applicable to Point Beach
3.3-1, 238	Not applicable to Point Beach
3.3-1, 239	Not applicable to Point Beach
3.3-1, 240	Not applicable to Point Beach (see SE Section 3.3.2.2.10)
3.3-1, 241	Consistent with the GALL-SLR Report (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	Not applicable to PWRs
3.3-1, 245	Not applicable to Point Beach (see SE Section 3.3.2.2.10)
3.3-1, 246	Not Used (see SE Section 3.3.2.2.4)
3.3-1, 247	Not applicable to Point Beach (see SE Section 3.3.2.2.10)
3.3-1, 248	Not applicable to Point Beach
3.3-1, 249	Consistent with the GALL-SLR Report
3.3-1, 250	Not applicable to Point Beach
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 Point Beach
3.3-1, 253	Consistent with the GALL-SLR Report
3.3-1, 254	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.8)
3.3-1, 255	Consistent with the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
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 Used. Addressed by 3.3-1, 091 and 3.3-1, 095
3.3-1, 259	Not applicable to Point Beach
3.3-1, 260	Consistent with the GALL-SLR Report
3.3-1, 261	Not applicable to Point Beach
3.3-1, 262	Not applicable to Point Beach
3.3-1, 263	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.8)
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 Point Beach
3.3-1, 266	Not applicable to Point Beach
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 NRC 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 3.3.2.1 discusses AMR results for components that the applicant states are either not applicable to PBN 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, while documenting any RAIs issued and the staff's conclusions. The remaining subsections in SE Section 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.

(3) 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 NRC staff's review of AMR results listed in SLRA Tables 3.3.2-1 through 3.3.2-15 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 its 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 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 nor provided. For AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in Section 3.3.2.1.2 through 3.3.2.1.9 below.

The applicant changed the designation for item 3.3-1, 267 from “Not applicable” in the original submittal to “Consistent with NUREG-2191” as part of Supplement 1, dated April 21, 2021. The NRC staff finds this change acceptable.

SE Section 3.3.2.1.1 documents the NRC staff’s review of AMR items 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, 007; 3.3-1, 010; 3.3-1, 025; 3.3-1, 030; 3.3-1, 030a; 3.3-1, 043; 3.3-1, 044; 3.3-1, 048; 3.3-1, 051; 3.3-1, 065; 3.3-1, 073; 3.3-1, 089; 3.3-1, 090; 3.3-1, 094; 3.3-1, 094a; 3.3-1, 096b; 3.3-1, 101; through 3.3-1, 104; 3.3-1, 107; 3.3-1, 112; 3.3-1, 113; 3.3-1, 115; 3.3-1, 116; 3.3-1, 122; 3.3-1, 123; 3.3-1, 133; 3.3-1, 135; 3.3-1, 139; 3.3-1, 140; 3.3-1, 146; 3.3-1, 147; 3.3-1, 149; 3.3-1, 150; 3.3-1, 155; 3.3-1, 158; 3.3-1, 159; 3.3-1, 161; 3.3-1, 166; 3.3-1, 167; 3.3-1, 170; 3.3-1, 172; 3.3-1, 175 through 3.3-1, 178; 3.3-1, 181; 3.3-1, 182; 3.3-1, 184; through 3.3-1, 186; 3.3-1, 192; 3.3-1, 194 through 3.3-1, 196; 3.3-1, 202; 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, 223; 3.3-1, 226; through 3.3-1, 231; 3.3-1, 233; 3.3-1, 236 through 3.3-1, 240; 3.3-1, 245 through 3.3-1, 248; 3.3-1, 250; 3.3-1, 252; 3.3-1, 259; 3.3-1, 261; 3.3-1, 262; and 3.3-1, 265 through 3.3-1, 266, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not used or not applicable to PBN. The NRC staff reviewed the SLRA and UFSAR 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; 3.3-1, 203; and 3.3-1, 244, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable because the associated items only apply to BWRs. The NRC staff reviewed the SRP-SLR, confirmed that these items only apply to BWRs, and finds that these items are not applicable to PBN because it is a PWR.

For the following SLRA Table 3.1-1 items, the applicant claims that the corresponding items in the GALL-SLR Report are not used because they are addressed by other SLRA Table 1 items: 3.3-1, 003a (addressed by 3.3-1, 020; see SE Section 3.3.2.2.2), 3.3-1, 008 (addressed by 3.3-1, 020), 3.3-1, 018 (addressed by 3.3-1, 124), 3.3-1, 055 (addressed by 3.3-1, 249), 3.3-1, 157 (addressed by 3.3-1, 078), and 3.3-1, 258 (addressed by 3.3-1, 091 and 3.3-1, 095). The NRC staff reviewed the SLRA and confirmed that the aging effects will be addressed by other SLRA Table 1 items. Therefore, the staff finds the applicant’s proposal to use alternate items acceptable.

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

SLRA Table 3.3-1, item 3.3-1, 064, addresses loss of material due to general, pitting, crevice corrosion, and MIC; as well as flow blockage due to fouling for steel and copper-alloy piping and piping components exposed to raw water, treated water, and raw water (potable). As amended by letter dated April 21, 2021, for the associated SLRA Table 2 AMR item that cites generic note E, the SLRA credits the External Surfaces Monitoring of Mechanical Components AMP to manage loss of material for ductile iron piping exposed to an external raw water environment. The AMR item cites plant-specific note 3, which states that the cited AMP is used to manage loss of material for the piping that may be subject to periodic submergence.

Based on its review of components associated with item 3.3-1, 064, for which the applicant cited generic note E, the NRC staff finds the applicant's proposal to manage loss of material for ductile iron piping exposed to an external raw water environment using the External Surfaces Monitoring of Mechanical Components AMP acceptable because the visual inspections required by the program can be capable of detecting loss of material.

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

SLRA Table 3.3-1, AMR item 3.3-1, 111, addresses loss of material for structural steel in the new fuel storage system exposed to an air-indoor uncontrolled environment. In its supplemental letter dated April 21, 2021, the applicant stated that this item is not applicable. The NRC staff evaluated the applicant's claim and determined the need for additional information, which resulted in the issuance of an RAI. RAI 3.3.1, 111-1 and the applicant's response are documented in ADAMS Accession No. ML21223A308.

In its response, the applicant stated that, although AMR item 3.3-1, 111 is not applicable to the new fuel storage rack at PBN since the racks are made of SS material, it is applicable to other components in SLRA Table 3.5.2-1. Therefore, the applicant revised SLRA Table 3.3.-1 to resolve the inconsistency in AMR item 3.3-1, 111.

During its evaluation of the applicant's response to RAI 3.3.1, 111-1, the NRC staff noted that the applicant proposed to manage loss of material for the steel liner in the reactor cavity and other miscellaneous steel structural components within the containment building structure using the Structures Monitoring AMP. The applicant associated the review of these components with AMR item 3.3-1, 111 and dispositioned the AMR item in SLRA Table 3.3-1 as applicable. The staff finds the applicant's response and changes to SLRA Table 3.3-1 acceptable because it addresses the inconsistency identified in the application and explains that, although the components are different from the one specified in the GALL-SLR Report, they are consistent with respect to the material, environment, and aging effect.

Based on its review of components associated with AMR item 3.3.-1, 111, for which the applicant cited generic notes A-D, the NRC staff finds the applicant's proposal to manage the effects of aging using the Structures Monitoring AMP acceptable because it is consistent with the GALL-SLR Report recommendation to adequately manage the aging effect for components with similar material, environment, and aging effect.

3.3.2.1.4 No Aging Effects/Mechanism

SLRA Table 3.3-1, AMR item 3.3-1, 119, addresses no aging effects/mechanisms for nickel-alloy, PVC, and glass piping and piping components exposed to air with borated water leakage, air-indoor uncontrolled, condensation, waste water, and raw water (potable). During its review of components associated with AMR item number 3.3-1, 119, the NRC staff noted that plastic piping exposed to air–indoor uncontrolled in SLRA Table 3.3.2-8, "Emergency Power System—Summary of Aging Management Evaluation," cites no AERM; however, GALL-SLR Report item VII.H2.A-797b cites aging effects for polymeric piping exposed to air. Therefore, the staff determined the need for additional information on the specific type of plastic material cited in SLRA Table 3.3.2-8 in order to justify citing no AERM. The applicant provided a supplement dated April 21, 2021, which replaced the plastic piping AMR items (associated with AMR item number 3.3-1, 119) with SS piping. Based on the applicant's supplement, the staff's concern associated with AMR item 3.3-1, 119 is moot.

3.3.2.1.5 Loss of Material Due to Erosion

SLRA Table 3.3-1, item 3.3-1, 126 addresses wall thinning due to erosion for metallic piping and piping components exposed to treated water, treated borated water, and raw water. As amended by letters dated April 21, 2021, November 30, 2021, and January 6, 2022, for the AMR items that cite generic note E, the SLRA credits the:

1. Open-Cycle Cooling Water System AMP to manage wall thinning due to erosion for various metallic components exposed to raw water (i.e., heat exchanger components, expansion joints, flow elements, orifices, piping, pump casings, strainers, thermowells, and valve bodies);

2. Fire Water System AMP to manage wall thinning due to erosion for various metallic components exposed to raw water (i.e., fire hydrants, nozzles, orifices, piping, pump casings, strainers, and valve bodies); and

3. Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP to manage wall thinning due to erosion for various metallic components exposed to raw water and waste water (i.e., compressor casings, drain traps, flow indicators, heat exchanger components, instruments, level gauges, orifices, piping, piping components, pump casings, strainers, tanks, and valve bodies).

Based on its review of components associated with item 3.3-1, 126, for which the applicant cited generic note E, the NRC staff finds the applicant's proposal to manage wall thinning due to erosion using the above cited programs acceptable because:

1. PBN's Open-Cycle Cooling Water System AMP implements the recommendations of GL 89-13, which provides for routine inspections and maintenance to ensure that aging mechanisms including erosion cannot degrade the performance of the systems serviced by the service water system;

2. PBN's Fire Water System AMP includes internal visual inspections capable of detecting surface irregularities indicative of erosion and includes volumetric inspections capable of monitoring wall thicknesses where surface irregularities are detected; and

3. PBN's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP includes activities from the initial license renewal's Periodic Surveillance and Preventive Maintenance AMP, which manage erosion mechanisms in multiple systems. The staff also notes that the program includes internal visual inspections capable of detecting surface irregularities and includes follow-up volumetric examinations, and that this program is typically credited for the portions of service water systems that are not within the scope of GL 89-13.

3.3.2.1.6 Loss of Material Due to Recurring Internal Corrosion

SLRA Table 3.3-1, item 3.3-1, 127, as modified by SLRA Supplement 2, addresses loss of material due to recurring internal corrosion for metallic piping components exposed to raw water and waste water. For associated AMR items that cite generic note E, the SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP. Although this designation in the SLRA indicates that the program being credited is different than the program recommended by the GALL-SLR Report, the NRC staff notes that SLR-ISG-2021-02-Mechanical, Appendix H, explains that multiple programs, including the cited program, are acceptable for managing the associated aging effects for item 3.3-1, 127. Consequently, the staff finds the applicant's proposal to manage the above aging effect/mechanism using the above program acceptable.

3.3.2.1.7 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 copper alloy greater than 15-percent zinc piping and piping components exposed to raw water. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Fire Water System AMP to manage cracking for copper alloy greater than 15-percent zinc valve bodies 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 AMP to manage this material-environment-aging effect combination.

Based on its review of components associated with item 3.3-1, 160, for which the applicant cited generic note E, the NRC staff finds the applicant's proposal to manage the associated material-environment-aging effect combination using the Fire Water System AMP acceptable. As discussed in Section 3.0.3.2.19 of this SE, following implementation of Enhancement 3, the Fire Water System AMP will include similar inspection methods and acceptance criteria as the GALL-SLR Report's recommended program and, as a result, will be capable of identifying cracking due to SCC in copper alloy greater than 15-percent zinc valve bodies before a loss of intended function.

3.3.2.1.8 Blistering or Cracking Due to Exposure to Ultraviolet Light, Ozone, Radiation and/or Chemical Attack; Hardening or Loss of Strength Due to Polymeric Degradation; Loss of Material Due to Peeling, Delamination, and/or Wear; and Flow Blockage Due to Fouling

SLRA Table 3.3-1, AMR item 3.3-1, 263, as revised by the supplement dated April 21, 2021, addresses blistering or cracking due to exposure to ultraviolet light, ozone, radiation and/or chemical attack; hardening or loss of strength due to polymeric degradation; loss of material due to peeling, delamination, and/or wear; and flow blockage due to fouling for polymeric piping, piping components, ducting, ducting components, and/or seals exposed to air, condensation, raw water, raw water (potable), treated water, waste water, underground, concrete, and/or soil. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Structures Monitoring AMP to manage the aging effects for inserts made of polystyrene (polymers) in manhole covers. Also, the AMR item cites plant-specific note 7, which states that polystyrene (polymer) inserts in yard manhole covers, which have ports allowing for inspection that may be susceptible to degradation through exposure to heat or sunlight, are limited and are inspected by the Structures Monitoring AMP.

For SLRA AMR item 3.3-1, 263, the NRC staff determined the need for additional information, which resulted in the issuance of an RAI. RAI 3.3.1, 263-1 and the applicant's response are documented in ADAMS Accession No. ML21223A308.

In its response, the applicant stated that the polymer material used in the manhole cover inserts is an inelastic polystyrene foam material that shares a similar chemical composition as other polymers, including plastics and elastomers. The applicant also stated that the manholes in the yard are inspected every 5 years by the Structures Monitoring AMP and are exposed to an outdoor environment where the manhole covers and inserts are exposed to cold temperatures during the winter, ultraviolet light and ozone, and precipitation. Therefore, the applicant revised SLRA Table 16-3 (items 38(d) and 38(k)) and Section B.2.3.34 to explain that the AMP enhancements associated with elastomers also address the inspection and acceptance criteria for the manhole cover inserts.

During its evaluation of the applicant's response to RAI 3.3.1, 263-1, the NRC staff noted that the applicant expanded the existing enhancement to show that the manhole cover inserts are monitored to ensure that there is no loss of material, no blistering, and no indications of loss of strength, such as unacceptable surface cracking, crazing, scuffing, dimensional change (e.g., "ballooning" and "necking"), shrinkage, discoloration, or hardening, using the Structures Monitoring AMP. The staff finds the applicant's response and changes to SLRA Section B.2.3.34 and SLRA Table 16-3 (items 38(d) and 38(k)) acceptable because the proposed parameters to be monitored or inspected and the proposed acceptance criteria are consistent with those recommended by the GALL-SLR Report for components made of similar material and exposed to similar environments.

Based on its review of components associated with AMR item 3.3-1, 263, for which the applicant cited generic note E, the NRC staff finds the applicant's proposal to manage the effects of aging using the Structures Monitoring AMP acceptable because the use of visual inspections to detect the proposed parameters using the proposed acceptance criteria will ensure that degradation from manhole cover inserts can be detected and corrective actions can be taken before a loss of function.

3.3.2.1.9 Loss of material due to general (steel, copper alloy only), pitting, crevice corrosion, and MIC; flow blockage due to fouling

SLRA Table 3.3.2-12, item 3.3-1, 134 addresses loss of material for carbon steel valve bodies exposed externally to raw water. As amended by the first annual update, dated November 30, 2021, for the AMR item that cites generic note E, the SLRA credits the External Surfaces Monitoring of Mechanical Components AMP to manage the aging effect for valve body. The AMR item cites plant specific note 2, which states, "The External Surface Monitoring of Mechanical Components (B.2.3.23) AMP used to manage loss of material of the submerged forebay inlet motor operated valves."

For SLRA AMR item 3.3-1, 134, the NRC staff determined the need for additional information, which resulted in the issuance of an RAI. RAI B.2.3.23-1 and the applicant's response are documented in ADAMS Accession No. ML22006A074. In its response, the applicant revised SLRA Table 3.3-1, item 3.3-1, 134 to credit the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP. During its evaluation of the applicant's response to RAI B.2.3.23-1, the staff noted that the applicant has referenced GALL-SLR Item VII.C1.A-727, which states that loss of material due to general (steel, copper alloy only), pitting, crevice corrosion, and MIC and flow blockage due to fouling is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP for steel, stainless steel, and copper alloy exposed to raw water. The staff finds the applicant's response and changes to SLRA Table 3.3.2-12, item 3.3-1, 134 acceptable because they are consistent with the recommendations of the GALL-SLR Report.

3.3.2.2 Aging Management Review Results for which Further Evaluation Is Recommended by the GALL-SLR Report

In SLRA Section 3.3.2.2, the applicant further evaluates aging management for the auxiliary systems 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 3.3.2.2. The following subsections document the staff's review.

3.3.2.2.1 Cumulative Fatigue Damage

SLRA Section 3.3.2.2.1, associated with SLRA Table 3.3.-1 AMR item 3.3-1, 001 and 3.3-1, 002, 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 4.3.3. SLRA Section 3.3.2.2.1 also states that the cranes (overhead heavy load handling systems) are evaluated as a TLAA in SLRA Section 4.7.6.

The applicant's evaluation of the TLAAs is consistent with SRP-SLR Section 3.3.2.2.1 and is, therefore, acceptable. The NRC staff's evaluation of the TLAA for the components of auxiliary systems and steam and power conversion systems is documented in SE Section 4.3.3. In addition, the staff's evaluation of the TLAA for the cranes is documented in SE Section 4.7.6.

3.3.2.2.2 Cracking Due to Stress Corrosion Cracking and Cyclic Loading

SLRA Section 3.3.2.2.2, associated with SLRA Table 3.3.-1, items 3.3-1, 003 and 3.3-1, 003a, addresses SS heat exchanger tubing exposed to treated borated water greater than 60 ^{o}C (140 ^{o}F) in the chemical and volume control system (CVCS), which will be managed for SCC by the Water Chemistry AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.2.

The NRC staff noted that the search of the applicant's corrective actions database did not find any evidence of SCC in the SS nonregenerative heat exchanger in the CVCS. In its review of components associated with item 3.3-1, 003, the staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Water Chemistry AMP is acceptable because no evidence was found to indicate SCC of the SS heat exchanger tubing in the CVCS. This satisfies the requirements of the further evaluation item 3.3.2.2.2 in the SRP-SLR.

The NRC staff also noted that SLRA Section 3.3.2.2.2, associated with SLRA Table 3.3.-1, AMR item 3.3.-1, 003a, addresses cracking due to SCC and cyclic loading for SS heat exchanger tubing exposed to treated borated water greater than 60 ^{o}C (140 ^{o}F) in the CVCS. The applicant stated in the SLRA that this item is being addressed in 3.3-1, 020, which uses the Water Chemistry AMP and the One-Time Inspection AMP to manage cracking due to SCC in SS heat exchanger components in treated borated water greater than 60 ^{o}C (140 ^{o}F). In its review of components associated with item 3.3.-1, 003a, the staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Water Chemistry AMP and the One-Time Inspection AMP is acceptable because no evidence was found to indicate SCC of the SS heat exchanger tubing in the CVCS. In addition, the One-Time Inspection AMP is capable of detecting whether cracking is occurring. This satisfies the requirements of the further evaluation item 3.3.2.2.2 in the SRP-SLR.

Based on the programs identified, the NRC staff concludes that the applicant's program meets SRP-SLR Section 3.3.2.2.2. 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, associated with SLRA Table 3.3.-1, AMR items 3.3-1, 004 and 3.3-1, 205, addresses cracking due to SCC for SS piping, piping components, and tanks exposed to air or condensation, which will be managed by the External Surfaces Monitoring of Mechanical Components AMP and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.3.

In its review of components associated with AMR items 3.3-1, 004 and 3.3-1, 205, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging for AMR item 3.3-1, 004 and 3.3-1, 205, using the External Surfaces Monitoring of Mechanical Components AMP and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP is acceptable because the periodic inspections conducted as part of these programs are capable of detecting whether cracking is occurring.

SLRA Section 3.3.2.2.3, associated with Table 3.3-1, AMR item 3.3-1, 231, addresses cracking due to SCC for SS tanks, exposed to air or condensation, within the scope of GALL-SLR Report AMP XI.M29. The applicant stated that this item is not used because SS tanks exposed to air are managed using different AMR items. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.3 and finds it acceptable. This is based on the applicant proposing to manage SS tanks exposed to air or condensation in the auxiliary systems using AMR item 3.3-1, 004 with the Surfaces Monitoring of Mechanical Components AMP, which includes periodic inspections capable of detecting whether cracking is occurring. In addition, based on a review of the UFSAR and SLRA, there are no SS tanks in the auxiliary systems within the scope of GALL-SLR Report AMP XI.M29.

Based on the programs identified, the NRC staff concludes that the applicant's programs meet 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, associated with Table 3.3-1, AMR items 3.3-1, 094a and 3.3-1, 146, addresses cracking due to SCC for, respectively, SS ducting and ducting components exposed to air or condensation, and SS underground piping, piping components, and tanks. The applicant stated that these items are not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.3 and finds it acceptable because, based on a review of the UFSAR and SLRA, there are no in-scope SS ducting and ducting components exposed to air or condensation, and no SS underground piping, piping components, or tanks in the auxiliary systems.

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, associated with SLRA Table 3.3-1, AMR items 3.3-1, 006, 3.3-1, 222, 3.3-1, 232, and 3.3-1, 241, addresses loss of material due to pitting and crevice corrosion for SS and nickel-alloy piping, piping components, tanks, and heat exchanger components exposed to air or condensation, which will be managed by the External Surfaces Monitoring of Mechanical Components AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.4.

In its review of components associated with AMR items 3.3-1, 006, 3.3-1, 222, 3.3-1, 232, and 3.3-1, 241, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components AMP 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 program identified, the NRC staff concludes that the applicant's programs meet 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, associated with Table 3.3-1, AMR item 3.3-1, 094, addresses loss of material due to pitting and crevice corrosion for SS ducting and ducting components exposed to air or condensation. The applicant stated that this item is not applicable. SLRA Section 3.3.2.2.4, associated with Table 3.3-1, AMR item 3.3-1, 246, addresses loss of material due to pitting and crevice corrosion for underground SS or nickel-alloy piping, piping components, and tanks. The applicant stated that this item is not used because there are no underground SS or nickel-alloy piping, piping components, or tanks in the auxiliary systems. The NRC staff evaluated the applicant's claims against the criteria in SRP-SLR Section 3.3.2.2.4 and finds them acceptable because, based on a review of the UFSAR and SLRA, there are no in-scope SS ducting and ducting components exposed to air or condensation, and no underground SS or nickel-alloy piping, piping components, or tanks, in the auxiliary systems.

SLRA Section 3.3.2.2.4, associated with Table 3.3-1, AMR item 3.3-1, 228, addresses loss of material due to pitting or crevice corrosion for SS and nickel-alloy tanks within the scope of GALL-SLR Report AMP XI.M29 exposed to air or condensation. The applicant stated that this item is not used because SS tanks exposed to air or condensation are managed using different AMR items. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.3 and finds it acceptable. This is based on the applicant proposing to manage SS tanks exposed to air or condensation in the auxiliary systems using AMR items 3.3-1, 006 and 3.3-1, 222 with the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP and the External Surfaces Monitoring of Mechanical Components AMP, which include periodic inspections capable of detecting whether cracking is occurring. In addition, based on a review of the UFSAR and SLRA, there are no SS tanks in the auxiliary systems within the scope of GALL-SLR Report AMP XI.M29.

3.3.2.2.5 Quality Assurance for Aging Management of Nonsafety-Related Components

SE Section 3.0.4 documents the NRC 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 NRC 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, as modified by SLRA Supplement 2, is associated with SLRA Table 3.3-1, item 3.3-1, 127, for loss of material due to recurring internal corrosion in metallic piping components exposed to several water environments. Following NRC staff audit questions, the applicant stated that, based on an additional review of operating experience, recurring internal corrosion is an applicable aging mechanism for carbon steel components exposed to raw water systems from Lake Michigan. The applicant did not find similar issues in the waste water or the treated water environments. Although the operating experience was limited to piping in the service water system, the applicant conservatively assumed that all carbon steel components exposed to Lake Michigan raw water in the CCW, service water, fire protection, emergency power, and circulating water systems are potentially susceptible to recurring internal corrosion.

Supplement 2 modified SLRA Sections B.2.1.11 (Open-Cycle Cooling Water System AMP), B.2.1.16 (Fire Water System AMP), and B.2.1.25 (Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP) and SLRA Appendix A, Sections 16.2.2.11, 16.2.2.16, and 16.2.2.25 (corresponding UFSAR descriptions) to address loss of material due to recurring internal corrosion. The supplement also included an enhancement to the corrective actions program element of the Fire Water System AMP to be consistent with an existing, comparable enhancement to the Open-Cycle Cooling Water Systems AMP related to recurring internal corrosion. The applicant addressed the further evaluation attributes a) through e), which are prescribed in SRP-SLR Section 3.3.2.2.7, for each of the three associated AMPs. In addition to loss of material, the applicant included flow blockage as an aging effect to be considered as part of the discussions addressing recurring internal corrosion for the three associated programs. The applicant stated that existing program activities manage recurring internal corrosion and discussed the examination methods to be used and the examination location selection process.

The NRC staff reviewed the applicant's approach against the criteria in SRP-SLR Section 3.3.2.2.7 for the components associated with item 3.3-1, 127. The staff noted that the existing PBN procedures SWP, "Service Water In-Service Inspection Program," and NP 7.7.22, "Service Water and Fire Protection Inspection Program," include implementation details for addressing this issue. The staff also noted that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP is a new program and that SLRA Supplement 2 modified the program to specifically address managing loss of material due to recurring internal corrosion. The staff finds that the applicant has met the further evaluation criteria, and that its approach to managing the associated aging effect/mechanism using the cited programs is acceptable because the implementation procedures used by the three programs provide instructions for using augmented inspections to confirm the extent of any identified degradation.

3.3.2.2.8 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

SLRA Section 3.3.2.2.8, associated with SLRA Table 3.3-1, AMR items 3.3-1, 189, 3.3-1, 233, and 3.3-1, 254, addresses cracking due to SCC for insulated and uninsulated aluminum piping, piping components, and tanks exposed to air, condensation, raw water, raw water (potable), or waste water, 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 AMP and the External Surfaces Monitoring of Mechanical Components AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.8.

For SLRA Section 3.3.2.2.8, Item 3.3-1, 233, the NRC staff determined the need for additional information because the SLRA originally omitted this item in Table 3.3-1 and then identified it as not applicable in response to RAI 3.3.2.2.8-1, as documented in ADAMS Accession No. ML21242A230. Subsequently, the SLRA First Annual Update added Item 3.3-1, 233 to SLRA Table 3.3.2-15 for insulated aluminum valve bodies without revising Table 3.3-1 or SLRA Section 3.3.2.2.8. This resulted in the issuance of an RAI. RAI 3.2.2.2.8-2 and the applicant's response are documented in ADAMS Accession Nos. ML21362A679 and ML22006A046, respectively. In its response, the applicant revised the SLRA Table 3.3-1 discussion to state that Item 3.3-1, 233 is consistent with the GALL-SLR Report and uses the External Surfaces Monitoring of Mechanical Components AMP for managing cracking of insulated aluminum piping components exposed to air. The applicant also revised SLRA Section 3.2.2.2.8 to state that insulated indoor piping components could be exposed to contaminants through or beneath insulation and, therefore, are susceptible to cracking due to SCC. The staff finds the applicant's response and changes to SLRA Section 3.2.2.2.8 and Table 3.3-1 acceptable because Table 3.3-1 was made consistent with Table 3.3.2-15 for Item 3.3-1, 233, and the proposed use of the External Surfaces Monitoring of Mechanical Components AMP for managing cracking due to SCC for the insulated aluminum valve bodies exposed externally to air or condensation is consistent with the GALL-SLR Report for Item 3.3-1, 233.

In its review of components associated with AMR items 3.3-1, 189; 3.3-1, 233 and 3.3-1, 254, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP and the External Surfaces Monitoring of Mechanical Components AMP 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 NRC staff concludes that the applicant's programs meet 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 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).

SLRA Section 3.3.2.2.8, associated with SLRA Table 3.3-1, AMR item 3.3-1, 233, addresses cracking due to SCC for insulated aluminum piping, piping components, and tanks exposed to air or condensation. The NRC staff noted that item 3.3-1, 233 was omitted from SLRA Table 3.3-1, which resulted in the issuance of an RAI. RAI 3.3.2.2.8-1 and the applicant's response are documented in ADAMS Accession Nos. ML21238A224 and ML21242A230. In its response, the applicant provided a revision to Table 3.3-1 consisting of a row for the evaluation of item 3.3-1, 233, stating that the item is not applicable. The staff finds the applicant's response and changes to Table 3.3.-1 acceptable because, based on a review of the UFSAR and SLRA, no insulated aluminum piping, piping components, or tanks are exposed to air or condensation in the auxiliary systems.

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

As amended by letter dated April 21, 2021, SLRA Section 3.3.2.2.9, associated with SLRA Table 3.3-1, item 3.3-1, 112, addresses loss of material due to general, crevice, or pitting corrosion for steel piping and piping components exposed to concrete. Specifically, SLRA Section 3.3.2.2.9 states the following:

- the auxiliary systems include steel piping and tanks exposed to concrete and does not include stainless steel components exposed to concrete. The concrete at PBN is designed and constructed in accordance with ACI 318-63 using ingredients/materials conforming to ACI and ASTM standards.
- a review of operating experience for PBN indicates that there are occurrences of concrete degradation that could lead to the penetration of water to the metal surface; therefore, a loss of material due to general, pitting, and crevice corrosion of steel piping and tanks exposed to concrete is an aging effect that requires management.
- consistent with the recommendation of the GALL-SLR Report, the Buried and Underground Piping and Tanks AMP and the Outdoor and Large Atmospheric Metallic Storage Tanks AMP are used to manage loss of material in steel piping and tanks exposed to concrete.

The NRC staff reviewed the applicant’s proposal against the criteria in SRP-SLR Section 3.3.2.2.9. For steel piping and piping components with an external environment of concrete, the staff determined that the applicant 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 AMP is acceptable because periodic visual inspections can be capable of detecting loss of material in steel piping. For steel tanks with an external environment of concrete, the staff determined that the applicant 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 AMP is acceptable because tank bottom thickness measurements performed at a 10-year frequency can be capable of detecting loss of material on the external surfaces of steel tanks.

As amended by letter dated April 21, 2021, SLRA Section 3.3.2.2.9, associated with SLRA Table 3.3-1, item 3.3-1, 202, addresses loss of material due to crevice or pitting corrosion and cracking due to SCC for SS piping and piping components exposed to concrete. The applicant stated that there are no SS piping or piping components in the auxiliary systems within the scope of subsequent license renewal that are exposed to concrete. The NRC staff evaluated the applicant’s claim against the criteria in SRP-SLR Section 3.3.2.2.9 and finds it acceptable because, based on a review of the UFSAR, there are no SS components exposed to concrete in the auxiliary systems.

Based on the programs identified, the NRC staff concludes that the applicant’s programs meet 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 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).

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

SLRA Section 3.3.2.2.10, associated with SLRA Table 3.3-1, AMR items 3.3-1, 234 and 3.3-1, 242 and 3.3-1, 245 addresses loss of material due to pitting and crevice corrosion for insulated and uninsulated 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 AMP and the External Surfaces Monitoring of Mechanical Components AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.10.

For SLRA Section 3.3.2.2.10, Item 3.3-1, 245, the NRC staff determined the need for additional information because the SLRA originally identified this item in Table 3.3-1 as not applicable, but the SLRA First Annual Update added it to SLRA Table 3.3.2-15 for insulated aluminum valve bodies without revising Table 3.3-1 or SLRA Section 3.3.2.2.10. This resulted in the issuance of an RAI. RAI 3.2.2.2.8-2 and the applicant's response are documented in ADAMS Accession Nos. ML21362A679 and ML22006A046, respectively. In its response, the applicant revised the SLRA Table 3.3-1 discussion to state that Item 3.3-1, 245 is consistent with the GALL-SLR Report and uses the External Surfaces Monitoring of Mechanical Components AMP for managing loss of material of insulated aluminum piping components exposed to air. The applicant also revised SLRA Section 3.2.2.2.10 to state that insulated indoor piping components could be exposed to contaminants through or beneath insulation and, therefore, are susceptible to loss of material due to pitting and crevice corrosion. The NRC staff finds the applicant's response and changes to SLRA Section 3.2.2.2.10 and Table 3.3-1 acceptable because Table 3.3-1 was made consistent with Table 3.3.2-15 for Item 3.3-1, 245, and the proposed use of the External Surfaces Monitoring of Mechanical Components AMP for managing loss of material due to pitting and crevice corrosion for the insulated aluminum valve bodies exposed externally to air or condensation is consistent with the GALL-SLR Report for Item 3.3-1, 245.

In its review of components associated with AMR items 3.3-1, 234; 3.3-1, 242, and 3.3-1, 245, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Internal Surfaces in Miscellaneous Piping and Ducting Components AMP and the External Surfaces Monitoring of Mechanical Components AMP 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 NRC staff concludes that the applicant's programs meet 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, associated with SLRA Table 3.3-1, AMR items 3.3-1, 223; 3.3-1, 227; 3.3-1, 240; and 3.3-1, 247, addresses 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, and aluminum piping, piping components, tanks, and heat exchanger components exposed to waste water. The applicant stated that items 3.3.1-223, 3.3.1-240, and 3.3.1-247 are not applicable because there are no such component and environment combinations in the auxiliary systems. The applicant stated that item 3.3.1-227 is not applicable because there is no such component and environment combination in the auxiliary systems. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.10 and finds it acceptable because, based on a review of the UFSAR and SLRA, 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 SLRA did not identify any AMR results in SLRA Tables 3.3.2-1 through 3.3.2-15 that are not consistent with, or not addressed in, the GALL-SLR Report.

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 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," is a summary comparison of the applicant's AMRs with those evaluated in the GALL-SLR Report for the steam and power conversion systems components.

3.4.2 Staff Evaluation

Table 3.4-1, below, summarizes the NRC 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 Point Beach
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

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4-1, 018	Consistent with the GALL-SLR Report
3.4-1, 019	Not applicable to Point Beach
3.4-1, 020	Not Used. Addressed by 3.4-1, 089
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 Point Beach
3.4-1, 023	Not applicable to Point Beach
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 Used. Addressed by 3.3-1, 049
3.4-1, 027	Not applicable to Point Beach
3.4-1, 028	Not applicable to Point Beach
3.4-1, 029	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 030	Not applicable to Point Beach
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 Point Beach
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	Not applicable to Point Beach
3.4-1, 037	Not applicable to Point Beach
3.4-1, 038	Not applicable to Point Beach
3.4-1, 039	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 040	Not applicable to Point Beach
3.4-1, 041	Consistent with the GALL-SLR Report
3.4-1, 042	Not applicable to Point Beach
3.4-1, 043	Not applicable to Point Beach
3.4-1, 044	Consistent with the GALL-SLR Report
3.4-1, 045	Not applicable to Point Beach
3.4-1, 046	Consistent with the GALL-SLR Report
3.4-1, 047	Not applicable to Point Beach
3.4-1, 048	Not applicable to Point Beach
3.4-1, 049	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 050	Not applicable to Point Beach
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	Not applicable to Point Beach
3.4-1, 053	Not applicable to Point Beach
3.4-1, 054	Consistent with the GALL-SLR Report
3.4-1, 055	Consistent with the GALL-SLR Report
3.4-1, 056	Not applicable to Point Beach
3.4-1, 057	Not applicable to Point Beach
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

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4-1, 061	Not Used (see SE Section 3.4.2.2.6)
3.4-1, 062	Not applicable to Point Beach
3.4-1, 063	Consistent with the GALL-SLR Report
3.4-1, 064	Not applicable to Point Beach
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 Point Beach
3.4-1, 068	Not applicable to Point Beach
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 Point Beach
3.4-1, 071	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1, 072	Not applicable to Point Beach
3.4-1, 073	Consistent with the GALL-SLR Report
3.4-1, 074	Not applicable to Point Beach (see SE Section 3.4.2.2.2)
3.4-1, 075	Not applicable to Point Beach
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 Point Beach
3.4-1, 078	Not applicable to Point Beach
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	Consistent with the GALL-SLR Report
3.4-1, 082	Not applicable to Point Beach (see SE Section 3.4.2.2.8)
3.4-1, 083	Consistent with the GALL-SLR Report
3.4-1, 084	Consistent with the GALL-SLR Report
3.4-1, 085	Consistent with the GALL-SLR Report
3.4-1, 086	Not applicable to Point Beach
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	Consistent with the GALL-SLR Report
3.4-1, 091	Consistent with the GALL-SLR Report
3.4-1, 092	Not applicable to Point Beach
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 Point Beach (see SE Section 3.4.2.2.9)
3.4-1, 095	Not applicable to Point Beach (see SE Section 3.4.2.2.3)
3.4-1, 096	Not applicable to Point Beach
3.4-1, 097	Not applicable to Point Beach (see SE Section 3.4.2.2.9)
3.4-1, 098	Not Used (see SE Section 3.4.2.2.3)
3.4-1, 099	Not applicable to Point Beach
3.4-1, 100	Not Used (see SE Section 3.4.2.2.2)
3.4-1, 101	Not applicable to Point Beach
3.4-1, 102	Not applicable to Point Beach (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)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4-1, 105	Not applicable to Point Beach (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 Point Beach
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	Consistent with the GALL-SLR Report (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 Point Beach
3.4-1, 115	Not applicable to Point Beach
3.4-1, 116	Not applicable to Point Beach
3.4-1, 117	Not applicable to Point Beach
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 Point Beach (see SE Section 3.4.2.2.9)
3.4-1, 120	Not applicable to Point Beach (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 Point Beach
3.4-1, 123	Not applicable to Point Beach
3.4-1, 124	Not applicable to Point Beach
3.4-1, 125	Not applicable to Point Beach
3.4-1, 126	Not applicable to Point Beach
3.4-1, 127	Not applicable to Point Beach
3.4-1, 128	Not applicable to Point Beach
3.4-1, 129	Not applicable to Point Beach
3.4-1, 130	Not applicable to Point Beach
3.4-1, 131	Not applicable to Point Beach
3.4-1, 132	Not applicable to Point Beach
3.4-1, 133	Not applicable to Point Beach
3.4-1, 134	Not applicable to Point Beach
3.4-1, 135	Not applicable to Point Beach

The NRC 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 3.4.2.1 discusses AMR results for components that the applicant states are either not applicable to PBN 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 require 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 NRC staff's review of 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 its 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 NRC staff's review of AMR items 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, 007; 3.4-1, 019; 3.4-1, 022; 3.4-1, 023; 3.4-1, 027; 3.4-1, 028; 3.4-1, 030; 3.4-1, 032; 3.4-1, 036; 3.4-1, 037; 3.4-1, 038; 3.4-1, 040; 3.4-1, 042; 3.4-1, 043; 3.4-1, 045; 3.4-1, 047; 3.4-1, 048; 3.4-1, 050; 3.4-1, 052; 3.4-1, 053; 3.4-1, 056; 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, 075; 3.4-1, 077; 3.4-1, 078; 3.4-1, 082; 3.4-1, 086; 3.4-1, 092; 3.4-1, 094 through 3.4-1, 102; 3.4-1, 105; 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 claims that the corresponding AMR items in the GALL-SLR Report are not used or not applicable to PBN. The NRC 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 claims that the corresponding items in the GALL-SLR Report are not used because they are addressed by other SLRA Table 1 items: 3.4-1, 020 (addressed by 3.4-1, 089), 3.4-1, 025 (addressed by 3.4-1, 015), and 3.4-1, 026 (addressed by 3.4-1, 049). The NRC staff reviewed the SLRA and confirmed that the aging effects will be 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 Further Evaluation Is Recommended by the GALL-SLR Report

In SLRA Section 3.4.2.2, the applicant further evaluated aging management for the steam and power conversion systems 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 3.4.2.2. 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, AMR items 3.4-1, 001 states that the TLAA on cumulative fatigue damage in the components of steam and power conversion systems is evaluated in accordance with 10 CFR 54.21(c)(1) and addressed in SLRA Section 4.3.3. This is consistent with SRP-SLR Section 3.4.2.2.1 and is, therefore, acceptable. The NRC staff's evaluation of the TLAA for the components of steam and power conversion systems is documented in SE Section 4.3.3.

3.4.2.2.2 Cracking Due to Stress Corrosion Cracking in Stainless Steel Alloys

SLRA Section 3.4.2.2.2, associated with SLRA Table 3.4-1, AMR items 3.4-1, 002 and 3.4-1, 104, addresses cracking due to SCC for SS piping, piping components, and tanks, insulated or not insulated, exposed to air or condensation, and underground SS piping, piping components, and tanks, which will be managed by the External Surfaces Monitoring of Mechanical Components AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.4.2.2.2.

In its review of components associated with AMR items 3.4-1, 002 and 3.4-1, 104, the NRC staff determined that the applicant met the further evaluation criteria, and that 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 AMP is acceptable because the periodic inspections conducted as part of this program are capable of detecting whether cracking is occurring.

Based on the program identified, the NRC staff concludes that the applicant's programs meet 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, associated with SLRA Table 3.4-1, AMR item 3.4-1, 074, addresses cracking for underground SS piping, piping components, and tanks. The applicant stated that this item is not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.2 and finds it acceptable because, based on a review of the UFSAR and SLRA, there are no underground SS piping, piping components, or tanks in the steam and power conversion systems.

SLRA Section 3.4.2.2.2, associated with SLRA Table 3.4-1, AMR item 3.4-1, 100, addresses cracking for SS tanks within the scope of GALL-SLR Report XI.M29 exposed to air or condensation. The applicant stated that this item is not used because there are no outdoor SS tanks in the steam and power conversion systems, and the indoor tanks are below the capacity threshold for tanks in the scope of GALL-SLR Report XI.M29. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.2 and finds it acceptable because, based on a review of the UFSAR and SLRA, there are no in-scope SS tanks within the scope of GALL-SLR Report AMP XI.M29 exposed to air or condensation in the steam and power conversion systems.

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, associated with SLRA Table 3.4-1, AMR items 3.4-1, 003 and 3.4-1, 103, addresses loss of material due to pitting and crevice corrosion for, respectively, uninsulated and insulated SS 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 AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.4.2.2.3.

In its review of components associated with AMR items 3.4-1, 003 and 3.4-1, 103, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging for AMR item 3.4-1, 003 and 3.4-1, 103 using the External Surfaces Monitoring of Mechanical Components AMP is acceptable because the periodic inspections conducted as part of the program are capable of detecting whether loss of material is occurring.

Based on the program identified, the NRC staff concludes that the applicant's programs meet 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, associated with SLRA Table 3.4-1, AMR item 3.4-1, 098, addresses loss of material due to pitting or crevice corrosion for SS or nickel-alloy tanks within the scope of GALL-SLR AMP XI.M29 exposed to air or condensation. The applicant stated that this item is not used because there are no outdoor SS tanks in the steam and power conversion systems, and the indoor tanks are below the capacity threshold for tanks in the scope of GALL-SLR Report XI.M29. The NRC Staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.3 and finds it acceptable because, based on a review of the UFSAR and SLRA, there are no in-scope SS or nickel-alloy tanks within the scope of GALL-SLR Report AMP XI.M29 exposed to air or condensation in the steam and power conversion systems.

SLRA Section 3.4.2.2.3, associated with SLRA Table 3.4-1, AMR item 3.4-1, 095, addresses loss of material due to pitting or crevice corrosion for underground SS and nickel-alloy piping, piping components, and tanks. The applicant stated that this item is not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.3 and finds it acceptable because, based on a review of the UFSAR and SLRA, there are no underground SS piping, piping components, or tanks in the steam and power conversion systems.

3.4.2.2.4 *Quality Assurance for Aging Management of Nonsafety-Related Components*

SE Section 3.0.4 documents the NRC 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 NRC 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, as modified by SLRA Supplement 2, is associated with SLRA Table 3.3-1, item 3.4-1, 061, for loss of material due to recurring internal corrosion in metallic piping components exposed to several water environments. Following NRC staff audit questions, the applicant stated that, based on an additional review of operating experience, recurring internal corrosion is an applicable aging mechanism for carbon steel components exposed to raw water from Lake Michigan. The applicant stated that the new Inspection of Internal Surfaces in Piping and Ducting Components AMP includes activities to address loss of material due to recurring internal corrosion. These include existing nondestructive examination methods to identify internal degradation due to corrosion and the process to select examination locations. Although the applicable operating experience was limited to piping in the service water system, the applicant conservatively assumed that all carbon steel components exposed to Lake Michigan raw water in the circulating water system are potentially susceptible to recurring internal corrosion. The applicant's operating experience review did not identify any similar issues in treated water or waste water environments.

The supplement modified SLRA Section B.2.1.25 (Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components) to address loss of material due to recurring internal corrosion. The applicant addressed the SRP-SLR's further evaluation attributes a) through e) for this program and included flow blockage as an additional aging effect to be considered as part of recurring internal corrosion. The applicant stated that existing program activities manage recurring internal corrosion and discussed the examination methods to be used and the examination location selection process.

The NRC staff reviewed the applicant's approach against the criteria in SRP-SLR Section 3.4.2.2.6 for the components associated with item 3.4-1, 061. The staff determined that the applicant met the further evaluation criteria, and that its approach to manage the associated aging effect/mechanism using the cited program is acceptable because the implementation procedures for this program will provide instructions for implementing augmented inspections to confirm the extent of any identified degradation.

3.4.2.2.7 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

SLRA Section 3.4.2.2.7, associated with SLRA Table 3.4-1, AMR item 3.4-1, 109, addresses cracking due to SCC for aluminum piping, piping components, and tanks exposed to air, condensation, raw water, and waste water, which will be managed by the External Surfaces Monitoring of Mechanical Components AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.4.2.2.7.

In its review of components associated with AMR item 3.4-1, 109, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging for AMR items 3.4.1-109 using the External Surfaces Monitoring of Mechanical Components AMP is acceptable because the periodic inspections conducted as part of this program are capable of detecting whether cracking is occurring.

Based on the program identified, the NRC staff concludes that the applicant's programs meet 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, associated with SLRA Table 3.4-1, AMR items 3.4-1, 102, 3.4-1, 105, and 3.4.1-112, addresses cracking due to SCC for aluminum tanks within the scope of GALL-SLR AMP XI.M29 exposed to air, condensation, soil, concrete, raw water, or waste water, 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. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.7 and finds it acceptable because, based on a review of the UFSAR and SLRA, 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, associated with SLRA Table 3.4-1, item 3.4-1, 051, addresses loss of material due to general, crevice, or pitting corrosion for steel piping and piping components exposed to concrete. Specifically, SLRA Section 3.4.2.2.8 states the following:

> The carbon steel condensate storage tank [CST] bottoms sit on a concrete pad. However, the concrete meets the ACI 318 requirements, there is no [operating experience] indicating degradation of the concrete that could lead to penetration of water to the metal surface, and the tank is not exposed to groundwater. Additionally, the CSTs are located indoors and protected from weather.

The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.4.2.2.8. For the CSTs associated with item 3.4-1, 051, the staff finds the applicant's proposal that there are no aging effects requiring management acceptable because, consistent with the further evaluation criteria: (a) the attributes of the concrete are consistent with ACI 318, (b) plant-specific operating experience indicates no degradation of the concrete that could lead to penetration of water to the metal surface of the CSTs, and (c) the CSTs are not exposed to groundwater or weather (i.e., rainwater) due to their location indoors on a concrete pad. In addition, based on its review of the UFSAR, the staff noted that there are no steel piping or piping components exposed to concrete in the steam and power conversion systems.

SLRA Section 3.4.2.2.8, associated with SLRA Table 3.4-1, item 3.4-1, 082, addresses loss of material due to crevice or pitting corrosion and cracking due to SCC for SS piping and piping components exposed to concrete. The applicant stated that there are no SS piping or piping components in the steam and power conversion systems within the scope of subsequent license renewal that are exposed to concrete. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.8 and finds it acceptable because, based on a review of the UFSAR, there are no SS components exposed to concrete in the steam and power conversion systems.

For those AMR items associated with SLRA Section 3.4.2.2.8, the NRC 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).

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

SLRA Section 3.4.2.2.9, associated with SLRA Table 3.4-1, AMR item 3.4-1, 035, 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 AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.4.2.2.9.

In its review of components associated with AMR item 3.4-1, 035, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging for AMR items 3.4.1-035 using the External Surfaces Monitoring of Mechanical Components AMP 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 program identified, the NRC staff concludes that the applicant's programs meet 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, 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, addresses 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 XI.M29 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 waste water. The applicant stated that these items are not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.9 and finds it acceptable because, based on a review of the UFSAR and SLRA, 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

The SLRA did not identify any AMR results in SLRA Tables 3.4.2-1 through 3.4.2-3 that are not consistent with, or not addressed in, the GALL-SLR Report.

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, "Containment, Structures and Structural Components/Commodities—Summary of Aging Management Programs," 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 NRC 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
3.5-1, 001	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.1)
3.5-1, 002	Not applicable to Point Beach (see SE Section 3.5.2.2.1.1)
3.5-1, 003	Not applicable to Point Beach (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)
3.5-1, 008	Consistent with the GALL-SLR Report (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	Consistent with the GALL-SLR Report (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	Consistent with the GALL-SLR Report
3.5-1, 017	This item number is not used in the SRP-SLR nor the GALL-SLR Report
3.5-1, 018	Consistent with the GALL-SLR Report
3.5-1, 019	Consistent with the GALL-SLR Report
3.5-1, 020	Not applicable to Point Beach (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
3.5-1, 027	Consistent with the GALL-SLR Report
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	Consistent with the GALL-SLR Report
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

Component Group (SRP-SLR Item No.)	Staff Evaluation
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 (see SE Section 3.5.2.2.1.5)
3.5-1, 041	Not applicable to PWRs
3.5-1, 042	Consistent with the GALL-SLR Report (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 Point Beach (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 Point Beach (see SE Section 3.5.2.2.2.2)
3.5-1, 049	Consistent with the GALL-SLR Report (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 Point Beach (see SE Section 3.5.2.2.2.4)
3.5-1, 053	Not applicable to Point Beach (see SE Section 3.5.2.2.2.5)
3.5-1, 054	Consistent with the GALL-SLR Report
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	Not applicable to Point Beach
3.5-1, 059	Consistent with the GALL-SLR Report
3.5-1, 060	Consistent with the GALL-SLR Report
3.5-1, 061	Consistent with the GALL-SLR Report
3.5-1, 062	Consistent with the GALL-SLR Report (see SE Section 3.5.2.1.2)
3.5-1, 063	Consistent with the GALL-SLR Report
3.5-1, 064	Consistent with the GALL-SLR Report
3.5-1, 065	Consistent with the GALL-SLR Report
3.5-1, 066	Consistent with the GALL-SLR Report
3.5-1, 067	Consistent with the GALL-SLR Report
3.5-1, 068	Consistent with the GALL-SLR Report (see SE Section 3.5.2.1.3)
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
3.5-1, 071	Not Used. Addressed by 3.3-1, 179 (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
3.5-1, 075	Consistent with the GALL-SLR Report
3.5-1, 076	Not applicable to PWRs
3.5-1, 077	Consistent with the GALL-SLR Report
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

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.5-1, 082	Consistent with the GALL-SLR Report
3.5-1, 083	Consistent with the GALL-SLR Report
3.5-1, 084	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.5-1, 085	Consistent with the GALL-SLR Report (see SE Section 3.5.2.1.4)
3.5-1, 086	Not Used. Addressed by 3.5-1, 091
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 Used. Addressed by 3.5-1, 085
3.5-1, 091	Consistent with the GALL-SLR Report
3.5-1, 092	Consistent with the GALL-SLR Report
3.5-1, 093	Consistent with the GALL-SLR Report
3.5-1, 094	Consistent with the GALL-SLR Report
3.5-1, 095	Not Used. Addressed by 3.5-1, 091 and 3.5-1, 092
3.5-1, 096	Consistent with the GALL-SLR Report
3.5-1, 097	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.6 and 3.5.2.2.2.7)
3.5-1, 098	Consistent with the GALL-SLR Report
3.5-1, 099	Not Used. Addressed by 3.5-1, 100 (see SE Section 3.5.2.2.2.4)
3.5-1, 100	Consistent with the GALL-SLR Report (see SE Section 3.5.2.1.5 and 3.5.2.2.2.4)

The NRC 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 PBN 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 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.

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

The following subsections document the NRC staff's review of AMR results listed in SLRA Tables 3.5.2-1 through 3.5.2-15 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 its 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 3.5-1, 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 3.5.2.1.5 below.

SE Section 3.5.2.1.1 documents the NRC staff's review of AMR items 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, 002; 3.5-1, 003; 3.5-1, 020; 3.5-1, 046; 3.5-1, 048; 3.5-1, 052; 3.5-1, 053; 3.5-1, 058, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not used or not applicable to PBN. The NRC 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 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 BWRs. The NRC staff reviewed the SRP-SLR, confirmed that these items only apply to BWRs, and finds that these items are not applicable to PBN because it is a PWR.

SLRA Table 3.5-1, AMR item 3.5-1, 020, addresses managing increases in porosity and permeability and loss of strength due to leaching for accessible containment concrete exposed to flowing water. The applicant stated that this item is not applicable. The NRC staff evaluated the applicant's claim and finds it acceptable because the containment structures are protected from the weather exposure (e.g., rain) by a façade building and no accessible containment concrete is exposed to flowing water.

SLRA Table 3.5-1, AMR item 3.5-1, 071, as amended by Supplement 1, dated April 21, 2021, addresses loss of material (spalling, scaling) and cracking due to freeze-thaw for masonry walls exposed to air-outdoor environment. The applicant stated that this item is not applicable since freeze-thaw for masonry walls is addressed in AMR item 3.3-1, 179. The NRC staff evaluated the applicant's claim and finds it acceptable because aging effects due to freeze-thaw for masonry walls will be managed by the Fire Protection AMP and the Masonry Walls AMP in AMR item 3.3-1, 179.

For the following SLRA Table 3.1-1 items, the applicant claims that the corresponding items in the GALL-SLR Report are not used because they are addressed by other SLRA Table 1 items: 3.5-1, 071 (addressed by 3.5-1, 179), 3.5-1, 074 (addressed by 3.5-1, 075), 3.5-1, 081 (addressed by 3.5-1, 091), 3.5-1, 086 (addressed by 3.5-1, 091), 3.5-1, 090 (addressed by 3.5-1, 085), 3.5-1, 095 (addressed by 3.5-1, 091 and 3.5-1, 092), and 3.5-1, 099 (addressed by 3.5-1, 100; see SE Section 3.5.2.2.2.4). The NRC staff reviewed the SLRA and confirmed that the aging effects will be addressed by other SLRA Table 1 items. Therefore, the staff finds the applicant's proposal to use alternate items acceptable.

3.5.2.1.2 Loss of Material and Change in Material Properties

SLRA Table 3.5-1, AMR item 3.5-1, 062, addresses loss of material and changes in material properties for wooden beams of the EDG Train A missile barrier outside the Control Building Structure, exposed to an outdoor air environment. The NRC staff noted in the SLRA that there are no wooden piles or sheathing used in the PBN circulating water pumphouse structure. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the Structures Monitoring AMP to manage the aging effect for wooden beams instead of the Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP.

Based on its review of components associated with AMR item 3.5-1, 062, for which the applicant cited generic note E, the NRC staff finds the applicant's proposal to manage the effects of aging using the Structures Monitoring AMP acceptable because it is consistent with the GALL-SLR Report recommendations to ensure that parameters monitored or inspected, and inspection frequencies, are commensurate with the Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP.

3.5.2.1.3 Cracking due to Stress Corrosion Cracking

SLRA Table 3.5-1, AMR item 3.5-1, 068, addresses cracking due to SCC for high-strength steel structural bolting exposed to air–indoor uncontrolled environment. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Structures Monitoring AMP to manage the aging effect for high-strength (HS) steel structural bolting for non-ASME component supports.

For SLRA AMR item 3.5-1, 068, the NRC staff determined the need for additional information on the adequacy of the visual examinations of the Structures Monitoring AMP to detect cracking in HS bolting, which resulted in the issuance of an RAI. RAI 3.5-1, 068-1 and the applicant's response are documented in ADAMS Accession No. ML21223A308.

In its response, the applicant enhanced the Structures Monitoring AMP and included Commitment No. 38(i) to specify that, for non-ASME HS bolting in-scope for SLR and greater than 1-inch nominal diameter, volumetric examination capable of detecting cracking will be performed in addition to the VT-3 examination. Within 10 years before entering the subsequent period of extended operation, and in each 10-year period during the subsequent period of extended operation, a representative sample of bolts will be inspected. The sample will be 20 percent of the population (for a material/environment combination) up to a maximum of 25 bolts. The applicant also revised Commitment No. 38(c) to specify that molybdenum disulfide and other lubricants containing sulfur will not be used.

The NRC staff finds the applicant's response and changes to the Structures Monitoring AMP and related commitments acceptable; the examination method (volumetric examination), frequency, and sampling criteria proposed by the applicant are adequate to detect cracking due to SCC in HS bolting in non-ASME supports and are consistent with the recommendations in the GALL-SLR for this component, material, and aging effect.

Based on its review of components associated with AMR item 3.5-1, 068, as amended by the response to RAI 3.5-1, for which the applicant cited generic note E, the NRC staff finds the applicant's proposal to manage the effects of aging using the Structures Monitoring AMP acceptable because the AMP will be enhanced, for non-ASME HS bolting, to include examination method, frequency, and sampling size capable of detecting cracking due to SCC before a loss of function and consistent with the recommendations of GALL-SLR AMP XI.S3.

3.5.2.1.4 Loss of Material Due to Pitting, Crevice Corrosion

SLRA Table 3.5-1, AMR item 3.5-1, 085, as amended by Supplement 1, dated April 21, 2021, addresses loss of material due to pitting and crevice corrosion for SS structural bolting exposed to treated borated water. During its review of components associated with AMR item number

3.5-1, 085, for which the applicant cited generic note A, the NRC staff noted that the SLRA credits the Water Chemistry AMP and the One-Time Inspection AMP to manage the aging effect for SS structural bolting.

The NRC staff noted that the applicant selected a different AMP to manage the effects of aging than that recommended by the GALL-SLR Report. The GALL-SLR Report credits the Water Chemistry AMP and the ASME Section XI, Subsection IWF AMP to manage the aging effect for SS structural bolting exposed to treated water.

For SLRA AMR item 3.5-1, 085, the NRC staff determined the need for additional information, which resulted in the issuance of an RAI. RAI 3.5-1, 085-1 and the applicant's response are documented in ADAMS Accession No. ML21223A308.

In its response, the applicant revised SLRA Table 3.5-1, item 3.5-1, 085, to show that the Water Chemistry AMP and the ASME Section XI, Subsection IWF AMP will manage loss of material for SS structural bolting exposed to treated borated water in the spent fuel pool. The response also revised the related AMR line item in SLRA Table 3.5.2-9 (on page 3.5-124) to credit the GALL-SLR Report line item III.B1.2.TP-232 that corresponds to SRP-SLR Table 3.5-1, item 085, with a generic note B.

The NRC staff finds the applicant's response and changes to SLRA Table 3.5-1 and Table 3.5.2-9 acceptable because the applicant corrected the AMR line items, corresponding to item 3.5-1, 085, for managing loss of material of SS bolting in a treated water spent fuel pool environment to be consistent with the corresponding GALL-SLR Report line item.

Based on its review of components cited above and revised by response to RAI 3.5-1, 085-1, for which the applicant cited generic note B, the NRC staff finds the applicant's proposal to manage the effects of aging using the Water Chemistry AMP and the ASME Section XI, Subsection IWF AMP acceptable because the amended AMR line items are consistent with those in the GALL-SLR Report.

3.5.2.1.5 Cracking Due to Stress Corrosion Cracking and Loss of Material Due to Pitting and Crevice Corrosion

SLRA Table 3.5-1, item 3.5.1-100, addresses loss of material due to pitting and crevice corrosion, and cracking due to SCC for aluminum and SS support members, welds, bolted connections, and support anchorage to building structure. As amended by letter dated April 21, 2021, for the associated SLRA Table 2 AMR items that cite generic note E, the SLRA credits the Fire Protection AMP to manage cracking and loss of material for aluminum and SS fire stops and wraps, SS fire barrier penetration seals, and SS rollup doors exposed to uncontrolled indoor air or outdoor air.

Based on its review of components associated with item 3.5.-1, 100 for which the applicant cited generic note E, the NRC staff finds the applicant's proposal to manage cracking and loss of material for aluminum and SS fire stops and wraps, SS fire barrier penetration seals, and SS rollup doors exposed to uncontrolled indoor air or outdoor air acceptable because the periodic visual inspections required by the program can be capable of detecting cracking and loss of material.

3.5.2.1.6 Reduced Thermal Insulation Resistance Due to Moisture Intrusion

SLRA Table 3.1-1, item 134 stated there were no aging effects requiring management for nonmetallic insulation exposed to air or condensation and, therefore, the insulation was not in-scope for SLR. The NRC staff determined the need for additional information, which resulted in the issuance of an RAI. RAI 3.5.2.2.2.6-2 and the applicant's response are documented in ADAMS Accession Nos. ML21189A173 and ML21253A138. In its response, the applicant revised item 134 to indicate that only the insulation on the reactor coolant piping passing through the primary shield wall is in-scope for SLR, since it is necessary to maintain the local temperature of the primary shield wall concrete at 65 ºC (150 ºF) or below, to prevent aging effects of the primary shield wall concrete. The applicant also stated that IN 2007-21 and its supplement were found to not be applicable to PBN because: (1) end caps were not used on the reactor coolant piping, (2) there is minimal flow-induced vibration in the reactor coolant loops, and (3) there is minimal relative motion between the insulation and the reactor coolant piping due to the piping size. The staff finds the applicant's response to include the portions of the nonmetallic insulation on the reactor coolant piping that passes through the primary shield wall as being in-scope for SLR, and the changes to Table 3.1-1, item 134, acceptable because managing aging of nonmetallic insulation in accordance with the External Surfaces Monitoring AMP is consistent with the recommendations in the GALL-SLR Report for AMR item 134.

On treatment of the in-scope portions of item 3.1-1, 134, in SLRA Table 3.5.2-1, the applicant cites generic note I and states that there are no aging effects requiring management for the thermal insulation exposed to uncontrolled indoor air and, therefore, no AMP is proposed. The AMR item also cites plant-specific note 9, which states that the insulation penetrations are encased and not subject to wetting so there are no plausible aging effects that could degrade the fiberglass, calcium silicate, or amosite asbestos (with a silicate binder) insulation. The applicant further stated that the normal operating temperature of the reactor coolant piping is well above the dew point and eliminates the need for insulation removal. Consistent with the recommendation in the GALL-SLR Report, the applicant also stated that visual inspections for loss of material will be performed every refueling outage and for cracking every 10 years, on accessible portions of the reactor coolant piping rigid metal insulation and insulation jacketing, as part of the External Surfaces Monitoring of Mechanical Components AMP. The NRC 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 because it is consistent with the recommendation in the GALL-SLR Report, and a review of plant-specific operating experience did not reveal any evidence of insulation penetration wetting on the reactor coolant piping that passes through the primary shield wall.

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 containments, 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 Sub-foundations

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 of containment concrete elements due to increased stress levels from settlement and the reduction of foundation strength, and cracking due to differential settlement and erosion of porous concrete sub-foundations exposed to soil and flowing water environments, respectively. The SLRA notes that the aging effects associated with settlement (AMR item 3.5-1, 001) will be managed by the ASME Section XI, Subsection IWL AMP and the Structures Monitoring AMP, while the aging effects associated with differential settlement and erosion of porous concrete sub-foundations (AMR item 3.5-1, 002) are not applicable. The SLRA further notes that there is no porous concrete sub-foundation under the containment, and a dewatering system is not credited in the CLB. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.1.

During its review, the NRC staff noted that settlement monitoring and inspections have not identified any evidence of uneven or excessive settlement since construction, and the staff verified that a dewatering system is not credited in the CLB. In addition, the ASME Code Section XI, Subsection IWL AMP and the Structures Monitoring AMP will continue to monitor for cracks and distortion to verify degradation due to settlement is not occurring. In its review of components associated with AMR item 3.5-1, 001, the staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWL AMP and the Structures Monitoring AMP is acceptable because years of settlement monitoring of structures, including the containments, have not identified indications of settlement, the accessible concrete components are monitored to confirm the absence of any visible effects due to settlement, and a dewatering system is not credited to manage settlement.

For aging effects associated with AMR item 3.5-1, 002, the NRC staff evaluated the applicant's not applicable claim against the criteria in SRP-SLR Section 3.5.2.2.1.1 and finds it acceptable because the containment foundations are not founded on porous concrete sub-foundations and there is no dewatering system.

Based on the programs identified, the NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.5.2.2.1.1 criteria. For those AMR items associated with SLRA Section 3.5.2.2.1.1, 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).

3.5.2.2.1.2 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, addresses the reduction of strength and modulus of elasticity due to elevated temperature (greater than 150 ^{o}F general; greater than 200 ^{o}F local) in concrete components (e.g., dome, wall, basemat, ring girders, buttresses, containment, and fill-in annulus) of containment structures exposed to an air-indoor uncontrolled or air-outdoor environment. The applicant stated that this item is not applicable, and a plant-specific AMP is not required for this aging effect. The applicant noted that, as described in UFSAR Section 5.1.2.4 and consistent with the current renewed licenses, temperatures of containment penetrations are kept below the allowable temperature thresholds specified in the GALL-SLR Report. In addition, the ASME Section XI, Subsection IWL AMP provides aging management of the containment wall. The NRC staff evaluated the applicant's claim of non-applicability against the criteria in SRP-SLR Section 3.5.2.2.1.2 and finds it acceptable because, based on its review of the SLRA and UFSAR, temperatures of containment are kept below temperature thresholds specified in the GALL-SLR Report; therefore, a plant-specific AMP is not necessary.

By letter dated July 8, 2021, in response to NRC staff RAI 3.5.2.2.2.6-2, the applicant updated the SLRA to note that the reactor coolant piping passing through the primary shield wall is insulated to ensure that concrete temperatures remain below 150 °F. The response also noted that the insulation is within the scope of subsequent license renewal and is age-managed by the External Surfaces Monitoring of Mechanical Components AMP. The staff reviewed the applicant's update and notes that it applies to Group 4 concrete (containment internal structures); however, the GALL-SLR Report recommendation for further evaluation is the same for Group 4 concrete and containment concrete. Therefore, since the applicant provided the update in the SLRA section associated with containment concrete, the staff will address the change in this section of the SE. The staff reviewed the update and finds it acceptable because the insulation will maintain the concrete below 150 °F, as recommended by the GALL-SLR Report, and the insulation is being age-managed by an appropriate AMP.

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

Item 1. SLRA Section 3.5.2.2.1.3.1, as amended by Supplement 1, dated April 21, 2021, 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 shell, drywell head, containment liner (including liner anchors and integral attachments), and penetration sleeves 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 AMP (which includes related augmented inspections) and the 10 CFR Part 50, Appendix J AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.3, item 1.

The NRC staff evaluated the applicant's claim of non-applicability for SLRA Table 3.5-1, AMR item 3.5.1, 004 and finds it acceptable because the AMR item only applies to BWR containment drywell shells, and the PBN containments are PWR designs that do not incorporate a drywell shell or drywell head.

For items 3.5-1, 005 and 3.5-1, 035, the NRC staff noted that the applicant concluded that a plant-specific program to manage this aging effect in accessible and inaccessible areas of the PBN containment liner (including anchors and integral attachments), and penetration sleeves are not required based on the following: (1) the plant-specific operating experience of liner corrosion primarily due to borated water leakage was addressed during the initial license renewal through acceptance criteria based on evaluation and augmented examinations, and/or repair/replacement through ASME Section XI, Subsection IWE AMP enhancements implemented through initial license renewal Commitment Nos. 71 and 72 in Appendix A and Section 3.5.2.2.1 (pages 3-278 through 3-281) of NUREG-1839, (2) per SLRA Section 3.5.2.2.1.3.1, as amended by Supplement 1, dated April 21, 2021, these initial license renewal Commitment Nos. 71 and 72 are in effect and will continue through the service life/end of license of the plant, (3) concrete core-drilled access holes were installed in the containment floor on the 8-ft elevation and keyway to monitor the inaccessible floor liner for corrosion; monitoring of these core holes of each PBN unit has shown no significant change over the last 10-year period, (4) acceptability of inaccessible areas is evaluated by the applicant's ASME Section XI, Subsection IWE AMP, when conditions found in accessible areas indicate the presence of, or could result in, flaws or degradation of the containment liner in inaccessible areas, (5) the concrete containments were designed, constructed, and inspected in accordance with ACI 318-63 and specifications that met the intent of ACI 201.2R-77, "Guide to Durable Concrete," as evaluated in NUREG-1839, which provided for quality, dense, well cured, air entrained, and low permeability concrete, and (6) the ASME Section XI, Subsection IWL AMP monitors and manages cracking, spalling, and loss of material in accessible containment concrete that could potentially provide a pathway for water to reach inaccessible areas of the steel liner.

In its review of components associated with AMR items 3.5-1, 005 and 3.5-1, 035, as amended by letter dated August 11, 2021, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the enhanced ASME Section XI, Subsection IWE AMP and the 10 CFR Part 50, Appendix J AMP is acceptable for the following reasons: (1) plant-specific operating experience with regard to corrosion associated with the containment liner in accessible and inaccessible areas has been identified, evaluated, and appropriately addressed by evaluation or augmented examination or corrected by repair/replacement, and initial license renewal Commitment Nos. 71 and 72 will continue into the subsequent period of extended operation, (2) there has been no significant operating experience of containment liner degradation in inaccessible areas over the last 10 years, (3) inaccessible areas will be evaluated based on degraded conditions found in accessible areas, (4) the design and construction of containment concrete has been in accordance with applicable ACI standards and specifications to produce durable concrete, (5) containment concrete is monitored for cracks by the ASME Section XI, Subsection IWL AMP, and (6) the continued monitoring using the proposed AMPs provides reasonable assurance that any occurrence of corrosion of the containment liner and its integral attachments will be identified and corrected before a loss of intended function. Additionally, the Boric Acid Corrosion AMP, evaluated in SE Section 3.0.3.2.8, minimizes the exposure of susceptible components to borated water by frequent monitoring of potential leakage locations and timely cleaning and repair if leakage is detected.

Based on the programs identified, the staff concludes that the applicant's programs meet the 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 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).

<u>Item 2</u>. SLRA Section 3.5.2.2.1.3.2, associated with SLRA Table 3.5-1, AMR item 3.5-1, 006, addresses loss of material for a steel torus shell exposed to air-indoor uncontrolled or treated water. The applicant stated that this item is not applicable, as it applies to BWR containments only. The NRC 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 PBN containments are PWR designs that do not incorporate torus shells.

<u>Item 3</u>. SLRA Section 3.5.2.2.1.3.3, associated with SLRA Table 3.5-1, AMR item 3.5-1, 007, addresses loss of material for steel suppression chamber shell, steel torus ring girders, and

steel downcomers exposed to air-indoor uncontrolled or treated water. The applicant stated that this item is not applicable as it applies to BWR containments only. The NRC 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 PBN 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, states that TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1) and that the evaluation of the TLAA associated with loss of prestress in the concrete containment tendon prestressing system is addressed in SLRA Section 4.5. This is consistent with SRP-SLR Section 3.5.2.2.1.4 and is, therefore, acceptable. SE Section 4.5 documents the NRC staff’s evaluation of the TLAA for the containment tendon prestressing system.

3.5.2.2.1.5 Cumulative Fatigue Damage

SLRA Section 3.5.2.2.1.5, as amended by Attachment 29 to Supplement 1, dated April 21, 2021, associated with SLRA Table 3.5-1, AMR item 3.5-1, 009, states that TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1) and that the evaluation of the TLAA for fatigue of the containment liner plate and piping (and ventilation) penetrations of carbon steel material that do not include dissimilar metal welds is addressed in SLRA Section 4.6. This is consistent with SRP-SLR Section 3.5.2.2.1.5 and is, therefore, acceptable. SE Section 4.6 documents the NRC staff’s evaluation of the TLAA for containment liner plate and carbon steel piping penetrations.

3.5.2.2.1.6 Cracking Due to Stress Corrosion Cracking

SLRA Section 3.5.2.2.1.6, as amended by SLRA Supplement 1, dated April 21, 2021, 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 penetration sleeves, penetration bellows, suppression chamber shell and vent line bellows made of SS, or SS with dissimilar metal welds (to carbon steel liner) exposed to an air–indoor, uncontrolled environment, which will be managed by the ASME Section XI, Subsection IWE AMP and the 10 CFR Part 50, Appendix J AMP. The NRC staff noted that the applicant also addressed aging management of cracking due to cyclic loading for these SS and dissimilar metal weld components and the SS fuel transfer tube in SLRA Section 3.5.2.2.1.6. The staff reviewed the applicant’s proposal 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 they apply to BWRs only. The NRC staff evaluated the applicant’s claim of nonapplicability 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 38 and 39, which only apply to a BWR containment suppression chamber shell and BWR vent line bellows, respectively, and the PBN containments are PWR designs that do not incorporate these components.

For components associated with AMR items 3.5-1, 010, the applicant stated that the aging effect will be managed by the ASME Section XI, Subsection IWE AMP and the 10 CFR Part 50, Appendix J AMP. The NRC staff noted from the SLRA, as amended, that SS penetrations and dissimilar metal welds (DMWs) associated with high temperature systems are exposed to temperatures greater than 60 °C (140 °F) and may be susceptible to SCC. The staff further noted that the same SS penetrations and any DMWs, as well as the SS fuel transfer tube assembly, are also susceptible to cracking due to cyclic loading and, therefore, the applicant addressed aging management of cracking due to the two mechanisms (SCC, cyclic loading) together for these components. The staff also noted that there has been no operating experience at PBN of cracking of the above-stated SS and DMW components. Therefore, the applicant stated that a supplemental one-time inspection of a representative sample of SS penetrations and DMWs will be performed, through an enhancement (Commitment No. 33(e)) to the ASME Section XI, Subsection IWE AMP, before entering the subsequent period of extended operation, to confirm the absence of the aging effect of cracking due to SCC or cyclic loading, and that no periodic supplemental examinations are required. The representative sample size will be 20 percent of the population of six such components at each PBN unit. As such, two of the SS penetrations or DMWs associated with high-temperature piping plus the SS fuel transfer tube will be examined for cracking at each PBN unit using surface examination or EVT-1 enhanced visual methods. The staff noted that, if cracking is detected as a result of the supplemental one-time inspection, additional inspections will be conducted in accordance with the corrective actions program. This will include one additional penetration with DMWs associated with high-temperature piping systems for each PBN unit until SCC is no longer detected. Periodic inspection for cracking of the subject SS penetrations with DMWs will be added to the ASME Section XI, Subsection IWE AMP, if necessary, based on the one-time inspection results.

In its review of components associated with AMR item 3.5-1, 010, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant’s proposal to manage the effects of aging using the ASME Section XI, Subsection IWE AMP and the 10 CFR Part 50, Appendix J AMP is acceptable. Considering that plant-specific operating experience has not revealed a history of cracking due to SCC or cyclic loading, a supplemental one-time inspection using appropriate inspection methods (surface or EVT-1 examination) will confirm, before the subsequent period of extended operation, that cracking due to SCC or cyclic loading does not occur for these high-temperature SS penetration components and DMWs, and for the fuel transfer tube. In the event that the one-time inspection is not able to confirm that the aging effect does not occur, the program includes provisions to implement additional appropriate examination methods within the ASME Section XI, Subsection IWE AMP, including periodic examinations, to ensure that cracking due to SCC or cyclic loading is detected and adequately managed during the subsequent period of extended operation.

Based on the programs identified, the NRC 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 Supplement 1, 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/soil environments. These aging effects will be managed by the ASME Section XI, Subsection IWL AMP and the Structures Monitoring AMP. The NRC staff reviewed the applicant’s proposal against the criteria in SRP-SLR Section 3.5.2.2.1.7.

During its review, the NRC staff noted that the concrete mix design ensured air content between 3 and 5 percent, and that the containment building is protected from the weather by a façade structure. In addition, the staff noted that inspections have not identified concrete degradation due to freeze-thaw in accessible areas and that the ASME Section XI, Subsection IWL AMP will continue to inspect for signs of this aging effect. Finally, the Structures Monitoring AMP will opportunistically confirm the absence of aging effects whenever normally inaccessible concrete is made accessible.

In its review of components associated with AMR item 3.5-1, 011, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWL AMP and the Structures Monitoring AMP is acceptable because the concrete mix designs contain an air-entraining admixture capable of entraining 3 to 5 percent air and plant operating experience has not identified any aging effects related to freeze-thaw in accessible areas. Therefore, a plant-specific AMP is not required. Additionally, the Structures Monitoring AMP will opportunistically confirm the absence of aging effects by examining normally inaccessible structural components when scheduled maintenance work and planned plant modifications permit access.

Based on the programs identified, the NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.5.2.2.1.7 criteria. For those AMR items associated with SLRA Section 3.5.2.2.1.7, 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).

3.5.2.2.1.8 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 of inaccessible areas of containment concrete components exposed to any environments, which will be managed by the Structures Monitoring AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.8.

During its review, the NRC staff noted that the applicant's Structures Monitoring AMP 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 aggregates were tested for reactivity during construction, and that plant operating experience has not identified indications of alkali-silica reactivity (ASR) in containment concrete. The staff further noted that the Structures Monitoring AMP includes opportunistic inspections of inaccessible areas.

In its review of components associated with AMR item 3.5-1, 012, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Structures Monitoring AMP is acceptable; a plant-specific aging management program is not needed because: (1) plant operating experience has not identified visual indications of ASR in accessible areas, and reactivity tests have not identified reactive aggregates, (2) the Structures Monitoring AMP includes inspections to detect indications of ASR, and (3) the Structures Monitoring AMP includes opportunistic inspections of inaccessible areas.

Based on the program identified, the NRC staff concludes that the applicant's programs meet 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 the increase 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. These aging effects will be managed by the ASME Section XI, Subsection IWL AMP and the Structures Monitoring AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.9.

During its review, the NRC staff noted that the ASME Section XI, Subsection IWL AMP inspects accessible areas for leaching of calcium hydroxide and carbonation, and plant operating experience since the initial license renewal has not identified evidence of this aging effect. The staff also noted that the façade buildings protect the containments from flowing water environments and that the Structures Monitoring AMP includes opportunistic inspections of inaccessible areas.

In its review of components associated with AMR item 3.5-1, 014, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWL AMP and the Structures Monitoring AMP is acceptable; a plant-specific enhancement is not necessary, because: (1) plant operating experience has not shown degradation due to leaching of calcium hydroxide, (2) the ASME Section XI, Subsection IWL AMP and the Structures Monitoring AMP inspect for evidence of the aging effect in accessible areas, and (3) the Structures Monitoring AMP will perform opportunistic inspections of normally inaccessible areas whenever they are made accessible.

Based on the programs identified, the NRC 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 evaluated aging management, as recommended in the GALL-SLR Report, for the containments, structures, and component supports components and provided information concerning how it will manage the applicable aging effects. The NRC 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 inaccessible areas of Groups 1–3, 5, and 7–9 concrete structures exposed to an air-outdoor and groundwater/soil environment, which will be managed by the Structures Monitoring AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 1.

The NRC staff noted that Groups 2 and 9 are not applicable to PBN. The staff also noted that, given the location of PBN, freezing conditions are occasionally experienced. However, the applicant claimed that a plant-specific AMP, or plant-specific enhancement, is not required to manage loss of material, and cracking in inaccessible areas, because the concrete air content and water-to-cement ratios are within the recommended values specified in ACI 318-63, and no significant concrete degradation due to freeze-thaw has been identified at the site. In addition, the applicant noted that the Structures Monitoring AMP will continue to monitor for this aging effect in accessible areas and will examine inaccessible areas when other activities allow access.

In its review of components associated with AMR item 3.5-1, 042, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Structures Monitoring AMP is acceptable because: (1) concrete air contents for plant structures were within the range specified by ACI 318-63, and the concrete water-to-cement ratio meets ACI 318-63 recommendations, (2) site operating experience has not identified significant concrete degradation due to freeze-thaw in accessible areas, (3) the Structures Monitoring AMP will detect aging effects related to freeze-thaw, should they occur, and (4) the Structures Monitoring AMP will also opportunistically confirm the absence of aging effects by examining normally inaccessible structural components when scheduled maintenance work and planned plant modifications permit access and will evaluate observed aging effects in accessible areas that could be indicative of degradation in inaccessible areas.

Based on the program identified, the NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.5.2.2.2.1, item 1, criteria. For those AMR items associated with SLRA Section 3.5.2.2.2.1, item 1, 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).

<u>Item 2</u>. SLRA Section 3.5.2.2.2.1, item 2, associated with SLRA Table 3.5-1 AMR item 3.5-1, 043, addresses cracking due to expansion from reaction with aggregates in inaccessible concrete areas for all structural groups (except Group 6) exposed to any environment, which will be managed by the Structures Monitoring AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 2.

The SLRA states that, during construction, the aggregates were tested for potential reactivity to ensure that cracking and expansion due to reaction with aggregates would not be probable aging effects at PBN. The SLRA also states that plant-specific operating experience has not identified any evidence of reaction with aggregates.

In its review of components associated with AMR item 3.5-1, 043, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Structures Monitoring AMP is acceptable because: (1) operating experience since 2005 has not identified any evidence of reaction with aggregates at PBN, and (2) the Structures Monitoring AMP has been refined, based on industry/fleet information, to include visual examination for patterned cracking, darkened crack edges, water ingress, and misalignment that would be indicative of reaction with aggregates, such as ASR, and it includes the opportunistic inspection of below-grade inaccessible concrete areas for PBN Groups 1, 3-5, 7, and 8 structures.

Based on the program identified, the NRC 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 AMR item 3.5-1, 044, addresses cracking and distortion due to increased stress levels from settlement for all concrete structure groups exposed to outdoor air or soil, which will be managed by the Structures Monitoring AMP. SLRA Section 3.5.2.2.2.1, item 3, is also associated with SLRA Table 3.5-1 AMR item 3.5-1, 046, which addresses the reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation in Groups 1-3 and 5-9 concrete structures exposed to water-flow.

The NRC staff noted that Groups 2 and 9 are not applicable to PBN. The staff also noted that the SLRA states that Groups 1, 3, and 5–8 structures at PBN are either founded on spread footings or basemats, with the Group 5 spent fuel pool founded on a basemat with steel piles that are driven to refusal. A dewatering system is not relied upon to control groundwater levels. The SLRA further notes that erosion of porous concrete is not an applicable aging effect because the foundations are not constructed of porous concrete. Settlement monitoring and structural inspections have indicated no visible evidence of uneven or excessive settlement since the construction of PBN; therefore, cracking, distortion, and an increase in component stress levels due to settlement are not probable aging effects at PBN. However, the SLRA notes that the Structures Monitoring AMP will monitor for indications of settlement.

The NRC 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: (1) PBN's structural foundations are constructed of solid concrete and not porous concrete, (2) the foundations are not subject to water-flow, other than groundwater, and a dewatering system is not credited to control groundwater levels, (3) settlement monitoring and structural inspections have not identified evidence of uneven or excessive settlement since the construction of PBN, and (4) the Structures Monitoring AMP will continue to monitor for indications of settlement and cracking.

Based on the program identified, the NRC 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 AMR item 3.5-1, 047, addresses the increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible concrete areas of Groups 1, 3–5, 7 and 8 structures exposed to water-flow. These aging effects will be managed by the Structures Monitoring AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 4.

In its review of components associated with AMR item 3.5-1, 047, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Structures Monitoring AMP is acceptable because: (1) change in material properties due to leaching of calcium hydroxide has not been observed to date, (2) operating experience has shown that concrete has not experienced unanticipated aging effects, (3) groundwater will be periodically sampled by the Structures Monitoring AMP to determine if it is aggressive to concrete, (4) visual inspection of inaccessible concrete areas will be conducted when the concrete becomes accessible for any reason, and (5) the observed condition from accessible areas will be used as an indicator of possible degradation in inaccessible areas.

Based on the program identified, the NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.5.2.2.2.1, item 4, criteria. For those AMR 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, AMR item 3.5-1, 048, addresses managing reduction of strength and modulus of elasticity due to elevated temperature (greater than 150 °F general; greater than 200 °F local) in concrete for structures in Groups 1–5 exposed to an air-indoor uncontrolled environment. The applicant stated that this item is not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.2.2 and finds it acceptable because: (1) there have been no instances of elevated temperatures for plant structures other than containment (which is addressed in SE Section 3.5.2.2.1.2), and (2) insulation on the process piping is conservatively included within the scope of SLR to maintain local concrete temperatures below the specified limits.

3.5.2.2.2.3 Aging Management of Inaccessible Areas for Group 6 Structures

Item 1. SLRA Section 3.5.2.2.2.3, item 1, associated with SLRA Table 3.5-1 AMR item 3.5-1, 049, addresses loss of material (spalling, scaling) and cracking due to freeze-thaw in inaccessible concrete areas of Group 6 structures exposed to an air-outdoor or groundwater/soil environment. These aging effects will be managed by the Structures Monitoring AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 1.

The NRC staff noted that PBN is located in a "Severe" weathering region per Figure 1 of ASTM C33, and that its Group 6 structures are exposed to temperatures of 32 °F or less for sufficient durations that could cause freeze-thaw aging effects to occur. The staff also noted that the forebay structure below the waterline is considered accessible and periodically inspected. In addition, the staff noted that inspections have not identified significant concrete degradation due to freeze-thaw in accessible areas, and that the Structures Monitoring AMP will opportunistically inspect inaccessible areas when they are made available.

In its review of components associated with AMR item 3.5-1, 049, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Structures Monitoring AMP is acceptable because: (1) site operating experience has not identified circulating water pumphouse or forebay concrete degradation due to freeze-thaw in accessible areas, and (2) management of this aging effect through visual inspection of inaccessible concrete areas when they become accessible for any reason is consistent with GALL-SLR Report recommendations.

Based on the program identified, the NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.5.2.2.2.3, item 1, criteria. For those AMR items associated with SLRA Section 3.5.2.2.2.3, item 1, 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).

<u>Item 2</u>. SLRA Section 3.5.2.2.2.3, item 2, associated with SLRA Table 3.5-1 AMR item 3.5-1, 050, addresses cracking due to expansion from reaction with aggregates for all concrete Group 6 structures exposed to a groundwater/soil environment, which will be managed by the Inspections of Water-Control Structures Associated with Nuclear Power Plants AMP, which is implemented through the Structures Monitoring AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 2.

The NRC staff noted that Group 6 structures at PBN are designed and constructed in accordance with ACI 318-63 using materials conforming to ACI and ASTM standards. The staff further noted that plant-specific operating experience has not identified any evidence of cracking due to reaction with aggregates in Group 6 structures.

In its review of components associated with AMR item 3.5-1, 050, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Inspections of Water-Control Structures Associated with Nuclear Power Plants AMP, implemented through the Structures Monitoring AMP, is acceptable because: (1) materials for concrete used in PBN concrete SCs were specifically investigated, tested, and examined in accordance with pertinent ASTM standards at the time of construction, (2) site operating experience has not identified circulating water pumphouse or forebay concrete cracking in accessible areas, and (3) cracking due to expansion and reaction with aggregates will be managed through visual inspection of inaccessible concrete areas when they become accessible for any reason. This is consistent with the GALL-SLR Report recommendations.

Based on the program identified, the NRC staff concludes that the applicant's programs meet 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).

<u>Item 3</u>. SLRA Section 3.5.2.2.2.3, item 3, associated with SLRA Table 3.5-1 AMR item 3.5-1, 051, addresses the increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation for inaccessible concrete areas of Group 6 structures exposed to water-flow. These aging effects will be managed by the Inspections of Water-Control Structures Associated with Nuclear Power Plants AMP, which is implemented through the Structures Monitoring AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 3.

In its review of components associated with AMR item 3.5-1, 051, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Inspections of Water-Control Structures Associated with Nuclear Power Plants AMP, implemented through the Structures Monitoring AMP, is acceptable because, consistent with GALL-SLR recommendations, an increase in porosity and permeability and a loss of strength due to leaching of calcium hydroxide and carbonation will be managed through visual inspection of inaccessible concrete areas when they become accessible for any reason.

Based on the program identified, the NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.5.2.2.2.3, item 3, criteria. For those AMR items associated with SLRA Section 3.5.2.2.2.3, 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).

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, as amended by letter dated April 21, 2021, 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 (a) Group 7 and 8 SS tank liners exposed to standing water, and (b) aluminum and SS support members, welds, bolted connections, and support anchorage to building structures exposed to air or condensation, which will be managed by either the External Surfaces Monitoring of Mechanical Components AMP, the Structures Monitoring AMP, or the Fire Protection AMP. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.4.

For SLRA Table 3.5-1 AMR item 3.5-1, 052, the applicant stated that this item is not applicable because tanks at PBN are addressed with the mechanical system to which they belong. The applicant further stated that the External Surfaces Monitoring of Mechanical Components AMP is credited with managing the condition of SS components in locations where water could collect. The NRC 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 UFSAR and SLRA confirmed that tanks with SS liners exposed to standing water that are within the scope of SLR are addressed as components of the applicable mechanical system, or by other AMR line items.

For SLRA Table 3.5-1 AMR item 3.5-1, 099, the applicant stated that this item is not used. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.2.4 and determined the need for additional information, which resulted in the issuance of an RAI. RAI 3.5.2.2.2.4-1 and the applicant's response are documented in ADAMS Accession No. ML21223A308.

In its response, the applicant stated that supports for ASME Class 1, 2, or 3 components at PBN do not use SS material; therefore, they are addressed by other Table 3.5-1 AMR items (i.e., items 3.5-1, 068; 3.5-1, 087; 3.5-1, 089; and 3.5-1, 091). The applicant revised SLRA Table 3.5-1 AMR item 3.5-1, 099 to explain that loss of material and cracking of non-ASME SS supports and non-ASME SS or other aluminum structural components are addressed using AMR item 3.5-1, 100.

During its evaluation of the applicant's response to RAI 3.5.2.2.2.4-1, the NRC staff noted that SS or aluminum material is not used for the structural supports of ASME Class 1, 2, 3, or MC components, and non-ASME code SS or aluminum structural supports and components exposed to an air environment are addressed using AMR item 3.5-1, 100. The staff finds the applicant's response and changes to SLRA Table 3.5-1 acceptable because a search of the applicant's UFSAR and SLRA confirmed that (a) there are no aluminum or SS support members, welds, bolted connections or anchorage to structure for ASME Class 1, 2, 3, or MC components, (b) steel, high-strength steel, and galvanized steel supports for ASME Class 1, 2, or 3 components are addressed by AMR items 3.5-1, 068; 3.5-1, 087; 3.5-1, 089 and 3.5-1, 091, and (c) the aging effects of loss of material and cracking of SS or aluminum material for non-ASME code supports and other structural components are addressed in AMR item 3.5-1, 100.

For the SLRA Table 2 items associated with AMR item 3.5-1, 100 that cite generic note E, the SLRA credits the Structures Monitoring AMP to manage the aging effects for SS liners (refueling cavity) and covers (sand box, PBN Unit 1 sump A strainer). The AMR items cite plant-specific note 4, which states that structural SS that is exposed to air-indoor uncontrolled during normal plant operation is inspected under the Structures Monitoring AMP, or in the case of the transfer canal, by the ASME Section XI, Subsection IWE AMP and the structural equivalent of the GALL-SLR Report XI.M36 External Surfaces Monitoring of Mechanical Components AMP. However, the NRC staff noted that one of the intended functions assigned to this component is pressure boundary and so determined the need for additional information, which resulted in the issuance of an RAI. RAI 3.5.2.2.2.4-2 and the applicant's response are documented in ADAMS Accession No. ML21223A308.

In its response, the applicant stated that pressure boundary is not an intended function for the identified SS covers (for the sandbox and PBN Unit 1 sump A strainer); therefore, a revised AMR line item was added to SLRA Table 3.5.2-1. The applicant also replaced the associated AMR item for the SS refueling cavity liner with AMR item 3.3-1, 125, since this component provided a pressure boundary function and the new AMR item addresses the same aging effects when exposed to a treated borated water environment (similar to the reactor cavity seal ring and other refueling components). The applicant revised SLRA Table 2.4-1, Section 3.5.2.2.2.4, Table 3.5-1, and Table 3.5.2-1 accordingly, to reflect all these changes.

During its evaluation of the applicant's response to RAI 3.5.2.2.2.4-1, the NRC staff noted that the revised AMR tables no longer have components with a pressure boundary function that is associated with AMR item 3.5-1, 100. The staff finds the applicant's response and changes to the SLRA section and tables (listed above) acceptable because the use of visual inspection to detect cracking due to SCC for structural supports not having a pressure boundary function will allow for proper corrective actions to be taken before a loss of function, once the aging effects are detected.

Based on its review of components in SLRA Table 3.5.2-1 items associated with AMR item 3.5.1-100, for which the applicant cited generic note E, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Structures Monitoring AMP is acceptable for the following reasons: (a) there has been no site operating experience of cracking or localized corrosion of SS or aluminum SSCs, and (b) the use of periodic visual inspections through the Structures Monitoring AMP to detect cracking and loss of material for the applicable non-ASME Code SS or aluminum supports and other structural components will allow for degradations to be detected and corrective actions to be taken before a loss of intended function.

The NRC staff also noted that other SLRA Table 2 items associated with AMR item 3.5-1, 100 that cite generic note E, credit the Fire Protection AMP to manage the aging effects for the SS rollup door, SS fire barrier penetration seals, and aluminum and SS fire stops and wraps. The AMR items in SLRA Table 3.5.2-10 cite plant-specific note 4, which states that SS fire barriers that are exposed to an air-indoor uncontrolled or air-outdoor environment during normal plant operation are inspected under the Fire Protection AMP, that coordinates with the External Surfaces Monitoring of Mechanical Components AMP. The AMR items in SLRA Table 3.5.2-14 cite plant-specific note 2, which states that SS and aluminum components that are exposed to an air-indoor uncontrolled environment during normal plant operation are inspected under the Fire Protection AMP, which coordinates with the External Surfaces Monitoring of Mechanical Components AMP.

Based on its review of these components associated with AMR item 3.5-1, 100, for which the applicant cited generic note E, the NRC staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Fire Protection AMP is acceptable for the following reasons: (a) there has been no site operating experience of cracking or localized corrosion of SS or aluminum SSCs, and (b) the Fire Protection AMP performs visual inspections at a frequency of at least once every 5 years for fire-rated structures, which is the same inspection method and frequency used by the Structures Monitoring AMP to ensure that the aging effects of cracking and loss of material can be detected and corrective actions be taken before a loss of intended function.

During its review of components associated with AMR item number 3.5-1, 100, for which the applicant cited generic notes A or C, the NRC staff noted that the SLRA credits the Structures Monitoring AMP or the External Surfaces Monitoring of Mechanical Components AMP to manage the aging effect for SS new fuel storage racks, aluminum manhole covers, SS and aluminum miscellaneous structural components, SS anchorage or embedment, SS component supports, and SS and aluminum insulation. Based on its review of the components, the staff determined that the applicant met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Structures Monitoring AMP or the External Surfaces Monitoring of Mechanical Components AMP is acceptable because 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 actions to be taken before a loss of intended function.

Based on the programs identified, the NRC 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 SRP-SLR Table 3.5-1, item 3.5-1, 053, states that there is no 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 component supports at PBN requiring evaluation as a TLAA. SLRA Section 3.5.2.2.2.5 also states that cumulative fatigue damage due to cyclic loading is an applicable aging effect for cranes (overhead heavy load handling systems) at PBN and is separately addressed in SLRA Section 4.7.6.

The specific component support groups addressed in SLRA Section 3.5.2.2.2.5 are the following: (1) Group B1.1, supports for ASME Code Class 1 piping and components, (2) Group B1.2, supports for ASME Class 2 and 3 piping and components, and (3) Group B1.3, supports for ASME Class MC components. SRP-SLR Section 3.5.2.2.2.5 states that evaluations involving time-dependent fatigue, cyclical loading, or cyclical displacement of component support members, anchor bolts, and welds are TLAAs as defined in 10 CFR 54.3 only if a CLB fatigue analysis exists.

To check if a CLB fatigue analysis exists for the component supports, the NRC staff reviewed the following sections of the UFSAR: (1) Section 3.0, “Reactor,” (2) Section 4.0, “Reactor Coolant System,” (3) Section 5.0, “Containment System Structure,” (4) Section 6.0, “Engineering Safety Features,” (5) Section 9.0, “Auxiliary and Emergency Systems,” and (6) Section 10.0, “Steam and Power Conversion.” In its review, the staff did not identify any fatigue analysis for the component supports.

The NRC staff also noted that the PBN containment structure is a right cylinder with a flat base slab and a shallow domed roof, as described in UFSAR Section 5.1.2.1. A steel liner is attached to the inside face of the concrete shell. In addition, the base liner is installed on top of the structural slab and is covered with concrete. The fatigue TLAAs on the containment steel linerand penetrations are addressed in SLRA Section 4.6, and the staff’s evaluation of the TLAAs is documented in SE Section 4.6. Given the steel liner configuration and separate fatigue analysis for the containment steel liner and penetrations, the staff finds that the absence of an existing fatigue analysis for Class MC supports is reasonable.

As discussed above, the NRC staff finds that the applicant’s evaluation of cumulative fatigue damage for the component supports is acceptable in accordance with the guidance in SRP-SLR Section 3.5.2.2.2.5 because there is no CLB fatigue analysis involving a time-dependent assumption for the component supports.

3.5.2.2.2.6 Reduction of Strength and Mechanical Properties of Concrete Due to Irradiation

SLRA Section 3.5.2.2.2.6, as amended by Supplement 1, dated April 21, 2021, 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 environment. The reactor cavity concrete consists, in part, of the primary and biological shield walls (PSW, BSW) with corresponding thicknesses of 3 feet 2 inches and 6 feet 6 inches, respectively. The applicant determined that while the PSW has a subsequent renewal function of radiation shielding, shelter/protection, and structural support, the BSW has no structural support function, other than to support itself. However, the BSW is physically and structurally connected to the PSW and thus, being the leading part of the PSW towards the RV air cavity, it shares the PSW’s design basis functions for shielding and protection. The NRC staff reviewed the applicant’s evaluation against the criteria in SRP-SLR Section 3.5.2.2.2.6.

The applicant reviewed the interconnected PSW, BSW structural integrity (see further discussions below) to ensure that it remains structurally sound until the end of the subsequent period of extended operation so that there would be no interaction of the PSW, BSW with component(s) performing safety functions. The applicant’s evaluation determined that a plant-specific AMP is not required to manage the effects of irradiation on BSW and PSW reinforced concrete even though the calculated ex-vessel neutron fluence gamma dose is in excess of thresholds in SRP-SLR Section 3.5.2.2.2.6, as modified by SLR-ISG-2021-03-STRUCTURES.

The applicant based its determination that a plant-specific AMP is not required on two sets of calculations. These calculations are documented in LTR-REA-20-28-NP, Revision 0, "Reactor Vessel, Reactor Vessel Supports, and Concrete Bioshield Exposure Data in Support of the Point Beach Unit 2 Subsequent License Renewal (SLR) Time-Limited Aging Analysis (TLAA)" (ADAMS Accession No. ML20329A264), dated July 31, 2020. The calculations provide estimates of the neutron fluence and gamma dose exposures to the inner surface of the BSW at the axial height of limiting fluence from the RV (i.e., at the traditional beltline region).

The first set are plant-specific Westinghouse fluence and gamma dose calculations projected to 72 EFPY for the end of the subsequent period of extended operation. The NRC staff noted that SLRA Section 4.2.1 defines the EFPY projections through the end of the subsequent period of extended operation for a PBN unit to be the sum of the accumulated EFPY and the projected future EFPY. The SLRA states that the EFPY at the end of 60 years of operation was calculated to be 53 EFPY. The SLRA further states that an estimate of the EFPY at the end of 80 years of operation can be made by assuming a 95 percent capacity factor for the 20-year subsequent period of extended operation. Using this approach, the projected 80-year EFPY for both PBN Units 1 and 2 is 72 EFPY, which is more conservative than the traditional assumption of a 90 percent capacity factor over 80 years. The second set of calculations provide the neutron fluence and gamma dose attenuation and radiological effects within the BSW concrete and also estimates of exposures for the PSW geometry to the end of the subsequent period of extended operation.

With regard to the aforementioned Westinghouse analyses, the NRC staff confirmed that they utilized plant-specific analytical models consistent with the NRC-approved fluence analysis methodology documented in WCAP-18124-NP-A, Revision 0, "Fluence Determination with RAPTOR-M3G and FERRET" (ADAMS Accession No. ML18204A008), and followed the guidance presented in RG 1.190. For the plant-specific analyses, Westinghouse performed three-dimensional (3D) discrete ordinates radiation transport calculations on a fuel-cycle-specific basis to determine the maximum neutron fluence ($E > 0.1$ MeV) and gamma dose (in rads) on the surface of the BSW. Additionally, Westinghouse augmented the results with a 10 percent positive bias, applied on the peripheral and re-entrant corner assemblies, for future fuel cycle projections to account for normal cycle-to-cycle variations that have been observed in past PBN core designs and that are expected to occur in future designs.

With regard to the applicant's analyses, the NRC staff noted that the attenuation of the Westinghouse calculated neutron fluence and gamma dose results that occurs within the reactor cavity concrete is based on a methodology developed by EPRI in its Report No. 3002011710, "Irradiation Damage of the Concrete Biological Shield Wall for Aging Management." The applicant applied the EPRI methodology to assess the attenuation of neutron fluence and of gamma dose based heating in the BSW and to estimate the neutron and gamma environment within the PSW geometry.

The results of the Westinghouse discrete ordinate transport calculations for neutron fluence and gamma dose are reported in Table 3.5.2.2-2 of SLRA Section 3.5.2.2.2.6, as amended by Supplement 1. Although reported exposures on the inner surface of the BSW exceed the radiation thresholds in the SRP-SLR, SLRA Section 3.5.2.2.2.6 states that the BSW performs no structural function. Furthermore, through application of the aforementioned EPRI model, the applicant also established that the neutron fluence and gamma dose exposures at the inner service of the PSW, which does serve a structural function, are within the radiation threshold levels of concern identified in the SRP-SLR.

On the analysis of irradiation effects on the BSW concrete, the applicant utilized the EPRI model from Report No. 3002011710 to determine the depth of the BSW concrete where the neutron fluence and gamma dose would fall below the radiation thresholds identified in the SRP-SLR. Additionally, the applicant considered the effects of radiation induced volumetric expansion (RIVE) as part of the BSW structural integrity evaluation. The results indicate that the BSW concrete, at the end of the subsequent period of extended operation, will experience neutron fluence and gamma dose greater than the SRP-SLR damage thresholds to a depth of 3.92 inches (3.35 inches without RIVE, as reported in the submitted SLRA) and 24 inches, respectively. The applicant conservatively applied the effects of neutron fluence and gamma dose resulting to zero-strength concrete and its heating at these depths on the entire vertical surface of the BSW corresponding to the active nuclear fuel region. With these conservatisms in place, the applicant indicated that the BSW will continue to satisfy its design basis function for shielding radiation effects and remain in place to the end of the subsequent period of extended operation.

<u>Fluence Evaluation on Concrete Walls</u>

The NRC staff observed that the applicant's evaluation is based on neutron fluence and gamma dose results for which the uncertainty has not been explicitly assessed. The staff noted that the depth of neutron fluence and gamma dose penetration into the BSW concrete may in fact be deeper with consideration of this uncertainty. Hence, it may influence the outcome of the applicant's assessment of the BSW continuing to satisfy its design basis function and remaining in place during the subsequent period of extended operation. While WCAP-18124-NP-A is an NRC-approved fluence methodology for determining exposure of the RV beltline material, no method, generic or specific to PBN, has been approved by the NRC for calculations of exposure for the BSW and PSW concrete to radiation. In prior reviews, the staff generally found calculations for neutron fluence and gamma dose acceptable (e.g., Safety Evaluation Reports Related to the Subsequent License Renewals of Peach Bottom Atomic Power Station, Units 2 and 3, and Surry Power Station, Units 1 and 2 (ADAMS Accession Nos. ML20044D902 and ML20052F523, respectively)) on the basis that the results are much less than the SRP-SLR damage thresholds and that the uncertainty in the calculations necessary for the results to exceed the damage thresholds is substantial (e.g., 200%). However, in the present review, the neutron fluence and gamma dose for concrete already exceed the SRP-SLR damage thresholds. The staff could not conclude whether reasonable assurance exists that the limiting neutron fluence and gamma dose values for concrete were identified with sufficient margin and conservatism to accommodate uncertainties in the fluence analysis methodology associated with calculating radiation exposure at an ex-vessel location. Therefore, the staff issued RAI 3.5.2.2.2.6-1 (ADAMS Accession Nos. ML21162A003, ML21161A119), requesting an estimate of the uncertainty on the neutron fluence and gamma dose results at the BSW surface. The applicant's response is documented in a letter dated July 8, 2021 (ADAMS Accession No. ML21189A173).

The NRC staff evaluated the applicant's response to RAI 3.5.2.2.2.6-1 and noted that the applicant conservatively estimated bounding values of the neutron fluence and gamma dose analytical uncertainties via an RV extended beltline uncertainty analysis. This analysis examined the uncertainties of neutron fluence and gamma dose at the RV inner and outer surfaces at various axial locations outside the beltline region through perturbation of parameters that have a significant impact on radiation exposure results. These parameters included, among others, core neutron source, reactor geometry, and coolant temperature. The applicant also doubled the uncertainty associated with the concrete composition parameter (further discussed below). The estimate of uncertainties from the extended beltline analysis, taken to be representative of the uncertainties at the BSW surface, were obtained from the outer surface of the RV at the axial location closest to the elevation of the maximum neutron fluence and gamma dose projections from the core midplane analysis. Because the extended beltline analysis, by design, did not consider axial elevations slightly above the core midplane, the difference in axial locations between the two analyses (i.e., the beltline analysis and the extended beltline analysis) is approximately 66 inches (167cm). The neutron fluence and gamma dose uncertainties at the BSW surface were both estimated to be 20 percent.

The RAI response, however, indicates that the estimate of the uncertainty was established using an existing RPV extended beltline uncertainty analysis. This statement implies that the analysis may have been submitted to the NRC in a prior review. The NRC staff requested clarification on the origins of the uncertainty analysis described in the applicant's response to RAI 3.5.2.2.2.6-1 in a public meeting with the applicant on August 5, 2021 (see meeting Agenda in ADAMS Accession No. ML21204A070). By letter dated September 10, 2021 (ADAMS Accession No. ML21253A138), through a supplement to RAI 3.5.2.2.2.6-1, the applicant further clarified its RAI 3.5.2.2.2.6-1 response stating that the extended beltline uncertainty analysis is part of WCAP-18124-NP-A, Revision 0, Supplement 1 (ADAMS Accession No. ML20344A385). The applicant indicated that the analysis examines parameters having a potentially significant contribution to the core neutron source, such as reactor geometry, coolant temperature, discretization, and modeling approximation uncertainties; and noted that the level of detail in the model used in the extended beltline uncertainty analysis is commensurate with that of the plant-specific PBN model used in the analyses discussed in SLRA Section 3.5.2.2.2.6, as amended by Supplement 1. The response also indicated that the estimated 20 percent analytical uncertainty, which was determined for 1 MeV neutrons, is bounding for neutron energies greater than 1 MeV and representative for neutrons with energies greater than 0.1 MeV (which is the energy range pertinent to concrete exposure). This is because the maximum BSW exposures occur at an elevation near the core midplane where the analytical uncertainty for 1 MeV neutrons in the reactor cavity is approximately 12 percent. While the uncertainty for 0.1 MeV neutrons is greater than 12 percent at this location, it is not so significantly different as to exceed the 20 percent overall uncertainty at the BSW surface.

The applicant's response to RAI 3.5.2.2.2.6-1 also reassessed the depth within the BSW concrete where the neutron fluence and gamma dose would fall below the damage thresholds identified in the SRP-SLR when considering application of the estimated uncertainties. This reassessment also considered the effects of RIVE. The results indicate that the BSW concrete, at the end of the subsequent period of extended operation, will experience neutron fluence and gamma dose greater than the SRP-SLR damage thresholds to a depth of approximately 3.66 inches and 28.5 inches, respectively, with a corresponding increase in RIVE when considered.

The NRC staff examined the extended beltline uncertainty analysis presented in WCAP-18124-NP-A, Revision 0, Supplement 1 and verified the selection of parameters pertinent to core neutron source uncertainties and the detail of the model as indicated by the applicant in the aforementioned public meeting and in the RAI 3.5.2.2.2.6-1 supplemental response. The staff also noted that the range over which the various parameters in the topical report study were perturbed, in particular the concrete composition parameter, which varied the prevalence of hydrogen, were reasonable.

The NRC staff finds that the methodology described in SLRA Section 3.5.2.2.2.6, and in the response to RAI 3.5.2.2.2.6-1, as supplemented, for neutron fluence and gamma dose exposure estimates for the BSW and PSW is acceptable as follows:

a) Information from the PBN plant-specific Westinghouse analyses was used to support neutron fluence and gamma dose estimates at the BSW surface (and subsequently, in the PSW geometry). The axial location of the SLRA estimates for both PBN units corresponds to that of the Westinghouse RV analysis for the maximum calculated neutron fluence and gamma dose of PBN Unit 2. The estimates occur at an azimuthal angle of 90 degrees (because this location is the closest to the centerline of the core) and at approximately 17 inches (43 cm) and approximately 14.5 inches (37 cm) above the core midplane, respectively. While RG 1.190 is only valid for the traditional beltline region of the RV, an appropriate level of detail was provided for the geometry and composition of the relevant structures. Specifically, the RV cavity, BSW, RV supports, and ring girder, were all explicitly modeled in the Westinghouse analyses. Consistent with the RAPTOR-M3G methodology presented in WCAP-18124-NP-A, the axial flux in the core was characterized with a burnup weighted average of the respective power distributions from individual operating cycles, with the most recent operating cycle considered to be representative of future operating cycles (with a 10 percent positive bias on peripheral assembly power). The use of approved analysis methods, consistency with RG 1.190, the use of a model with geometric detail and material composition outside the traditional beltline region that is specific to PBN, the incorporation of power distributions from PBN's actual operating history, and the application of a positive 10 percent bias on projected operating cycles provides estimates of neutron fluence and gamma dose that are expected to be conservative for the subsequent period of extended operation. The staff therefore finds the applicant's approach to be reasonable. The staff also notes that any significant impacts to these estimates due to changes in operations would need to be addressed by the licensee prior to making such changes.

b) The uncertainty in the neutron fluence and gamma dose at the inner surface of the BSW is expected to be higher than that for the traditional beltline region given that the RAPTOR-M3G methodology is not well validated for predicting neutron and gamma exposures at ex-vessel locations. However, given that the air gap between the RPV outer surface and the BSW surface is approximately 5 inches and the reasonable level of detail in the extended plant-specific model, it is not expected that the uncertainties will be significantly higher. Conversely, the extended beltline analysis begins approximately 12 inches (30 cm) above the top of that active fuel, and it is known that, for the RAPTOR-M3G methodology, analytical uncertainty increases with axial distance above the top of the active fuel. Therefore, the applicant's approach of estimating the uncertainty at the BSW using an extended beltline analysis is expected to yield conservative results. According to WCAP-18124-NP-A, the RAPTOR-M3G methodology has an estimated analytical uncertainty of 12 percent for neutron fluence at the mid-core location. The applicant's extended beltline analysis estimated an analytical uncertainty of 20 percent for neutron fluence. This increase in analytical uncertainty is consistent with the discussion above. Therefore, the staff finds that there is reasonable assurance that 20 percent is a conservatively bounding estimate for the neutron fluence uncertainty at the BSW. A similar line of reasoning applies to the gamma dose predictions; the gamma dose prediction capabilities of the RAPTOR-M3G methodology have not been as well validated as the neutron fluence prediction capabilities, but the use of an extended beltline uncertainty estimate is expected to be conservatively bounding for the core midplane location. The staff notes that the use of a 20 percent analytical uncertainty would effectively yield a net uncertainty of 21 percent for the RAPTOR-M3G methodology, as compared to the reported 13 percent.

c) The staff performed independent confirmatory calculations for the attenuation of neutron fluence and gamma dose in the BSW and to estimate exposures in the PSW geometry. These calculations utilized the Westinghouse discrete ordinates transport equation analyses estimates of the neutron fluence and gamma dose at the BSW surface, and they were performed for the both the original values presented in the SLRA and the values presented in the response to RAI 3.5.2.2.2.6-1. The attenuation results align very closely (within 3 percent) with those provided by the applicant, which utilized the models in EPRI Report No. 3002011710. The close agreement between the two attenuation calculations provides a level of confidence that the assessment of exposures in the PSW wall geometry is reasonable and that the assessment of gamma heating of the BSW in the EPRI report is also reasonable. However, EPRI Report No. 3002011710 has not been submitted to the NRC for review or endorsement, and the staff did not find it necessary to perform a full review of the EPRI report calculations or draw any conclusions about the report. As a result, this SE does not represent a generic endorsement of the findings in the EPRI report.

Structural Integrity of Walls

As noted above, the NRC staff reviewed the applicant's evaluation against the criteria in SRP-SLR Section 3.5.2.2.2.6 and additionally against the criteria in SRP-SLR 3.5.2.2.1.2, and the GALL-SLR Report, as applicable and noted below. The staff noted from the SLRA and during its audit that to date, the applicant has not identified plant-specific operating experience for reduction of strength and mechanical properties of concrete due to irradiation or thermal aging effects.

Thermal Aspects

Following the review of SLRA Section 3.5.2.2.2.6, as amended by Supplement 1, dated April 21, 2021, the NRC staff noted that the reactor coolant piping which penetrates the PSW is insulated to ensure that ambient temperatures remain within design limits. In addition, the staff noted that the reported temperature assumptions were based on the normal operating temperature of the fluid in the RV nozzle of approximately 613°F and cooling of approximately 100°F for each inch away from the heat source. Concerned that the PSW concrete may be exposed to temperatures exceeding those of the design basis and thresholds discussed in SRP-SLR Section 3.5.2.2.1.2, by email and attachment dated June 10, 2021 (ADAMS Accession Nos. ML21162A003 and ML21161A119, respectively), the staff solicited through RAI 3.5.2.2.2.6-2 the applicant to clarify the aforementioned. The request included that the applicant confirm whether accessibility and inspectability of the reactor coolant piping insulation is consistent with guidance provided in GALL-SLR AMP XI.M36, "detection of aging effects," other applicable program elements, or other applicable PBN programs, so that it can fulfill its intended function (i.e., protection of the PSW concrete to abnormal temperature and radiation exposures) during the subsequent period of extended operation. In addition, the staff, through RAI 3.5.2.2.2.6-5 by email and attachment dated June 10, 2021 (ADAMS Accession Nos. ML21162A003 and ML21161A119, respectively), requested that the applicant further clarify its statement that the temperature assumptions made were consistent with previous structural analyses.

The NRC staff reviewed the applicant's response to RAI 3.5.2.2.2.6-2, dated July 8, 2021 (ADAMS Accession No. ML21189A173), and found it acceptable for the following reasons: (a) it revised SLRA Scoping Section 2.1.5.1, SLRA Table 2.4-1 (reviewed and evaluated in Section 2.4.1 of this SE) to incorporate additional areas for AMR of insulation items; (b) it included an update to SLRA Section 3.5.2.2.1.2 (reviewed and evaluated in Section 3.5.2.2.1.2 of this SE) confirming that the concrete temperature at the PSW wall where the insulated reactor coolant piping passing through remains at or below 150 °F; (c) it clarified the type of insulation used, its construction, assembly, plant conformance to IN 2007-21 (and its Supplement 1), and measures taken or to be taken regarding aging management of the combined RMI – fiberglass insulation used in the prevalent environment of mechanical vibration, temperature, and radiation. However, the staff noted that the RAI response did not provide a revision to SLRA Commitment No. 27 regarding revision of inspection procedure(s). Following a public meeting on August 5, 2021 (ADAMS Accession No. ML 21204A070), at which the omission of visual inspections for the RMI-fiberglass insulation was discussed, the applicant supplemented its response to RAI 3.5.2.2.2.6-2 by letter dated September 10, 2021 (ADAMS Accession No. ML21253A138) amending Commitment No. 27 in SLRA Appendix A, Table 16-3, to include an additional commitment to the External Surfaces Monitoring of Mechanical Components AMP (SLRA Section B.2.3.23; reviewed and evaluated in Section 3.0.3.2.25 of this SE) for revision of procedures for visual inspections of the RCI piping RMI.

In its response to RAI 3.5.2.2.2.6-5, the applicant stated that the RV nozzle temperatures are part of the analysis of record (AOR) referenced in the PBN Extended Power Uprate License Amendment Request (EPU LAR). The NRC staff finds the applicant's response with temperatures reported in its EPU LAR (ADAMS Accession Nos. ML091250564, ML091250566, and ML091250569), evaluated by the NRC staff (ADAMS Accession Nos. ML110880039 and ML110450159), acceptable because it reflects the AOR for the RCS coolant and RV vessel head temperatures corresponding to a reactor thermal power of 1800 MWt and they are consistent with those reported in SLRA Supplement 1. The LAR AOR reported numbers are further corroborated in Table 4.1-2 of the UFSAR.

With regard to overall reactor cavity temperatures reported in SLRA Section 3.5.2.2.2.6, as amended by Supplement 1, the NRC staff noted that elevated temperatures augmented with those induced by gamma heating potentially could deplete the exposed concrete moisture content and, hence, affect the performance of reactor cavity concretes during the subsequent period of extended operation. The applicant used EPRI 3002011710 (which assumed a generic air cavity temperature of 150 °F as the threshold temperature for further analyses) in its evaluation for the effects of gamma heating on concrete, to determine that the inner concrete wall's temperature would not exceed the ACI licensing basis code requirements. Because EPRI 3002011710 has not been submitted to the NRC for review or endorsement, the staff did not find it necessary to do a review of the EPRI report calculations. For added conservatism, however, the staff addressed gamma heating in its evaluation for thermal heating affecting the BSW, PSW structural integrity of concrete, where applicable.

For the reactor cavity, the NRC staff noted that UFSAR Section 6.3 describes the reactor cavity cooling sub-system, which consists of cooling coils, fans, and ductwork arranged to supply cooled air to the annulus between the RV and the primary shield wall with cooling redundancy provided by a standby fan. In its review of UFSAR Sections 5.3 and 6.3, describing containment temperatures and ventilating and air cooling systems, the staff found that the reported ambient temperature in SLRA Section 3.5.2.2.2.6 for the reactor cavity during plant operation, at or below 105 °F, aligned with the UFSAR values. This temperature is well below the air cavity temperature of 150 °F used in the EPRI 3002011710 limiting analyses. The staff noted that the PBN air cavity temperatures are about a third less than that considered in the EPRI 3002011710 limiting gamma heating analyses, with the air flow rate as outlined in UFSAR Table 5.3-1. Hence, the staff concludes that it is highly unlikely that the concrete inner walls will be impacted by gamma heating.

Radiation Aspects

During the audit, the NRC staff verified Figure 3.5.2.2-1 of the SLRA to be representative of the general configuration of the PSW, BSW reinforced concrete designs (with their liners as attached), as well as the proximity of the RV to the BSW and, hence, its direct exposure to streaming radiation from the RV. In its evaluation of the BSW structural integrity and effects of aging due to the aforementioned fluence and gamma dose, the staff considered results of the applicant's calculations and conservatisms of assessments summarized in SLRA 3.5.2.2.2.6, SLRA Supplement 1, and RAI responses and their supplements. For the BSW and PSW concretes, the staff examined the effects of aging due to irradiation effects compounded with those of reactor cavity temperatures less than 105 ^{o}F, and on aspects the BSW concrete mix (e.g., water/cement ratio, aggregates), its steel reinforcement, and liner to the end of the subsequent period of extended operation.

For the steel liner (i.e., formwork left in place following construction) used on the exposed faces of the PSW and BSW to the reactor cavity, the applicant modified its SLRA submittal in its Supplement 1, dated April 21, 2021, to indicate that the BSW steel liner potentially could deform due to calculated RIVE neutron fluence effects and, hence, would be subject to further inspections for concrete RIVE effects. It also stated that the BSW corbels are "significant structures" that are not affected by RIVE and, hence, they will continue to support the design configuration. The NRC staff reviewed Figure 3.5.2.2-1 in SLRA Section 3.5.2.2.2.6 and confirmed the existence of corbels with flexural and shear capacities manifested by the existence of shear keys and reinforcing bars of sufficient length for development length/anchorage into the PSW, thus affirming in part the PSW structural support function. The staff also confirmed that the PSW is further removed from the intense exposure witnessed in the reactor cavity, typically at the fuel midplane.

However, concerned with the compounding effects of RIVE and potential liner embrittlement due to impacting RV radiation, the NRC staff issued RAI 3.5.2.2.2.6-3, by email and attachment dated June 10, 2021 (ADAMS Accession Nos. ML21162A003 and ML21161A119, respectively), requesting additional clarification to confirm the integrity of the BSW liner and whether the wall would remain in place during the subsequent period of extended operation. In its response by letter dated July 8, 2021 (ADAMS Accession Nos. ML21189A173), the applicant reiterated that the BSW has no structural support function except to maintain its integrity, and that its liner has no intended SLRA function(s) during the subsequent period of extended operation. Additionally, the applicant stated that the BSW and its liner would remain in place during the subsequent period of extended operation. In supplemental responses to RAIs 3.5.2.2.2.6-2 and 3.5.2.2.2.6-3, included in a letter dated September 10, 2021 (ADAMS Accession No. ML21253A138), the applicant reaffirmed that "the BSW provides shielding, this shielding does not support subsequent license renewal intended functions. Additionally, the BSW performs no structural intended functions."

In reviewing the structural integrity of the BSW as reported in the SLRA, as amended by Supplement 1, dated April 21, 2021, RAI Set 1 responses dated July 8, 2021, and further supplemented on September 10, 2021, the NRC staff noted that the applicant based its review to determine the integrity of the BSW concrete to the end of the subsequent period of extended operation on documents referenced in SLRA Section 3.5.4 (specifically SLRA references 3.5.4.1 through 3.5.4.5). Accordingly, the applicant estimated concrete damage due to RIVE to be approximately a half inch. The applicant limited the radiation damage to reactor cavity concrete just above and below the mid-height of the BSW where active fuel radiation exposure is calculated to be at maximum. The applicant focused its evaluation for degradation of BSW concrete and its integrated (anchored) liner in just that area. To this end, the applicant reported the constituents of the reactor cavity concrete in SLRA Table 3.5.2.2-1. The included constituents in the table, besides water, are cement, crushed dolomite, and alluvial sand for coarse and fine aggregates, respectively, and the Plastiment® (water reducing) admixture. The applicant then calculated the reactor cavity concrete mix of 4,000 psi concrete compressive strength to have a water cement ratio of 0.6 and stated that the reactor cavity concrete surfaces are fully covered with ¼ inch steel liners.

In its review of UFSAR Sections 1.3, 9.4, and 14.3, the NRC staff confirmed the existence of a continuous liner over the reactor cavity concrete. The staff's review of UFSAR Section 5.6.1.8 confirmed that for a concrete strength of 4,000 psi, PBN concrete mixes had a water cement ratio of at least 0.6. In its evaluation for adequacy of BSW to maintain its integrity during the subsequent period of extended operation, the staff noted, as pointed out by RJ McConn Jr., et al. in Pacific Northwest National Laboratory (PNNL) Report 15870 (an earlier revision of which was also referenced by the applicant in SLRA 3.5.4.4), that wetter concretes such as that used at PBN contain by weight an increased number of water molecules and, hence, hydrogen atoms, than normal concretes. The hydrogen nucleus is uniquely effective in slowing down fast neutrons. Therefore, increased water (or hydrogen content) in wet concretes provides further slowdown/capture neutrons thus resulting in less overall damage to concrete. Recent hybrid radiation transport calculations of combined discrete ordinates and Monte Carlo methods performed by Oak Ridge National Laboratory and discussed in NUREG/CR-7281, "Radiation Evaluation Methodology for Concrete Structures" (ADAMS Accession No. ML21216A100), also demonstrate the capacity of such wetter concretes to attenuate fluence within the concrete at a higher rate, thus resulting in overall reduced fluence effects on concrete.

The NRC staff, however, noted that the consequences of the augmented fluence uncertainty of 20 percent, as reported in "*Fluence Evaluation on Concrete Walls*" above, could potentially inflict additional radiation effects on concrete resulting in an extended volume of reduced concrete compressive strength and a corresponding increase in RIVE. Hence, the staff took additional review steps discussed below to ensure that BSW structural integrity remains to the end of the subsequent period of extended operation.

Based on the maximum neutron flux at midplane of the fuel assembly, as discussed above, the NRC staff noted that the compressive (and tensile) RIVE stresses, if any, of concrete would be limited to a narrow 2-inch band about the mid-height of the BSW. At that level, the staff noted that, in areas of RIVE-induced compressive stress dominance, once past the depth of irradiated concrete of calculated no strength and the 28.5 inches of concrete affected by gamma heating, the substrate 4,000 psi concrete would provide adequate resistance to the applied RIVE-induced compressive stresses in part due to stress redistribution resulting from the St. Venant effect, according to which stresses are increasingly reduced at distances greater than the largest cross-sectional dimension where the load is applied (see also R. von Mises). Given the 38.5 inch thickness of the BSW, the minimally affected RIVE area, if any, in compression and its effects, the staff finds that it is highly unlikely that the BSW concrete compressive stresses would negatively impact the PSW intended support function. However, on the tensile side of concrete, towards the BSW outer surface, the affected liner may potentially bulge and/or locally detach. In its response to RAIs 3.5.2.2.2.6-3 and 3.5.2.2.2.6-4, dated July 8, 2021 (ADAMS Accession No. ML21189A173), and further supplemented on September 10, 2021 (ADAMS Accession No. ML21253A138), the applicant indicated that the Structures Monitoring AMP would be enhanced and SLRA Table 3.5.2-1 AMR line item revised to include monitoring of the liner for potential bulges, as leading indicators of concrete damage. The monitoring would occur at the Structures Monitoring AMP inspection frequency of five years or less to ensure that the BSW retains its integrity and remains in place.

The NRC staff finds these measures to be adequate because: (a) on the compression side of the BSW (inner side of wall), there is adequate strength to minimize its effects on the safety-related PSW; (b) on the tension side of the BSW, there is a concerted effort to monitor damage of the underlying concrete to BSW liner by looking for potential bulging/deformation/detachment of the liner; (c) the vertical liner extends the full length of the BSW for more than 15 feet, where the anchoring angles will be fully effective in all but the areas of highest fluence, which are approximately the 2 inches of concrete surface corresponding to the fuel midplane.

To further validate the applicant's claim of adequacy of the BSW to maintain its structural integrity during the subsequent period of extended operation, the NRC staff reviewed recent developments by industry and research organizations on the effects of radiation on concrete and its constituents. The staff's review of Bruck et al., which summarizes finite element analyses and experimental results of EPRI and Oak Ridge National Laboratory, and of past key studies, confirmed that RIVE effects are coupled to potential "reduction in concrete properties" due to radiation exposure and that "[n]o changes are presumed [to exist in concrete properties] when the neutron fluence drops below the threshold" of 1×10^{19} n/cm^2 (E > 0.1 MeV) in the SRP-SLR. The effects of RIVE, according to Bruck et al., referencing the work of Field et al. and Rosseel et al., would distress the inner concrete volume of a steel lined wall exposed to fluence levels of 1×10^{19} n/cm^2 up to about 6.0×10^{19} n/cm^2 (E > 0.1 MeV), which also is approximately the bounding fluence to the U.S. nuclear power plant fleet operating to 80 years, to experience compressive strains leading to increased compressive stresses (constraint induced RIVE stresses added to design basis loading stresses), while its outer part would be in tension. Kambayashi et al., based on the work of Maruyama et al. (as referenced in Kambayashi et al.), extended the Bruck et al. findings, demonstrating that unlined concrete walls could experience spalling when tension cracks interconnect radially when the volumetric expansion (ΔV) exceeds 2 percent. For lined walls experiencing cracking, their structural and shielding performance would remain relatively unaffected because of minimal crack dimensions. Kambayashi's concrete models were three-dimensional and, unlike those of past efforts, considered expansion of concrete's largest constituents, its coarse aggregates, and reinforcing bars explicitly, and reported tensile and compressive effects of RIVE on concrete. Kambayashi et al. has shown that cracks near rebars due to quartz aggregate expansion for a comparable level of exposure sustained at the U.S. nuclear power plant fleet for 80 years of operation did not appear to result in significant bond deterioration.

LePape et al. (see LePape 2020) reported that "[e]xperimental evidence shows that the primary damage mechanism of irradiated concrete is caused by the RIVE of the concrete aggregates." The process, identified as metamictimization, affects primarily quartz, which Kambayashi et al. used for their concrete models in their analysis discussed above, and feldspar aggregates that results in volumetric expansions of eighteen and eight percent, respectively. The PBN reactor cavity concrete, however, has crushed dolomite as its coarse aggregate, which is classified as a carbonate having a minimal RIVE of less than one percent as indicated by LePape, et al. As LePape et al. remarks, "[t]he absence of highly covalent bonds in carbonated minerals is … the main reason for their low RIVEs."

Carbonates that include dolomites have been found to experience beyond a threshold of fluence a constancy in RIVE between 0.3 to 0.8 percent (see LePape 2018). However, "[t]he literature data on neutron irradiated carbonates do not allow to delineate a clear trend in terms of swelling rate, as it appears … an expansion plateau is rapidly reached above fluence of 0.05 n/m^2 (E >

10 keV)." This information is corroborated with the sigmoid curve shown in Figure 8 of Bruck at al., where irrespective of fluence, RIVE in dolomites with minimal uncertainty hovers at about zero percent (i.e., no volumetric expansion). Hence, the effects of RIVE, if any, appear to be minimal.

Given that the RIVE in dolomite aggregates (used in the PBN PSW, BSW) is minimal and plateaus rather early during exposure and given the published results of calculations for concrete having quartz aggregates as constituents discussed above, the NRC staff finds that there is reasonable assurance that the temperature steel located at or about 4 inches inside the BSW would maintain its function during the subsequent period of extended operation.

Therefore, the NRC staff finds damage to BSW concrete that could potentially affect its integrity and ability to remain in place during the subsequent period of extended operation to be highly unlikely based on the following conservatisms: (a) the applicant, in its design for the support of the BSW, used two massive corbels with adequate flexural and shear capacities and anchored into the PSW; (b) the applicant used a wetter concrete during the construction of the BSW, PSW that further slows down/captures neutrons thus resulting in minimizing overall damage to concrete; (c) the literature indicates that dolomites, used as coarse aggregate in the concrete mix used by the applicant, show a RIVE between 0.3 to 0.8 percent with an expansion plateau rapidly reached at or above fluence of 0.05 n/m^2 (E > 10 keV); (d) calculations reported in the literature qualitatively indicate that effects of radiation on reinforcing bar bonding to concrete having quartz as a coarse aggregate to be minimal; (e) RIVE compressive stress effects, if any, are adequately resisted by the concrete compressive strength so that the PSW remains unaffected; (f) the applicant will monitor damage of the underlying concrete to BSW liner by looking for potential deformation/detachment of the liner using the Structures Monitoring AMP; (g) detachment of the vertical liner from the BSW is highly unlikely as it extends the full length of the BSW for more than 15 feet, where the anchoring angles will be fully effective in all but the areas of highest fluence, about 2 inches of concrete surface corresponding to fuel midplane; and (h) the effects of gamma heating considered were appropriate and would not affect the structural integrity of the BSW.

The NRC staff also finds that the PSW concrete is unaffected by irradiation effects because the fluence and gamma dose levels in the PSW are below the SRP-SLR damage thresholds.

Based on its review of SLRA Section 3.5.2.2.2.6, as amended by Supplement 1, and the referenced attachments, responses to RAIs 3.5.2.2.2.6-1, 3.5.2.2.2.6-2, 3.5.2.2.2.6-3, 3.5.2.2.2.6-4, 3.5.2.2.2.6-5, and RAI supplemental responses 3.5.2.2.2.6-1, 3.5.2.2.2.6-2, 3.5.2.2.2.6-3, 3.5.2.2.2.6-4, the NRC staff determined that the applicant met the intent of the SRP-SLR further evaluation criteria consistent with the GALL-SLR Report principles regarding the structural integrity of the PBN Units 1 and 2 BSW and PSW.

For the BSW and PSW associated with the evaluation in SLRA Section 3.5.2.2.2.6, the NRC staff concludes that a plant-specific AMP is not required to manage aging effects due to irradiation, for the following reasons:

a) The applicant's evaluation for BSW and PSW is consistent with the SRP-SLR Section 3.5.2.2.2.6 review process and its SLRA is consistent with the GALL-SLR Report.
b) The applicant demonstrated that the PBN Units 1 and 2 BSWs are designed, installed, and monitored to maintain their structural integrity and remain in place in an irradiated environment such as that to be experienced during the subsequent period of extended operation, consistent with their design basis.

c) The applicant's proposal to continue monitoring the PBN Units 1 and 2 BSW concrete through potential deformation of the encapsulating liner provides reasonable assurance that any sign of loss of BSW structural integrity will be identified in a timely fashion.
d) The applicant's proposal to continue managing aging effects for loss of structural function for the PBN Units 1 and 2 PSWs and liners using the Structures Monitoring AMP provides reasonable assurance that applicable aging effects will be adequately managed.
e) To date, the applicant has not identified plant-specific operating experience for reduction of strength and mechanical properties of concrete due to irradiation aging effects.
f) The applicant has adequately addressed the staff's concerns related to all potential aging effects consistent with the SRP-SLR and GALL-SLR Report principles.
g) In addition, the staff finds that Commitment No. 51 in SLRA Appendix A, Table 16-3, provides assure that changes will be made to the program based on ongoing research or future operating experience, if applicable and needed.

Conclusion. Based on the evaluation performed for loss of structural function of PSW, BSW walls, the NRC staff finds that the applicant's programs and AMR items in the SLRA, as amended by SLRA Supplement 1, dated April 21, 2021, are acceptable. Further, the staff finds that the applicant adequately assessed, through evaluations, that a plant-specific program is not needed to manage the effects of aging due to radiation for the PBN Units 1 and 2 BSWs, PSWs. Therefore, the applicant's evaluation of the reduction of strength and mechanical properties of concrete due to irradiation aging effects meets the intent of the SRP-SLR further evaluation criteria, consistent with the GALL-SLR Report principles. As such, the staff concludes that SLRA Section 3.5.2.2.2.6, as amended by Supplement 1, is consistent with the GALL-SLR and SRP-SLR Reports review principles to manage the effects of aging where applicable for reduction of strength and mechanical properties of concrete due to irradiation. The staff also concludes that the applicant has demonstrated that the PBN Units 1 and 2 BSWs and liners will maintain their integrity and remain in place, while the PSWs will be adequately managed so that their intended function(s) will be maintained consistent with the CLB during the 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 Vessel

SLRA Section 3.5.2.2.2.7, associated with SLRA Table 3.5-1, AMR item 3.5-1, 097, as amended by Supplement 1, dated April 21, 2021, addresses the applicant's further evaluation related to the effects of aging; specifically, to the effects of loss of fracture toughness due to neutron irradiation embrittlement of the PBN Units 1 and 2 RV steel support structure assemblies (RV SSSAs).

The amended section describes the RV SSSAs of PBN Units 1 and 2, and states that the two units have essentially identical RV SSSAs. Based on its evaluation, the applicant determined that a plant-specific AMP is not required to manage the effects of neutron irradiation on the RV SSSAs.

The applicant included tables in the SLRA that summarize plant design basis and radiation exposure information (e.g., loads, interaction ratios (IRs), displacements per atom (dpa), postulated flaws) relevant to its evaluation of the PBN Units 1 and 2 RV SSSAs for applicable aging effects during the subsequent period of extended operation.

Before reevaluating the RV SSSAs for radiation exposure induced aging effects, the applicant determined that, as reported in SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, their “existing physical 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 NRC staff’s audit of the plant operating experience for the RV SSSAs confirmed that, other than light corrosion at the base of the supports, the applicant’s non-destructive examination (NDE) Level III examinations were determined to be insignificant and that there was no damage or degradation to the RV SSSAs. The staff noted that applicable AMPs for surveillance, inspections, and examinations for the aforementioned aging effects include the ASME Section XI, Subsection IWF AMP and the Boric Acid Corrosion AMP, described in SLRA Sections B.2.3.31 and B.2.3.4, respectively, and reviewed and evaluated in SE Sections 3.0.3.2.32 and 3.0.3.2.7, respectively.

Interaction Ratios

In addition to the existing physical condition of the RV SSSAs, the summarized information in SLRA Table 3.5.2.2-4, as amended by Supplement 1, addresses the current stress IRs (i.e., ratios of applied stresses to allowable stresses) relevant to their various components. As described in RAI 3.5.2.2.2.7-2, issued by e-mail and attachment dated June 10, 2021 (ADAMS Accession Nos. ML21162A003 and ML21161A119, respectively), the reported IRs in the table are 10 to 70 percent higher than those reported previously. The NRC staff issued RAI 3.5.2.2.2.7-2 asking the applicant to explain how (i.e., the methodology used) and where (i.e., which referenced component) the IRs were calculated. The staff reviewed the applicant’s response, dated July 8, 2021 (ADAMS Accession No. ML21189A173), and found the reported overall applied methodology to calculate the IRs to be conservative and acceptable for the following reasons: (a) the applied stresses were location invariant as they represent the maximum numerically calculated stress within each of the reported components, (b) the allowable stresses were calculated consistent with the licensing basis design codes (see AISC Manual of Steel Construction—ASD, 7th Edition, ASME Code Section II, “Materials,” Part D, “Properties”), and (c) the IRs did not consider effects of radiation that would have increased the allowable yield strengths for any of the RV SSSA components and, therefore, decrease each of the considered IR values.

The NRC staff also addressed a potential discrepancy in the reported peak values of Table 3.5.2.2-4 that summarizes the stress IRs for the various RV SSSA components. Specifically, the staff noted that the reported values for the RV SSSA columns for Upset and Faulted-2 loading conditions in the table were almost unity, while those for the Faulted-1 loading condition were much less than unity. To this end, as described in RAI 3.5.2.2.2.7-3, issued by e-mail and attachment dated June 10, 2021 (ADAMS Accession Nos. ML21162A003 and ML21161A119, respectively), the staff sought a clarification for the apparent discrepancy. The staff reviewed the applicant’s response to RAI 3.5.2.2.2.7-3 in a letter dated July 8, 2021 (ADAMS Accession No. ML21189A173) that reaffirmed the consistency of the applied methodology with that used in the PBN EPU LAR and finds it acceptable for the aforementioned loading conditions because the reported IRs in the amended SLRA Section 3.5.2.2.2.7 use the same operating basis earthquake values found acceptable by the staff in its SE of the EPU LAR.

Although the IRs discussed above do not consider effects of irradiation, a potentially damaged or degraded RV SSSA and the existence of potentially undetected flaws in an irradiated environment are conditions that can impact the structural integrity of the RV SSSAs because of their loss of fracture toughness due to irradiation. The key tenets that the applicant considered in its facture mechanics evaluation for the subsequent period of extended operation (which were confirmed by the staff during its audit) consist of the reexamination of the methodology and applied acceptance criteria with respect to the original or previously updated analyses and fabrication procedures used in the construction of the RV SSSAs, along with their ongoing physical inspection and examinations.

The fracture mechanics approach is a recommended approach that the applicant followed to evaluate the structural integrity and loss of fracture toughness of the RV SSSAs due to neutron irradiation embrittlement. The recommended NRC guidance on the fracture mechanics methodology is discussed in NUREG-1509, "Radiation Effects on Reactor Pressure Vessel Supports," issued May 1996, the successful implementation of which rests with the consideration of the aforementioned key tenets.

While SLRA Table 3.5.2.2-6 summarizes postulated critical flaw sizes for 72 EFPY, further discussed below, the NRC staff noted in SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, that the RV SSSAs maintain their structural integrity and flaw tolerance even though calculated IRs for Upset and Faulted-2 loading conditions approach unity. Therefore, concerned that design stresses approach controlling material yield stresses without consideration of potentially undetected flaws, the staff sought further clarification on the IRs in RAIs 3.5.2.2.2.7-4 and 3.5.2.2.2.7-5, issued by e-mail and attachment dated June 10, 2021 (ADAMS Accession Nos. ML21162A003 and ML21161A119, respectively). Specifically, these RAIs inquired where on the supports the maximized IRs occur, the methodology used to calculate these, and whether they explicitly consider potentially undetected flaws and residual stresses (for weldments). The RAIs also requested clarification on the adequacy and consistency of the ASME Section XI, Subsection IWF AMP with that of the GALL-SLR XI.S3 to support the review of relevant RV SSSA AMR items.

The NRC staff reviewed the applicant's responses to RAIs 3.5.2.2.2.7-4 and 3.5.2.2.2.7-5, dated July 8, 2021 (ADAMS Accession No. ML21189A173), for assurance of the structural integrity and flaw tolerance of the RV SSSAs and finds them acceptable for the following reasons:

(a) The methodology used to calculate the IRs in SLRA Table 3.5.2.2-4 is conservative. It is based on stresses resulting from a combination of maximum loads without consideration of flaws and welding-induced residual stresses, and on the allowable stress design (ASD) concept consistent with the American Institute of Steel Construction (AISC) Manual of Steel Construction ASD, 7th edition, which is the structural steel design licensing basis code. The ASD accounts for uncertainties, such as those in assessing working loads (stresses), yield (elastic) strengths of materials used, mode(s) of potential failure, methods of construction pursued through the use of safety factors or reduction in allowable stresses, as is the case of the maximized IRs at the full penetration welds of the columns.

(b) The ASME Section XI, Subsection IWF AMP inspections and examinations are adequate to identify potential flaws in RV SSSAs as the postulated critical flaw sizes for components whose IRs approach unity are deemed to be much larger than the comparable postulated critical flaw sizes allowed by ASME Code Section XI for pressure-retaining components. Furthermore, as noted in SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, there are no indications reported to date in the required ASME Code Section XI ISIs performed, which the staff confirmed during its audit.

(c) It is highly unlikely that applicable aging effects (loss of material/fracture toughness) would enlarge undetectable flaws or spawn new ones due to irradiation embrittlement that would diminish the RV SSSA flaw tolerance, since an additional (10-percent) bias was introduced on the power in peripheral fuel assemblies, augmenting fluence/exposure accordingly. This resulted in larger iron dpa values (LTR-REA-20-28-NP, Revision 0, included as Attachment 1 of Enclosure 4 to the SLRA (ADAMS Accession No. ML20329A264)), which correlate to an increase in nil-ductility transition temperature (ΔNDTT) or embrittlement of the RV SSSAs, as discussed in Section 3 of NUREG-1509.

Neutron Fluence

The NRC staff noted that conclusions made in SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, with respect to aging management of the box ring girder and six columns of the PBN Units 1 and 2 RV SSSAs depend, in part, on the projected 72 EFPY neutron fluence at the end of the subsequent period of extended operation to be representative of that for 80 years of operation, as documented in SLRA Section 4.2.1, “Neutron Fluence Projections.”

During its evaluation of SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, the NRC staff noted that Westinghouse performed the neutron fluence calculations in the manner discussed in SLRA Section 3.5.2.2.2.6; that is, calculations used plant-specific analytical models, the NRC-approved fluence analysis methodology documented in WCAP-18124-NP-A, Revision 0, and the guidance presented in RG 1.190. Westinghouse performed three-dimensional discrete ordinates radiation transport calculations on a fuel-cycle-specific basis to determine the maximum neutron fluence (E > 0.1 MeV) dpa to the end of the subsequent period of extended operation on the RV SSSA components. A 10-percent positive bias was applied on the peripheral and reentrant corner assemblies for future fuel cycle projections. This bias is intended to account for normal cycle-to-cycle variations that have been observed in past PBN core designs and that are expected to occur in future designs. The results of the plant-specific Westinghouse analyses are documented in LTR-REA-20-28-NP, Revision 0 (included as Attachment 1 of Enclosure 4 to the SLRA (ADAMS Accession No. ML20329A264)).

The results of the Westinghouse discrete ordinate transport analyses for the maximum projected neutron fluence and dpa of the PBN Units 1 and 2 RV SSSAs are documented in SLRA Table 3.5.2.2-5. These results are used by the applicant in determining critical flaw sizes for RV SSSA components. However, the NRC staff observed that the applicant’s determination of critical flaw sizes is based on neutron fluence and dpa results for which the uncertainty has not been assessed. As discussed in Section 3.5.2.2.2.6, the 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, but in the present review, the reported neutron fluence and gamma dose for concrete already exceed the SRP-SLR damage thresholds. This suggests that the margin to critical flaw size for the RV SSSAs is also diminished. Therefore, the staff could not conclude that reasonable assurance exists that the limiting neutron fluence and dpa values for RV SSSAs were identified with sufficient margin and conservatism to accommodate uncertainties in the fluence analysis methodology associated with calculating exposure at an ex-vessel location. Therefore, for an estimate of the uncertainty on the neutron fluence and dpa results for the RV SSSAs, the staff issued RAI 3.5.2.2.2.7-1 by e-mail and attachment dated June 10, 2021 (ADAMS Accession Nos. ML21162A003 and ML21161A119, respectively).

The NRC staff evaluated the applicant’s response to RAI 3.5.2.2.2.7-1, documented in a letter dated July 8, 2021(ADAMS Accession No. ML21189A173), and noted that, as with the response to RAI 3.5.2.2.2.6-1 that the staff discussed in SE Section 3.5.2.2.2.6, the applicant conservatively estimated bounding values of the neutron fluence and dpa analytical uncertainties in an RV extended beltline uncertainty analysis. This analysis examined the uncertainties of neutron fluence at the RV inner and outer surfaces at various axial locations outside the beltline region through perturbation of parameters that have a significant impact on results. These parameters included, among others, core neutron source, reactor geometry, and coolant temperature. The applicant also doubled the uncertainty associated with the concrete composition parameter. The estimate of uncertainties from the extended beltline analysis, taken to be representative of the uncertainties at the RV SSSAs, were obtained from the outer surface of the RV at the axial location closest to the elevation of the maximum neutron fluence projections from the original analysis. The RV SSSAs considered were the RV support columns, the ring girder lower edge, and the ring girder upper edge. Because the extended beltline analysis, by design, did not consider axial elevations slightly above the core midplane, the uncertainty for the RV support columns was determined at approximately 12 inches (30 cm) above the top of active fuel. The uncertainty for the lower edge of the ring girder was determined at approximately 27 inches (70 cm) above the top of active fuel and the uncertainty for the upper edge of the ring girder was determined at approximately 35 inches (90 cm) above the top of active fuel. The neutron fluence and dpa uncertainties for the RV support columns and ring girder lower edge were both estimated to be 20 percent while the uncertainty for the ring girder upper edge was estimated to be 25 percent.

The NRC staff finds the methodology described in the response to RAI 3.5.2.2.2.7-1 for estimating neutron fluence uncertainties for the RV SSSAs acceptable as follows.

The uncertainties in the neutron fluence results for the RV SSSAs are expected to be higher than would be determined for the traditional beltline region, given that the RAPTOR-M3G methodology is not well validated for predicting neutron fluence at ex-vessel locations. However, it is known that, for the present methodology, the analytical uncertainty increases with axial distance above the top of the active fuel, and it is expected that the uncertainties involved will do so at a greater rate with an increasing radial distance from the RV beltline region (due to the reasonable level of detail in this region in the extended plant-specific model). Therefore, the applicant's approach of estimating the uncertainties for the RV SSSAs using an extended beltline analysis is expected to yield reasonable results, for the following reasons:

(a) For the RV support columns, the distance between the RV outer surface and the RV support columns is approximately 15 inches (40 cm) while the extended beltline analysis begins approximately 12 inches (30 cm) above the top of the active fuel. While the radial distance of the support column within the beltline region is greater than the axial distance from the top of active fuel in the extended beltline analysis, the difference is not substantial. 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 (30 cm) above the top of active fuel. This increase in analytical uncertainty is consistent with the discussion above. Therefore, the staff finds that there is reasonable assurance that 20 percent is a representative estimate for the neutron fluence uncertainty for the RV support columns.

(b) For 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 there is reasonable assurance that the neutron fluence uncertainty estimates from the extended beltline analysis are representative of the neutron fluence uncertainties for these structural components at the associated axial locations.

<u>Fracture Mechanics Evaluation</u>

Section 3.5.2.2.2.7 of the SLRA, as amended by Supplement 1, includes reference 3.5.4.6, which implements the fracture mechanics methodology of NUREG-1509 for the evaluation of the RV SSSAs. The referenced evaluation is included as Attachment 2 of Enclosure 4 to the SLRA (hereinafter referenced as WCAP-18554-NP, Revision 1 (ADAMS Accession No. ML20329A264)) for the non-proprietary version, and Attachment 2 of Enclosure 5 to the SLRA (hereinafter referenced as WCAP-18554-P, Revision 1 (ADAMS Accession No. ML20329A287)) for the proprietary version. The results of the fracture mechanics evaluation postulate critical flaw sizes in SLRA Table 3.5.2.2-6 for 72 EFPY at ten RV SSSA limiting locations against which credible flaw sizes that could exist are compared.

SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, states that the postulated critical flaw sizes in SLRA Table 3.5.2.2-6 were determined by setting the applied stress intensity factor (SIF) equal to fracture toughness (K_{IC}) and back-calculating the flaw size. The applicant performed the fracture mechanics evaluation in WCAP-18554-NP/P, Revision 1, which consists of three key determinations, that of (a) the initial K_{IC}, (i.e., K_{IC} without the effect of irradiation), (b) the change in K_{IC} due to irradiation embrittlement, and (c) the characterization of postulated critical flaw sizes.

Fracture toughness

The first two key aspects of the fracture mechanics evaluation are determinations for the initial K_{IC} and the change in K_{IC} due to neutron irradiation embrittlement. The applicant discussed both of these in detail in Section 5.1 and associated subsections of WCAP-18554-NP/P, Revision 1. The applicant stated, in part, that the RV SSSAs are made of high-strength steel materials that are not comparable to the steels commonly used for the design and construction of RVs and tested to generate the K_{IC} or K_{IR} fracture toughness curves found in Article G-2000 of Appendix G to ASME Code Sections III and XI. The applicant stated that, instead of using the ASME Code K_{IC} or K_{IR} fracture toughness curves to calculate the critical flaw sizes, it **[[**

]]. The NRC staff finds the applicant's approach for determining initial K_{IC} acceptable because it is based on applicable RV SSSA **[[** **]]**.

Once the initial K_{IC} values are established, the applicant then, as outlined in WCAP-18554-NP/P, Revision 1, determined the change in K_{IC} due to embrittlement and strain rate effects from dynamic loading(s). The applicant conservatively included the strain rate effect to **[[**

]]. Once the change in K_{IC} values due to embrittlement and strain rate effect were established, the applicant then determined the K_{IC} value applicable at the **[[ ]]** discussed in Section 5.1.2 of WCAP-18554-NP/P, Revision 1 (see Table 5-2). The applicant showed the calculated K_{IC} values at **[[ ]]** in Table 5-1 of WCAP-18554-NP/P, Revision 1. The NRC staff notes that 42 EFPY represents approximately the current operational period for both PBN units per the number of completed fuel cycles given in Section 2 (e.g., as shown in Tables 2.4-4 and 2.5-4) of WCAP-18555-NP, Revision 1 (Attachment 3 of Enclosure 4 to the SLRA (ADAMS Accession No. ML20329A264)).

The NRC staff finds that the shift in fracture toughness due to the strain rate effect described in Section 5.1.1.6 of WCAP-18554-NP/P, Revision 1, for RV steels is applicable to high-strength steels as well. This is a reasonable assumption for the high-strength steels of the RV SSSAs because dynamic fracture toughness data for such steels is generally scant compared to those of RV steels, which have ample fracture toughness data from surveillance specimens required for their monitoring and testing. The staff also finds the temperatures listed in Table 5-2 of WCAP-18554-NP/P, Revision 1, to be acceptable because of the applied conservatisms (e.g., reduction of **[[ ]]**) to the RV SSSA components discussed in Section 5.1.2, except for the **[[ ]]**.

In Section 5.1.2 of WCAP-18554-NP/P, Revision 1, the applicant stated that the vertical legs of the supports and the corners of the hexagonal ring-beam support (box ring girder) are exposed to considerable movement of ambient temperature air and, therefore, their temperature is close to that of ambient (approximately 65 °F to 100 °F). The NRC staff confirmed this in its review of UFSAR Sections 5.3.1.1 and 3.5.2.1. The applicant also reiterated, in its supplemental response to RAIs 3.5.2.2.2.7-2 and 3.5.2.2.2.7-4, included in the letter dated September 10, 2021 (ADAMS Accession No. ML21253A138), that the movement of air takes place without disturbing the RV SSSAs. The staff, however, noted that some of the temperatures of the RV SSSA components reported in Table 5-2 of WCAP-18554-P, Revision 1, exhibit temperatures higher than those of the circulating air, particularly the **[[ ]]**. The staff, through RAI 3.5.2.2.2.7-6 issued by email and attachment dated June 10, 2021 (ADAMS Accession Nos. ML21162A003 and ML21161A119, respectively), sought clarification as to whether the temperature specified in Table 5-2 of WCAP-18554-NP/P, Revision 1, for the **[[ ]]** could result in nonconservative fracture toughness at that location because the specified temperature is higher than that of the circulating air. In the response to RAI 3.5.2.2.2.7-6 included in the letter dated July 8, 2021 (ADAMS Accession Nos. ML21189A173 and ML21189A174 for the non-proprietary and proprietary versions, respectively), the applicant stated that the temperature of about 65 °F to 100 °F, due to circulating air at the corners of the hexagonal ring-beam supports, is an assumption and not a measured value. The applicant also stated that the appropriate bulk temperatures at the RV SSSA for fracture toughness calculations were determined based on those used in CLB calculations and that the temperatures were **[[ ]]**. The staff finds the applicant's response acceptable because the bulk temperatures at the RV SSSA were based on those used in CLB calculations and contain a reasonable amount of conservatism for the fracture mechanics evaluation.

The NRC staff noted that the change in initial K_{IC} is largely due to neutron embrittlement, which the applicant described in Section 5.1.3 of WCAP-18554-NP/P, Revision 1. The applicant determined the effect of neutron embrittlement from the upper bound curve of Figure 3-1 of NUREG-1509, which shows the ΔNDTT as a function of irradiation exposure expressed as dpa.

The applicant presented the dpa and corresponding ΔNDTT at various locations of the RV SSSA in Table 5-5 and the ΔNDTT at the ten limiting locations of the RV SSSA in Table 5-6 of WCAP-18554-NP/P, Revision 1.

The NRC staff confirmed the consistency of dpa values in Table 5-5 of WCAP-18554-NP/P, Revision 1, with the exposure data in Table 4-14 of LTR-REA-20-28-NP, Revision 0, included as Attachment 1 of Enclosure 4 to the SLRA (ADAMS Accession No. ML20329A264). The staff then confirmed that the applicant's use of Figure 3-1 of NUREG-1509 is appropriate as it is the recommended method for calculating ΔNDTT in the fracture mechanics methodology outlined in Figure 4-3 of NUREG-1509. The staff noted that some components of the RV SSSAs, however, are made of copper-bearing alloy steels, particularly the welded T-1 high-strength steel plates (ASTM A514 or A-517 Type F per Section 5.1.1.1 of WCAP-18554-NP/P, Revision 1) of the box ring girder and shear brace I-beams (see also Section 3 of WCAP-18554-NP/P, Revision 1). The staff also noted that, even though the embrittlement curves in Figure 3-1 of NUREG-1509 were generated mostly from ASTM A212B steel, a noncopper-bearing (carbon) steel, the T-1 steel plates of the box ring girder and shear brace I-beams, are in the dpa range of Figure 3-1 upper bound curve (see Tables 5-5 and 5-6 of WCAP-18554-NP/P, Revision 1) for which there are data for copper-bearing alloy steels (ASTM A350LF3) used by the applicant. Based on this discussion, the staff finds the applicant's use of the upper bound curve in Figure 3-1 of NUREG-1509 to be reasonable and, therefore, acceptable for calculating the ΔNDTT values for the RV SSSAs.

Postulated critical flaw sizes

The third key aspect of the fracture mechanics evaluation is determination of postulated critical flaw sizes, which the applicant discussed in Section 7 of WCAP-18554-NP/P, Revision 1. As previously stated, the applicant determined the postulated critical flaw sizes by setting the applied SIF equal to K_{IC} (with the change due to effects of irradiation included) and back-calculating the flaw size for stresses resulting from the following four design basis load combinations listed in SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, and further discussed in Section 4 of WCAP-18554-NP/P, Revision 1, and in Table A.5-3 of the UFSAR:

Normal: Deadweight stress + thermal stress

Upset: Normal + operational basis earthquake stress

Faulted-1: Normal + safe shutdown earthquake stress

Faulted-2: Normal + safe shutdown earthquake stress + loss-of-coolant (LOCA) stress

The applicant stated that stresses due to the above four loading combinations were generated using **[[** **]]** and include effects of **[[** **]]** and that the LOCA loads are based on a break of the **[[** **]]**. The applicant selected for fracture mechanics evaluation the following ten limiting locations within the RV SSSAs: column, box ring girder, I-beam, bolts at shear brace, key shear, bolts at ring girder, pins at the bottom of column, support shoe box, leveling screw, and base plate. These limiting locations represent points of highest stresses within the RV SSSAs near the active core of the RV that is subjected to high neutron irradiation. The NRC staff finds the applicant's approach for determining stresses for the SIF calculation acceptable for the following reasons: (a) they are based on appropriate design basis load combinations, which the staff verified from Table A.5-3 of the UFSAR, (b) they were [[ ]], and (c) they include effects of [[ ]]. The staff also finds the selection of the ten limiting locations acceptable because they are based on locations of highest stresses that are also subjected to high neutron irradiation.

In Section 5.2 of WCAP-18554-NP/P, Revision 1, the applicant described the determination of the applied SIF model appropriate for each of the ten limiting locations selected for fracture mechanics evaluation. [[ ]] were conservatively used to calculate components' fractures based on the Mode I SIF. For the shear key, however, Mode II and Mode III SIF were considered, because the shear key is under shear loading only. Additionally, the [[ ]]. The applicant stated that applied SIFs were based on expressions from published literature that have been accepted by the industry and used frequently in fracture mechanics evaluations. The NRC staff finds the applicant's approach for determining applied SIF acceptable because stresses were treated in a conservative manner with applied SIF expressions based on published sources that are widely used for fracture mechanics evaluations.

Using the applied SIF as discussed above and the corresponding K_{IC} value with the change due to effects of irradiation included, the applicant determined the postulated critical flaw sizes for the subsequent period of extended operation for the ten limiting component locations stated in SLRA Table 3.5.2.2-6. As discussed by the NRC staff above when evaluating the applicant's response to RAI 3.5.2.2.2.7-4, as supplemented, the welds at the top of the column could also be a limiting location because of their proximity to the RV. Although they are not included in SLRA Table 3.5.2.2-6, the full penetration welds are considered to be part of the columns. In the discussion that follows SLRA Table 3.5.2.2-6, the applicant determined that the postulated critical flaw sizes for the welds at the top of the columns would be of the same order of magnitude as the welds of the ring girder flange (i.e., box ring girder) and I-beam flange, because of similarities in stresses, fracture toughness, and geometry. The staff finds the applicant's determination acceptable for the welds at the top of columns, in part because the same filler material and a similar level of stress and weld geometries were used for all of the RV SSSA welds. The staff's additional review for acceptability of welds in box ring girders, I-beams, and at the top of the columns is further discussed below.

In Section 7 of WCAP-18554-NP/P, Revision 1, the applicant explained that the [[ ]]. The NRC staff finds that it is acceptable to not include these safety factors because they are intended: (a) for flaws found during ISI (i.e., as-found flaws, not postulated flaws), and (b) for the RV, which is a reactor coolant pressure boundary component that is subject to more stringent acceptance criteria due to its higher safety significance relative to the RV SSSA. Therefore, the staff evaluated the margins in the postulated critical flaw sizes in SLRA Table 3.5.2.2-6 based on their sizes relative to reference flaw sizes and on the conservatisms of plant-specific modeling and bounding input conditions that the applicant used for the calculations in Section 7 of WCAP-18554-NP/P, Revision 1, and also discussed in SLRA Section 3.5.2.2.2.7, as amended by Supplement 1.

For reference flaw sizes, the applicant included, in SLRA Table 3.5.2.2-6, allowable flaw sizes from ASME Code Section XI, IWB-3500. In Section 6 of WCAP-18554-NP/P, Revision 1, however, the applicant included two other sources of reference flaw sizes for the RV SSSA, those from **[[**
]]. The NRC staff noted that allowable flaw sizes based on ASME Code Section XI are not available specifically for the RV SSSAs because they are inspected by visual examination in accordance with ASME Section XI, IWF-2500, for which allowable flaw sizes are not specified. The applicant stated in Section 5 of WCAP-18554-NP/P, Revision 1, and further elaborated in its response to RAIs 3.5.2.2.2.7-4 and 3.5.2.2.2.7-5, reviewed and evaluated by the staff above, that the goal of the fracture mechanics evaluation is to demonstrate that the postulated critical flaw sizes based on 72 EFPY of neutron embrittlement that are calculated for the RV SSSAs would be sufficiently large compared to the reference (allowable) flaw sizes and, therefore, detectable through ASME Section XI, Subsection IWF inspections.

For the five RV SSSA locations for PBN Units 1 and 2 in SLRA Table 3.5.2.2-6; namely, columns, shear brace bolts, shear keys, support shoes box, and column base plates, the NRC staff finds that there are sufficient margins from failure due to loss of fracture toughness through the end of the subsequent period of extended operation because the postulated critical flaw sizes are large relative to the referenced ASME Code Section XI allowable flaw sizes.

For the leveling screw in SLRA Table 3.5.2.2-6, as amended by Supplement 1, the NRC staff noted that the postulated critical flaw sizes are larger than the reference ASME Code Section XI allowable flaw sizes but not by as much as in the five locations discussed above. The staff noted from Table 7-9 of WCAP-18554-NP/P, Revision 1, that the postulated critical flaw sizes are based on the flaw depth-to-radius ratio and are for a 360-degree continuous circumferential flaw. Since the outer diameter of the listed leveling screw in SLRA Table 3.5.2.2-6 is 3.54 inches, the smallest postulated critical flaw size (with a 9.5-percent crack depth over screw thickness/diameter) is equivalent to a 360-degree continuous circumferential flaw with a crack depth of about 0.17 inch. Section 5.1.1.4 of WCAP-18554-NP/P, Revision 1, states that the leveling screws are made of **[[ ]]**. According to Table 6-1 of WCAP-18554-NP/P, Revision 1, **[[ ]]**, which the staff verified following its review of the ASTM standard specification for the **[[ ]]** material. Given this specification for the leveling screws, the staff finds that a 360-degree continuous circumferential flaw with a depth of 0.17 inch during construction would have been rejected in the leveling screw.

SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, summarizes statements made in Section 7 of WCAP-18554-NP/P, Revision 1, about conservatisms considered in the evaluations to estimate the critical flaw sizes in SLRA Table 3.5.2.2-6. The NRC staff noted, in particular, the conservatisms on how stresses were used to calculate the SIFs applied to components in SLRA Table 3.5.2.2-6, confirmed by the applicant in its response to Request for Confirmation of Additional Information (RCI) 3.5.2.2.2.7-1, included in a letter dated July 8, 2021 (ADAMS Accession No. ML21189A173). The staff noted that these conservatisms on how stresses were applied provide additional margins on critical flaw sizes, in that they result in smaller postulated critical flaw sizes. The staff also noted that, if more accurate/representative stresses were to be applied, they would be smaller, resulting in a smaller crack driving force or a larger postulated critical flaw size. Because the procurement specification for the leveling screws provides reasonable assurance that the screws **[[ ]]** and the conservatisms applied to stresses in calculating the SIFs provide additional margin on critical flaw sizes, the staff finds that the leveling screws of the RV SSSAs at PBN Units 1 and 2 have sufficient protection from failure/cracking due to the reduction of fracture toughness through the subsequent period of extended operation.

The NRC staff also noted the small postulated critical flaw sizes in SLRA Table 3.5.2.2-6 at these four locations: box ring girder, I-beam, bolts at the ring girder, and pins at the bottom of column. As previously stated, the postulated critical flaw sizes for the welds at the top of the column will be of the same order of magnitude as those postulated for the welds of the box ring girder and I-beam. In the discussion that follows SLRA Table 3.5.2.2-6, the applicant described its evaluation of these five locations having small postulated critical flaw sizes.

For the box ring girders (including its welds), I-beams (including its welds), and top of the column weldments, the applicant stated in SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, that welding residual stresses were considered in the calculation of the postulated critical flaw sizes. The applicant also stated that, according to design specifications, the welds at these locations are constructed with weld metal of sufficient strength to join the T-1 base metals but without post-weld heat treatment to alleviate potential cracking of weldments. In its response to RCI 3.5.2.2.2.7-3, included in the letter dated August 25, 2021 (ADAMS Accession No. ML21237A055), the applicant confirmed that welding of T-1 steels was performed as specified in the audited Bechtel Design Specification 6118-C-10, which indicates that the weld strength is lower than the T-1 steel material strength. The NRC staff noted that, since the weld strength is lower than the T-1 steel material strength, the fracture toughness of the welds that join the T-1 base materials would be higher than the T-1 base materials because of the inverse relation of strength and fracture toughness (i.e., as material strength decreases, fracture toughness increases). Since the fracture toughness of the welds that join the T-1 base materials is higher than the T-1 base materials, the staff finds that the fracture mechanics evaluation performed for the T-1 base metals bounds that of the welds that join the T-1 materials.

Section 3 of WCAP-18554-NP/P, Revision 1, provides that the RV SSSAs were detailed, fabricated, and delivered according to the audited Bechtel Design Specification 6118-C-10. The applicant confirmed in its response to RCI 3.5.2.2.2.7-2, included in the letter dated July 8, 2021 (ADAMS Accession No. ML21189A173), that Design Specification 6118-C-10 references the 1963 version of the AISC, “Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings” and the 1966 version of American Welding Society (AWS) D2.0.

The NRC staff notes that not performing post-weld heat treatment means that welding residual stresses must be considered in the fracture mechanics evaluation, since one of the main purposes of post-weld heat treatment is to minimize welding residual stresses. The applicant determined that the flaw tolerances at these locations (i.e., box ring girder (including its welds), I-beam (including its welds), and welds at the top of the column) are insignificantly impacted by neutron embrittlement during the subsequent period of extended operation, based on the following arguments:

(a) AWS D2.0 requires welds at these locations to be free from indications after initial fabrication and because of this requirement, the welds at these locations would continue to be free from indications after an extended period of plant operation, since crack growth mechanisms are assumed not to be present at the RV SSSA. In Section 6 of WCAP-18554-NP/P, Revision 1, the applicant further explained that, in Bechtel Design Specification 6118-C-10, **[[**

]].

(b) The change in the magnitude of critical flaw sizes over time is negligible.

(c) The conservatisms discussed in Section 7 of WCAP-18554-NP/P, Revision 1, lead to small postulated critical flaw sizes.

The NRC staff finds that the design specifications for the RV SSSAs provided adequate quality controls such that weldments in the box ring girder, I-beam, and at the top of the column are reasonably assured to be free of detectable cracks. The staff also finds that the assumption of no crack growth mechanisms being present at the RV SSSAs is acceptable because Section 6 of WCAP-18554-NP/P, Revision 1, states that there is **[[ ]]** present at the RV SSSAs, which the staff confirmed through a review of the UFSAR. The staff further finds that the conservatisms discussed in Section 7 of WCAP-18554-NP/P, Revision 1, particularly the values of assumed residual stresses at weldments and the conservatisms on how stresses were combined and applied, result in small critical flaw sizes for the following reasons: (a) the conservatisms applied to stresses provide additional margins on critical flaw sizes, in that they result in smaller postulated critical flaw sizes than those that would have resulted if more accurate/representative stresses were to be applied, and (b) invariably such stresses would be smaller, resulting in a smaller crack driving force or a larger postulated critical flaw size.

The NRC staff finds that the small change in postulated critical flaw sizes from 42 EFPY to 72 EFPY, as shown in Tables 7-2 and 7-3 of WCAP-18554-NP/P, Revision 1, demonstrates that embrittlement of the welds at the subject RV SSSA locations to the end of the subsequent period of extended operation would be small. The staff confirmed during its audit and review of SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, that the ASME Code Section XI ISIs performed to date have not shown any indications (cracking, gross deformation, or corrosion) that would result in degradation or loss of capacity of the load bearing members of the RV SSSAs. The staff noted that the 42 EFPY postulated critical flaw sizes are already small at the box ring girder, I-beams, and welds at the top of the columns. Given that 42 EFPY represents approximately the current operational period, had the structural integrity at these locations been compromised due to irradiation embrittlement degradation, the effect of the degradation would have manifested itself and been detectable during the regularly performed and mandated ASME Code Section XI ISIs. Thus, the staff finds that the examination history of the RV SSSAs, in conjunction with the small effect of embrittlement on the postulated critical flaw sizes from 42 EFPY to 72 EFPY, provide reasonable assurance that the structural integrity of the RV SSSAs at the box ring girder (including its welds), I-beam (including its welds), and top of the column weldments will be maintained during the subsequent period of extended operation.

The NRC staff finds that, for the box ring girders (including welds), I-beams (including welds), and welds at the top of the columns, the above assessments and evaluations collectively provide reasonable assurance that these locations have sufficient margins from failure due to loss of fracture toughness through the end of the subsequent period of extended operation.

For the bolts at the ring girder, the postulated critical flaw sizes in SLRA Table 3.5.2.2-6 are for a 360-degree continuous circumferential flaw per Table 7-6 of WCAP-18554-NP/P, Revision 1. The bolts are made of ASTM A490 steel according to Section 3 of WCAP-18554-NP/P, Revision 1. In SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, the applicant determined that the postulated critical flaw sizes are acceptable for 80 years of plant operation, based on the following arguments: (a) Table 7-6 of WCAP-18554-NP/P, Revision 1, shows reasonable postulated critical flaw sizes for the semicircular flaw when compared to the ASME

Code Section XI allowable flaw sizes and when the change in the magnitude of critical flaw sizes from 42 EFPY to 72 EPFY is negligible, (b) based on the design specifications for each of the RV SSSA and ASTM A490-64, the bolts are free of detectable defects after initial installation and after an extended period of time, since crack growth mechanisms are assumed not to be present at the RV SSSA, and (c) the conservatisms discussed in Section 7 of WCAP-18554-NP/P, Revision 1, lead to small postulated critical flaw sizes.

The NRC staff finds that the audited Bechtel Design Specification 6118-C-10 for the PBN Units 1 and 2 RV SSSAs, and ASTM A490-64 for the bolts at the ring girder, provided adequate quality controls such that bolts with defects (i.e., detectable cracks) would have been rejected. With respect to allowable defects for ASTM A490 bolts, the staff noted in Table 6-1 of WCAP-18554-NP/P, Revision 1, that a **[[**
]]. The staff finds that the conservatisms discussed in Section 7 of WCAP-18554-NP/P, Revision 1, particularly those on how stresses were combined and applied, would result in smaller critical flaw sizes due to additional margins than those that would result if more accurate/representative stresses were to be used. More accurate/representative stresses mean smaller applied stresses, which, in turn, means a smaller crack driving force or a larger postulated critical flaw size. The staff also finds that the small change in postulated critical flaw sizes from 42 EFPY to 72 EFPY, as shown in Table 7-6 of WCAP-18554-NP/P, Revision 1, demonstrates that reduction in fracture toughness of the bolts at the ring girder over this operating period would be small.

SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, states that, based on the ASME Code Section XI ISIs to date, none of the RV SSSA bolts have been found defective or replaced since their original installation. Similar to the discussion for the box ring girders, I-beams, and welds at the top of the columns, the NRC staff noted that, because the postulated critical flaw sizes at 42 EFPY are already small for the bolts at the ring girder, had their structural integrity been compromised due to irradiation embrittlement, the effect of the degradation would have manifested itself and been detectable during the ASME Code Section XI ISIs. Thus, the staff finds that the examination history of the support bolts, in conjunction with the small effect of embrittlement on the postulated critical flaw sizes from 42 EFPY to 72 EFPY, provides reasonable assurance that the structural integrity of the bolts at the ring girder will be maintained during the subsequent period of extended operation.

The NRC staff finds that the reasons discussed above collectively provide reasonable assurance that the bolts at the ring girder would perform their intended function through the end of the subsequent period of extended operation.

For the pins at the bottom of the column, SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, states that, based on the discussion in Section 5.1.1.5 and the information in Table 5-1 of WCAP-18554-NP/P, Revision 1, they are sufficiently away from the active core to be relatively protected from neutron irradiation damage. This results in an insignificant, if any, change to the fracture toughness of the pins, or in their postulated critical flaw sizes (i.e., the level of flaw tolerance remains the same from 40 years to 80 years of plant operation). The applicant, therefore, determined that there is no impact of neutron irradiation on the pins located at the bottom of each column because of the low radiation exposure or dpa at this location to cause flaw instability concerns.

The NRC staff reviewed the neutron exposure levels and the corresponding ΔNDTT in Tables 5-5 and 5-6 of WCAP-18554-NP/P, Revision 1, applicable to the pins at the bottom of each column and, after cross-referencing the data with that in Figure 3-1 of NUREG-1509, confirmed that there is no change in ΔNDTT from 42 EFPY to 72 EFPY. The staff, therefore, finds that there is insignificant, if any, loss of fracture toughness for the pins due to neutron irradiation embrittlement to the end of the subsequent period of extended operation.

SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, also states that "[f]or thermal growth, there is relative motion between the RV nozzles, shim plates and support shoes, and no lubricants are used on these sliding surfaces." The NRC staff verified during the audit and confirmed through a review of the UFSAR that no lubricants have been used or are to be used in the sliding surfaces at the RV support shoes and bolts in the RV SSSA, as these lubricants could disassociate in an irradiated environment leading to subsequent aging effects.

Based on the discussions above, the NRC staff finds that the applicant's evaluation, as documented in SLRA Section 3.5.2.2.2.7, adequately addressed the loss of fracture toughness due to irradiation embrittlement of the RV SSSAs at PBN Units 1 and 2 through the subsequent period of extended operation.

Based on the review of SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, the above writeup, responses to RCIs 3.5.2.2.2.7-1, 3.5.2.2.2.7-2, 3.5.2.2.2.7-3 and RAIs 3.5.2.2.2.7-1, 3.5.2.2.2.7-2, 3.5.2.2.2.7-3, 3.5.2.2.2.7-4, 3.5.2.2.2.7-5, 3.5.2.2.2.7-6, and RAI supplements 3.5.2.2.2.7-4 and 3.5.2.2.2.7-5, the NRC staff determined that the applicant met the intent of the SRP-SLR further evaluation criteria consistent with the GALL-SLR Report principles on the structural integrity of the RV SSSAs discussed in SLRA Section 3.5.2.2.2.7 for further evaluation for loss of fracture toughness due to irradiation embrittlement of the RV SSSAs.

The NRC staff also finds that the applicant's conclusion that a plant-specific program is not required to manage aging effects of irradiation for the RV SSSAs for the subsequent period of extended operation is acceptable for the following reasons:

(a) The applicant's fracture mechanics and fluence evaluations provided reasonable assurance that the effects of aging for loss of fracture toughness due to irradiation or other relevant aging effects will not occur and do not require specific aging management during the subsequent period of extended operation.

(b) The applicant's proposal to continue to manage aging effects for loss of material and loss of mechanical function using the ASME Section XI, Subsection IWF AMP, the Structures Monitoring AMP, the External Surfaces Monitoring of Mechanical Components AMP, and the Boric Acid AMP (as applicable), provides reasonable assurance that applicable aging effects will be adequately managed.

(c) To date, the applicant has not identified plant-specific operating experience of RV SSSA degradation due to irradiation aging effects.

(d) The applicant has adequately addressed the staff's concerns related to all potential aging effects consistent with the SRP-SLR and GALL-SLR Report principles.

(e) Commitment No. 51 in SLRA Appendix A, Table 16-3 provides assurance that changes will be made to the program based on ongoing research or future operating experience, if applicable and needed.

Conclusion. Based on the programs identified to manage loss of material and loss of mechanical function of the RV SSSAs, the NRC staff finds that the applicant's programs and AMR items in the SLRA, as amended by SLRA Supplement 1, dated April 21, 2021, are acceptable. Further, the staff finds that the applicant adequately assessed, through evaluations, that a plant-specific program is not needed to manage the effects of aging due to radiation (loss of fracture toughness, loss of function due to irradiation embrittlement, and/or loss of material) for the PBN Units 1 and 2 RV SSSAs. Therefore, the applicant's evaluation of the structural steel structure and RV support sliding feet assemblies meets the intent of the SRP-SLR further evaluation criteria, consistent with the GALL-SLR Report principles. As such, the staff concludes that SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, is consistent with the GALL-SLR and SRP-SLR Reports review principles to manage the effects of aging for the RV structural steel structure and RV support sliding feet assemblies. The staff also concludes that the applicant has demonstrated that the effects of aging for the RV SSSAs will be adequately managed so that their intended function(s) will be maintained consistent with the CLB during the 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 NRC 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 NRC 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 NRC staff's review of AMR results listed in SLRA Tables 3.5.2-1 through 3.5.2-15 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 section and then by material and environment combinations.

For component type, material, and environment combinations not evaluated in the GALL-SLR Report, the NRC staff reviewed the applicant's evaluation to determine whether the applicant 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 Structure and Internal Structural Components—Summary of Aging Management Evaluation—SLRA Table 3.5.2-1

<u>Copper Alloy Air Locks, Equipment Hatches, and Accessories Exposed to Air–Indoor Uncontrolled Environment.</u>

SLRA Table 3.5.2-1 states that cracking and loss of material aging effects for copper-alloy containment airlocks, equipment hatches, and accessory components exposed to an air–indoor uncontrolled environment will be managed by the 10 CFR Part 50, Appendix J AMP and the ASME Section XI, Subsection IWE AMP. The AMR items cite generic note F. The AMR items also cite plant-specific note 1, which states: "Copper alloy is not addressed as a structural component in NUREG-2191. However, the environment, aging effects (cracking and loss of material) and aging management programs for steel air lock, hatch components are conservatively also applicable to the copper alloy airlock bushings."

The NRC 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. Based on its review of GALL-SLR Section V "Engineered Safety Features," Table F, AMR item V.F.EP-10, corresponding to SRP-SLR item 3.2-1, 057, which states that, for piping and piping components of copper-alloy material exposed to air, the aging effect/mechanism and AMP are "None" and "None," respectively. Therefore, the staff finds that the applicant has identified all applicable aging effects conservatively for this containment component, material, and environment combination.

<u>Steel Reactor Vessel (RV) Supports and Bolting Exposed to Air–Indoor Uncontrolled Environment.</u>

SLRA Table 3.5.2-1, as amended by Supplement 1, dated April 21, 2021, states that the loss of fracture toughness aging effect for steel RV supports and bolting exposed to air–indoor uncontrolled environment will be managed by the ASME Section XI, Subsection IWF AMP. 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 11, which states, "The loss of fracture toughness aging effect will be managed by the ASME Section XI, Subsection IWF (B.2.3.31) AMP."

The plant-specific fracture mechanics evaluation in SLRA Section 3.5.2.2.2.7, as amended by Supplement 1, dated April 21, 2021; in response to related RAIs by letter dated July 8, 2021; and the NRC 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) to justify the adequacy of the current visual examination (VT-3) of the RV structural steel supports as part of the ASME Section XI, Subsection IWF AMP. 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 discussed 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 VT-3 examinations of RV supports and additional volumetric examination on a sampling basis of high-strength bolting (Commitment No. 35(i)) of the ASME Section XI, Subsection IWF AMP (evaluated in SE Section 3.0.3.2.32) are sufficient to monitor for cracking as potential symptom(s) of loss of fracture toughness through the subsequent period of extended operation, and (3) Commitment No. 51 in SLRA Appendix A, Table 16-3, provides assurance that changes will be made to the program based on ongoing research or future operating experience, if applicable and needed.

3.5.2.3.2 Yard Structures—Summary of Aging Management Evaluation—SLRA Table 3.5.2-11

<u>Earth Berm Exposed to Air-Outdoor.</u>

SLRA Table 3.5.2-11 states that loss of form and loss of material for earthen berm structures exposed to an air-outdoor environment will be managed by the Structures Monitoring AMP. The AMR item cites generic note J. Also, the AMR item cites plant-specific note 4, which states that the berm surrounding the fuel oil storage tanks serves a fire barrier function.

For the items in Table 3.5.2-11 stating that the loss of form and loss of material for earthen berm structures exposed to an air-outdoor environment will be managed by the Structures Monitoring AMP and citing generic note J, the NRC staff determined the need for additional information, which resulted in the issuance of an RAI. RAI 3.5.2.11-1 and the applicant's response are documented in ADAMS Accession No. ML21223A308.

In its response, the applicant stated that the existing Structures Monitoring AMP only includes loss of material as an AERM for the earthen berm around the fuel tank. Therefore, the applicant revised SLRA Section B.2.3.34 and SLRA Appendix A, Table 16-3 (items 38(d) and 38(j)), to include, as an enhancement to the AMP, loss of form as an AERM for the earthen berm surrounding the fuel oil storage tanks.

During its evaluation of the applicant's response to RAI 3.5.2.11-1, the NRC staff noted that the acceptance criteria for both loss of material and loss of form will be inspected for absence of evidence of settlement (unusual localized or overall settlement, depressions, sinkholes), slope instability (variance from originally constructed slopes, unusual changes from original crest alignment and elevation, evidence of movement), and erosion (gullies or notches in slope). The staff finds the applicant's response and changes to SLRA Section B.2.3.34 and SLRA Appendix A, Table 16-3, acceptable because the proposed enhancement will ensure that the AMP will be consistent with the GALL-SLR Report recommendations to adequately manage the aging effects for earthen dams and embankment structures.

The NRC 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 GALL-SLR Report addressed loss of material and loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff and/or seepage for similar component, material, and environment combinations in other AMR items (i.e., item III.A6.T-22). Based on its review of the GALL-SLR Report for similar components, 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 effects of aging acceptable because managing the aging effects of loss of material and loss of form provides reasonable assurance that age-related degradation for earthen berm structures will be adequately managed during the subsequent period of extended operations and allows for corrective actions to be taken before a loss of function.

3.5.2.3.3 Component Supports Commodity Group—Summary of Aging Management Evaluation—SLRA Table 3.5.2-13

<u>Epoxy Resin-Based Grout Exposed to Air-Indoor (Uncontrolled)</u>.

SLRA Table 3.5.2-13, as amended by letter dated November 4, 2021, states that reduction in anchor capacity and loss of anchor preload for epoxy resin-based grout used for embedment of structural supports exposed to an air-indoor (uncontrolled) environment will be managed by the Structures Monitoring AMP. The AMR item cites generic note F and plant-specific note 2, which states that this material at PBN is subject to similar aging effects as those identified by other items for anchors and grout, considering that epoxy resin-based grout is not used in locations where normal temperatures exceed 120°F or in high radiation areas as defined in 10 CFR Part 20. The plant-specific note also states that the Structures Monitoring AMP will be enhanced to include periodic inspections for tightness (e.g., torque checks, as applicable) to ensure that proper installation is maintained and to verify that preload has not been lost due to creep.

The NRC 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 Regulatory Guide 1.199, Revision 1, "Anchoring Components and Structural Supports in Concrete," dated

April 2020 (ADAMS Accession No. ML19336A079), addresses the codes or standards and inspections requirements for component and structural supports in concrete. The staff noted that the applicant addressed other applicable aging effects (e.g., loose nuts, damaged subsurface concrete, cracking, etc.) for this component, material, and environment combination in other AMR items. Based on its review of the operating experience identified in IN 83-40, which addresses the need to consider thermal aging and radiation environment effects in the design of epoxy grouted anchors to prevent significant loss of strength, and which states that "[w]here anchor bolts are bedded in epoxy grout, and tensioned to any appreciable preload, it may be important to periodically verify that the preload has not been lost due to creep in the grout," the staff finds that the applicant has identified all applicable aging effects for this component, material, and environment combination.

The NRC staff noted that the SLRA includes an enhancement to the Structures Monitoring AMP that will prohibit the use of epoxy resin-based grout in safety-related applications when high temperatures and/or high radiation environments exist to prevent the associated aging effects. The staff also noted that ACI 355.4, "Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary," states that "evaluation of the tension resistance of grouted anchors installed in hole diameters greater than 1.5 times the diameter requires separate consideration of bond stresses developed along the anchor element/grout interface, as well as between the grout and the concrete." Therefore, the staff finds the applicant's proposal to manage the effects of aging acceptable because the use of periodic tightness inspections to monitor reduction in anchor capacity and loss of anchor preload due to creep, as a supplement to visual inspections, will ensure that that applicable degradations, associated with structural supports that have been installed using epoxy resin-based grout, can be detected and properly managed before a loss of intended function.

3.6 Aging Management of Electrical and Instrumentation and Controls

3.6.1 Summary of Technical Information in the Application

SLRA Section 3.6 provides AMR results for those components the applicant identified in SLRA Section 2.5, "Electrical and Instrumentation and Control Systems," as being subject to an AMR. SLRA Table 3.6-1, "Summary of Aging Management Programs for the Electrical Components Evaluated in Chapter VI of the GALL-SLR Report," 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 NRC 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 SE 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 Point Beach (see SE Sections 3.6.2.2.3 and 3.6.2.3.1)
3.6-1, 005	Not applicable to Point Beach (see SE Sections 3.6.2.2.3 and 3.6.2.3.1)
3.6-1, 006	Not applicable to Point Beach (see SE Sections 3.6.2.2.3 and 3.6.2.3.1)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.6-1, 007	Not applicable to Point Beach (see SE Sections 3.6.2.2.3 and 3.6.2.3.1)
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
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 Point Beach
3.6-1, 017	Not applicable to Point Beach
3.6-1, 018	Not applicable to Point Beach
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 Point Beach (see SE Section 3.6.2.2.3 and 3.6.2.3.1))
3.6-1, 022	Not applicable to Point Beach
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 Point Beach
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 Point Beach (see SE Section 3.6.2.2.2)
3.6-1, 030	Not applicable to Point Beach (see SE Section 3.6.2.2.2)
3.6-1, 031	Not applicable to Point Beach (see SE Section 3.6.2.2.2)
3.6-1, 032	Not applicable to Point Beach

The NRC 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 3.6.2.1 discusses AMR results for components that the applicant states are either not applicable to PBN or are consistent with the GALL-SLR Report. Section 3.6.2.1.1 summarizes the staff's review of items that are not applicable.

(2) SE Section 3.6.2.2 discusses AMR results for which the GALL-SLR Report and SRP-SLR recommend further evaluation.

(3) SE Section 3.6.2.3 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.

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

The following subsections document the NRC staff's review of AMR results listed in SLRA Tables 3.6-1 and 3.6.2-1 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 its 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 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 3.6-1 and no separate writeup is required or provided. The staff did not identify any AMR items that required additional evaluation with an associated writeup.

SE Section 3.6.2.1.1 documents the NRC 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; 3.6-1, 030; 3.6-1, 031; and 3.6-1, 032, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not used or not applicable to PBN. The applicant noted that the results of its evaluation showed that there are no fuses at PBN that support a system-level intended function that are not part of an active component such as switchgears, power supplies, power inverters, battery chargers, load control centers, and circuit boards. Since piece parts and subcomponents in such an enclosure are routinely inspected and regularly maintained as part of the plant's normal maintenance and surveillance activities, the NRC staff finds that the exclusion of fuse holders from the electrical commodities subject to an AMR is acceptable. The applicant also noted that cable bus and all aluminum conductors are not used at PBN. 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.

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 the electrical 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 3.6.2.2. 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 EQ is a TLAA as defined by 10 CFR 54.3. The applicant's evaluation of this TLAA is addressed in SLRA Section 4.4. This is consistent with SRP-SLR Section 3.6.2.2.1, which states that TLAAs are defined in 10 CFR 54.3, are evaluated according to 10 CFR 10 54.21(c)(1), and are, therefore, acceptable. The NRC staff's evaluation of the TLAA for EQ 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 associated with SLRA Table 3.6-1, items 3.6-1, 027; 3.6-1, 029; 3.6-1, 030; 3.6-1, 031; and 3.6-1, 032, 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. The applicant stated that these items are not applicable because there are no in-scope cable bus arrangements at PBN. The NRC staff reviewed PBN documents and searched the operating experience database provided by the applicant, using the keyword "cable bus." The staff finds the SLRA Section 3.6.2.2.2 statement acceptable because it determined that cable bus arrangements are not used at PBN.

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 and SLRA Table 3.6.2-1, as amended by letter dated May 6, 2021, 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, address 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. A discussion of each of these AMR items follows.

<u>Transmission Conductors Composed of Aluminum and Steel Exposed to Air-Outdoor.</u>

SLRA items 3.6-004 and 3.6-1, 021 (aluminum only) address the aging effect of loss of conductor strength due to corrosion in transmission conductors composed of aluminum and steel exposed to air-outdoor environment. SLRA Section 3.6.2.2.3 states as follows:

> Transmission conductors are subject to AMR if they are necessary for recovery of offsite power following an SBO [station blackout] event. The PBN power path for restoration of offsite power following an SBO event utilizes short (jumper) connections of 2156 million circular mils (MCM) aluminum conductor steel reinforced (ACSR) to connect the Unit 1 and Unit 2 345 kV, Section 3 – Aging Management Review Results PBN Nuclear Plant Units 1 and 2 Page 3.6-6 Subsequent License Renewal Application Revision 0, circuit switchers to the high-voltage station auxiliary transformers on each unit. The Unit 1 and Unit 2 circuit switchers are the last components in the connection to offsite power controlled by PBN operators and demarcate the SBO switchyard boundary for SLR. Other PBN transmission conductors are not subject to AMR since they do not perform or support SLR intended functions.

SLRA Section 3.6.2.2.3 cites the widely known Ontario Hydro study of transmission conductor loss of composite strength. The study shows the loss of conductor strength for similar conductors in 80 years of operation, exposed to air-outdoor environment, to be limited to 30 percent. The short length of the in-scope transmission conductor (4/0 ACSR jumper) used at PBN is about two years old and has ample strength margin for loss of conductor strength due to corrosion through the subsequent period of extended operation. The NRC staff conducted an audit and verified the extent of the in-scope transmission conductors to be a short jumper installed recently, as well as the lack of operating experience with any unique aging effects at PBN. The staff also noted that the referenced Ontario Hydro study has been cited in previous NRC license renewal SEs and found to be acceptable. The staff finds the applicant's proposal acceptable because the in-scope transmission conductors at PBN are new and will have adequate strength maintained during the subsequent period of extended operation, based on design and operating experience at PBN and in the industry.

<u>Transmission Connectors Composed of Aluminum and Steel Exposed to an Air-Outdoor Environment</u>. SLRA item 3.6-1, 005, as supplemented by letter dated February 4, 2021, addresses the aging effect of increased resistance of connections due to oxidation or loss of preload in transmission connectors composed of aluminum and steel, exposed to air-outdoor environment. SLRA Section 3.6.2.2.3 states that oxidation and loss of preload are not applicable aging effects for PBN transmission connectors, based on PBN design and operating experience.

The applicant stated that, at PBN, transmission connector surfaces are coated with an antioxidant compound to minimize connection oxidation. The applicant concluded that, based on PBN design, maintenance practices (thermography), and operating experience, oxidation and corrosion are not applicable aging mechanisms resulting in the aging effect of increased resistance for PBN transmission connectors.

The NRC staff reviewed the associated items in the SLRA, as supplemented by letter dated May 6, 2021. The staff conducted an audit and confirmed that these aging effects are not applicable for this component, material, and environmental combination. The staff noted that PBN's bolted transmission connectors employ antioxidant material that minimizes corrosion of the contact surfaces. The staff also noted that thermography inspections performed at PBN can identify connection integrity issues. The staff finds the applicant's further evaluation acceptable because the PBN transmission connectors have not exhibited significant aging effects, based on site-specific experience as well as routine maintenance and inspections.

<u>Switchyard Bus and Connections Composed of Aluminum, Copper, Bronze, Stainless Steel, Galvanized Steel Exposed to Air-Outdoor</u>. SLRA item 3.6-1, 006 addresses the aging effects of loss of material due to wind-induced abrasion, increased resistance of connection due to oxidation, or loss of preload in switchyard bus and connections composed of aluminum and SS exposed to air-outdoor environment. SLRA Section 3.6.2.2.3 states that loss of material and increased resistance of connection are not applicable aging effects for the PBN switchyard bus and connections.

The applicant stated that PBN uses a short length of rigid busbars supported by post insulators, which are not subject to wind loading and induced movement, loss of material, or abrasion. Connections between the in-scope switchyard bus and active components, such as circuit switchers, are short lengths of flexible aluminum conductors that are not typically subject to vibration under wind loading. The switchyard bus is not subject to abrasion induced by wind loading due to its rigid mounting.

The applicant further stated that the PBN connection hardware includes Belleville washers that are torqued to prevent loss of preload. Connections also employ antioxidant compounds to minimize oxidation and corrosion. The applicant concluded that, based on design and as confirmed by operating experience, wind-induced abrasion and increased resistance of connections due to oxidation and loss of preload are not applicable aging mechanisms for the switchyard bus and connections at PBN.

The NRC staff reviewed the associated items in the SLRA, conducted an audit, and confirmed that these aging effects are not applicable for this component, material, and environment combination. The staff noted that the very short lengths of in-scope switchyard bus components are rigidly mounted and torqued and use washers and corrosion inhibitors to preclude oxidation, corrosion, and loss of preload. The staff finds the applicant's evaluation acceptable because operating experience and preventive maintenance thermography inspections have demonstrated that increased connection resistance due to corrosion, oxidation, or loss of preload is not an AERM at PBN.

<u>Transmission Conductors Composed of Aluminum Steel Exposed to Air-Outdoor</u>. SLRA item 3.6-1, 007 addresses the aging effects of loss of material due to wind-induced abrasion in transmission conductors composed of aluminum and steel exposed to an air-outdoor environment. SLRA Section 3.6.2.2.3 states that loss of material due to wind loading and abrasion is not an applicable aging effect for PBN transmission conductors.

The applicant stated that in-scope transmission conductors are short jumpers. Based on design and as confirmed by operating experience, wind-induced loading and abrasion resulting in loss of material is not an applicable aging mechanism for transmission conductors at PBN.

The NRC staff reviewed the associated items in the SLRA and conducted an audit. The staff noted that wind-induced vibration and abrasion have not been shown to be a contributor to loss of material based on the short run of transmission conductors and industry operating experience. Therefore, the staff finds that loss of material (wear) of transmission conductors and connections due to wind-induced abrasion is not an AERM at PBN.

Conclusion. Based on its audit and review of the SLRA, the NRC staff determined that the applicant 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 NRC 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 NRC staff's evaluation of the applicant's ongoing review of operating experience.

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

The following subsections document the NRC staff's review of AMR results listed in SLRA Tables 3.6-1 and 3.6.2-1 that are either not consistent with or not addressed in the GALL-SLR Report and are usually denoted with generic note I, which states that the aging effect in the GALL-SLR for this component, material, and environment combination is not applicable. To efficiently capture and identify multiple applicable AMR items in each subsection, and because these AMR items often are not associated with a Table 3.6-1 item, the subsections are organized by applicable AMR section and then by material and environment combinations.

For component type, material, and environment combinations not evaluated in the GALL-SLR Report, the NRC 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.

3.6.2.3.1 Transmission Connectors Composed of Aluminum, and Steel, and Switchyard Bus and Connections Composed of Aluminum, Stainless Steel, Copper, Bronze, and Galvanized Steel, and Transmission Conductors Composed of Aluminum, and Steel, Exposed to Air-Outdoor

In SLRA Table 3.6.2-1, as amended by a letter dated May 6, 2021, the applicant stated that the aging effects related to the following are not applicable: transmission conductors composed of aluminum and steel exposed to an air-outdoor environment (Table 3.6-1, item 3.6-1, 004), transmission connectors composed of aluminum and steel exposed to an air-outdoor environment (Table 3.6-1, item 3.6-1, 005); switchyard bus and connections composed of aluminum, copper, bronze, SS, and galvanized steel exposed to an air-outdoor environment (Table 3.6-1, item 3.6-1, 006); transmission conductors composed of aluminum and steel exposed to an air-outdoor environment (Table 3.6-1, item 3.6-1, 007); and transmission conductors composed of aluminum exposed to an air-outdoor environment (Table 3.6-1, item 3.6-1, 021).

As a result, the applicant proposed no AMPs for the above component, material, and environment combinations. These AMR items cited generic note I, which states that the aging effect in the GALL-SLR for this component, material, and environment combination is not applicable.

The NRC staff's evaluation of the applicant's claim on 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 is documented in SE Section 3.6.2.2.3.

3.7 <u>Conclusion for Aging Management Review Results</u>

The NRC staff reviewed SLRA Section 3, "Aging Management Review Results," and SLRA Appendix B, "Aging Management Programs," as supplemented. Based on its audit and its 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 PBN.

With regard to these matters, the NRC 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 PBN 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 and Plant-Specific Exemptions

This section of the safety evaluation (SE) provides the U.S. Nuclear Regulatory Commission (NRC or the Commission) 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 time-limited aging analyses, that need to be identified and evaluated in the subsequent license renewal application (SLRA).

The regulation in Title 10 of the *Code of Federal Regulations* (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 component (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;

(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 described 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 application for subsequent license renewal to contain a list of TLAAs and that the applicant demonstrate that:

(i) The analyses remain valid for the period of extended operation;

(ii) The analyses have been projected to the end of the period of extended operation; or

(iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

In addition, in accordance with 10 CFR 54.21(c)(2), an application for subsequent license renewal 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

4.1.1.1 Identification of TLAAs

SLRA Section 4.1, "Identification of Time-Limited Aging Analyses," as amended by letter dated April 21, 2021 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML21111A155), summarizes the methodology that the applicant used to identify those analyses that may conform to the definition of a TLAA in 10 CFR 54.3. SLRA Table 4.1.5-1, "Review of Generic TLAAs Listed in NUREG-2192, Table 4.1-2," as amended, summarizes the applicant's determination on whether the generic analyses identified as TLAAs in NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" (ADAMS Accession No. ML17188A158) (SRP-SLR), Table 4.1-2, "Generic Time-Limited Aging Analyses," are TLAAs for the Point Beach Nuclear Plant, Units 1 and 2 (Point Beach or PBN) SLRA. SLRA Table 4.1.5-2, "Review of Plant-Specific TLAAs Listed in NUREG-2192, Table 4.7-1," summarizes the applicant's determination on whether the plant-specific analyses identified as TLAAs in SRP-SLR Table 4.7-1, "Examples of Potential Plant-Specific TLAA Topics," are plant-specific TLAAs for the PBN SLRA. SLRA Table 4.1.5-3, "Summary of Results – PBN TLAAs," as amended, lists those analyses in the PBN CLB that the applicant has determined to be TLAAs in accordance with the definition criteria in 10 CFR 54.3.

In its letter dated April 21, 2021, the applicant amended SLRA Table 4.1.5-1 to identify the high-energy line break (HELB) analysis as an analysis that conforms to the definition of a TLAA in 10 CFR 54.3 and to state that the applicant evaluated the TLAA as part of the TLAA in SLRA Section 4.3.3, "Metal Fatigue of Non-Class 1 Components."

SLRA Tables 4.1.5-1, 4.1.5-2, and 4.1.5-3 indicate that the applicant discusses and evaluates its TLAAs in SLRA Sections 4.2 through 4.7, or in applicable subsections of these sections. The applicant's evaluations of these TLAAs provide its bases for demonstrating acceptability of the TLAAs in accordance with 10 CFR 54.21(c)(1)(i), (ii), or (iii).

4.1.1.2 Identification of Plant-Specific Exemptions

The applicant stated that it reviewed the CLB to determine whether the CLB contained any plant-specific exemptions that would need to be identified and evaluated in accordance with 10 CFR 54.21(c)(2). The applicant stated that its review did not identify any exemptions for the CLB that were granted in accordance with 10 CFR 50.12, are based on a TLAA, and remain in effect in the CLB.

In its letter dated April 21, 2021, the applicant amended SLRA Section 4.1.4, "Identification and Evaluation of Exemptions," to provide its technical justification for why the January 27, 1997, plant-specific exemption for use of American Society of Mechanical Engineers (ASME) Code Case N-514 is no longer considered and applied as the CLB for calculating site-specific low temperature overpressure protection (LTOP) system pressure lift and system arming temperature setpoints (refer to the TLAA in SLRA Section 4.2.5, "Pressure-Temperature Limits and Low Temperature Overpressure Protection (LTOP) Setpoints") and why the plant-specific exemption is no longer considered to remain in effect for the CLB.

4.1.2 Staff Evaluation

The NRC staff reviewed the information in SLRA Section 4.1 (including SLRA Tables 4.1.5-1, 4.1.5-2, and 4.1.5-3) and the applicant's TLAA and plant-specific exemption identification methodology and results in accordance with the acceptance criteria in SRP-SLR Section 4.1.2 and the review procedures in SRP-SLR Section 4.1.3. As part of its review, the staff held two virtual teleconferences (i.e., in-office audit breakout sessions on March 12 and 23, 2021) with the applicant to discuss the methodology and results in SLRA Section 4.1. The staff summarized its audit observations on the specific TLAAs and plant-specific exemptions that the applicant identified as needing evaluation in the SLRA in Section 4.1 of the staff's audit report (ADAMS Accession No. ML21208A447). The staff documented the records reviewed as part of the audit in Section 4.1 of the audit report.

4.1.2.1 Identification of TLAAs

4.1.2.1.1 Analyses in the CLB Conforming to the 10 CFR 54.3 TLAA Definition Criteria

SLRA Table 4.1.5-3 identifies those generic analyses or plant-specific analyses in the CLB that the SLRA identifies and evaluates as TLAAs.

During its audit of the SLRA, the NRC staff identified the HELB analysis for non-Class 1 components as a potential TLAA. Following the audit, the applicant supplemented the SLRA by letter dated April 21, 2021, to identify the HELB analysis for non-Class 1 components as a TLAA for the SLRA, and added the HELB analysis to SLRA Section 4.3.3. The staff finds that the applicant has resolved the potential TLAA identification issue with the HELB analysis because the applicant appropriately amended SLRA Table 4.1.5-1 and SER Section 4.3.3 to include and evaluate the HELB analysis as a TLAA for the SLRA. SER Section 4.3.3 documents the staff's evaluation of the applicant's basis for dispositioning the HELB analysis.

The NRC staff determined that the analyses identified as TLAAs in SLRA Tables 4.1.5-1, 4.1.5-2, and 4.1.5-3, as amended, conform to the six criteria for defining TLAAs in 10 CFR 54.3 and are TLAAs for the SLRA. Therefore, the staff finds that the identification of these TLAAs is acceptable because it meets the acceptance criteria in SRP-SLR Section 4.1.2 and complies with the requirement in 10 CFR 54.21(c)(1).

4.1.2.1.2 Absence of TLAA Bases – TLAAs for Boiling Water Reactor (BWR)-Designed Light-Water Reactors that Are Not Applicable to the SLRA

In SLRA Tables 4.1.5-1 and 4.1.5-2, the applicant states that the following analyses are only applicable to the CLBs for BWR-designed light-water reactors and are not applicable to PBN: (a) [Reactor Vessel] Circumferential Weld Relief-Probability of Failure and Mean Adjusted Reference Temperature Analysis for the [Reactor Vessel] Circumferential Welds and (b) Reactor Vessel Axial Weld Probability of Failure and Mean Adjusted Reference Temperature Analysis.

The NRC staff verified that these analyses are not applicable to the CLB for PBN because the Updated Final Safety Analysis Report (UFSAR) confirms that the reactor units are Pressurized-Water Reactors (PWRs) designed by the Westinghouse Electric Company (Westinghouse). Therefore, the staff finds that the applicant's statements that the referenced BWR analyses are not applicable to PBN are acceptable (and that the applicant does not need to identify or evaluate these types of analyses as TLAAs in the SLRA) because the staff has confirmed that: (a) the analyses are not contained or incorporated by reference in the CLB and (b) the analyses do not conform to the criterion 6 for defining TLAAs in 10 CFR 54.3.

4.1.2.1.3 Absence of TLAA Bases – Other Plant Analyses Not Identified as TLAAs

In SLRA Tables 4.1.5-1 and 4.1.5-2, the applicant states that the following analyses or types of analyses do not qualify as TLAAs for the SLRA:

- Ductility reduction evaluation for reactor vessel internals
- Component-specific corrosion allowance calculations
- Component-specific flaw growth analyses due to stress corrosion cracking
- Metal fatigue analyses for the spent fuel pool liners

Ductility reduction evaluation for reactor vessel internal (RVI) components. The NRC staff noted that SRP-SLR Section 3.1.2.2.3, Item 3, identifies this type of analysis as only applicable to PWRs designed by the Babcock and Wilcox Company. The staff also noted that the UFSAR identifies the PWRs at PBN as designed by Westinghouse and that the CLB does not include this type of fracture toughness analysis for the PBN RVI components. Therefore, the staff finds that the applicant does not need to evaluate this type of analysis as a TLAA in the SLRA because the CLB does not contain or incorporate by reference any reduction of ductility analysis for the RVI components that conforms to criterion 6 for defining TLAAs in 10 CFR 54.3.

Component-specific corrosion allowance assessments. The applicant stated that the CLB does not include any component-specific corrosion allowance assessments for metallic components where the amount of additional metal in the component design was established through the results of a time-dependent corrosion wear or wastage analysis. The NRC staff reviewed the UFSAR for the facility and confirmed that the CLB does not contain or incorporate by reference any time-dependent corrosion allowance analyses. Therefore, the staff finds that the applicant does not need to evaluate this type of analysis as a TLAA in the SLRA because the CLB does not contain or incorporate by reference any component-specific metal corrosion analysis that conforms to criterion 6 for defining TLAAs in 10 CFR 54.3.

Component-specific flaw growth analyses involving stress corrosion cracking mechanisms. The applicant stated that the CLB does not include any component-specific flaw growth analyses that assess growth in terms of growth induced by a time-dependent stress-corrosion cracking mechanism. The NRC staff reviewed the UFSAR for the facility and confirmed that the CLB does not contain or incorporate by reference any stress-corrosion cracking-induced crack growth analyses for SSCs in the PBN unit-specific designs. Therefore, the staff finds that the applicant does not need to evaluate this type of analysis as a TLAA in the SLRA because the CLB does not contain or incorporate by reference any component-specific or structure-specific stress-corrosion cracking flaw growth analyses that conform to criterion 6 for defining TLAAs in 10 CFR 54.3(a).

Metal fatigue analyses for the spent fuel pool liners. The applicant stated that the CLB does not include any metal fatigue analyses for the spent fuel pool liners at PBN. The staff reviewed the UFSAR for the facility and confirmed that the UFSAR does not include or reference any metal fatigue analyses for the spent fuel pool liners in Unit 1 and Unit 2. Therefore, the staff finds that the applicant does not need to evaluate this type of analysis as a TLAA in the SLRA because the CLB does not include or incorporate by reference any metal fatigue analyses for the spent fuel pool liners that conform to criterion 6 for defining TLAAs in 10 CFR 54.3(a).

4.1.2.1.4 Staff Determination – TLAA Identification Results

Based on this review, the NRC staff finds that the applicant has appropriately identified all plant analyses that conform to the definition of a TLAA in 10 CFR 54.3(a) and has included its evaluations of these TLAAs in Chapter 4 of the SLRA. The staff did not find any additional analyses contained or incorporated by reference in the CLB (i.e., aside from those that were initially identified and evaluated as TLAAs in the SLRA, or the HELB analysis that was added as a TLAA by the applicant’s letter dated April 21, 2021) that would conform to the definition of a TLAA in 10 CFR 54.3(a) or would need to be identified and evaluated in the SLRA in accordance with the requirements in 10 CFR 54.21(c)(1).

4.1.2.2 Identification of Plant-Specific Exemptions

The NRC staff reviewed, in accordance with the review procedures in SRP-SLR Section 4.1, the applicant's plant-specific exemption identification methodology and results and the applicant's statement in SLRA Section 4.1.4 that the CLB does not include any plant-specific exemptions granted in accordance with 10 CFR 50.12 that remain in effect and are based on a TLAA. Specifically, the staff independently searched the CLB and the NRC's ADAMS database to identify any exemptions for the CLB that were granted in accordance with the requirements in 10 CFR 50.12.

Based on its ADAMS search, the NRC staff noted that the NRC had granted for PBN a total of 18 plant-specific exemptions in accordance with the exemption approval criteria in 10 CFR 50.12. As documented in the staff's audit report for SLRA Section 4.1, the staff noted that, with the exception of the plant-specific exemption granted in January of 1997 for the use of ASME Code Case N-514, none of the previously granted plant-specific exemptions fell within the scope of the plant-specific exemption evaluation criteria in 10 CFR 54.21(c)(2) because the exemptions either involved one-time schedular alternatives for completing operating license condition requirements or alternatives that were not based on TLAAs or time-dependent assumptions.

The NRC staff also noted that on January 27, 1997 (ADAMS Accession No. ML20134B737), the NRC had granted an exemption from the requirements for LTOP system setpoint analyses in 10 CFR Part 50, Appendix G, "Fracture Toughness Requirements," under the exemption provisions of 10 CFR 50.12 that permitted the applicant to use ASME Code Case N-514 as an alternative methodology for calculating the LTOP system setpoints that are required to be calculated by the 10 CFR Part 50, Appendix G rule. The staff also noted that the methods in ASME Code Case N-514 may be based on a TLAA because the Code Case methodology calculates the LTOP system setpoints as a function of the specific pressure-temperature (P-T) points in the applicant's P-T limit cooldown curves for the PBN units, which are within the scope of the applicant's P-T limits TLAA in SLRA Section 4.2.5. However, the staff further noted that the applicant's current pressure-temperature limits report (PTLR) for the PBN units (ADAMS Accession No. ML20009E096) does not rely on the use of ASME Code Case N-514 for the LTOP system setpoint calculations.

The NRC staff discussed the plant-specific exemption related to Code Case N-514 with the applicant during the in-office audit and raised the topic of whether the exemption remained in effect for the CLB. The staff informed the applicant that, while the staff understood the current PTLR LTOP system setpoint calculation methodology required to be used in accordance with PBN Technical Specification 5.6.5 does not involve the use of Code Case N-514, the exemption for the use of Code Case N-514 has not been formally withdrawn from the CLB for PBN Units 1 and 2 and, therefore, the exemption for the use of Code Case N-514 could be considered to remain in effect for the CLB. Based on the audit discussion, the applicant informed the staff that it would amend the SLRA to provide a 10 CFR 54.21(c)(2) evaluation statement in regard to the plant-specific exemption for the use of ASME Code Case N-514.

The NRC staff confirmed that, in its letter dated April 21, 2021, the applicant amended SLRA Section 4.1.4 to state that it no longer relies on the use of ASME Code Case N-514 as the basis for performing the LTOP system setpoint calculations and that the exemption is not considered to remain in effect for the CLB. With this SLRA amendment, the staff finds that the applicant has satisfied the requirement in 10 CFR 54.21(c)(2) because it has performed the evaluation of the exemption in accordance with the evaluation criteria in 10 CFR 54.21(c)(2) and has formally amended the SLRA to indicate that it no longer relies on the use of Code Case N-514 for the calculations of the LTOP system pressure lift and system arming temperature setpoints. Therefore, the staff concludes that the plant-specific exemption granted for the use of ASME Code Case N-514 no longer remains in effect for the CLB.

4.1.3 Conclusion

Based on its review, the NRC staff concludes that the applicant has provided an acceptable list of TLAAs as defined in 10 CFR 54.3. The staff also concludes that, in accordance with the criteria in 10 CFR 54.21(c)(2), the CLB does not include any plant-specific exemptions granted in accordance with 10 CFR 50.12 and that are based on a TLAA and remain in effect for the CLB.

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. 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. The NRC staff's evaluation of the Reactor Vessel Material Surveillance AMP is documented in SER Section 3.0.3.2.22, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects.

The applicant projected the expected neutron fluence values for the RPV to 80 years. The applicant's projected neutron fluence values 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. Updated neutron fluence evaluations were performed and documented in Westinghouse WCAP-18555-NP, Revision 1, "Point Beach Units 1 and 2 Time-Limited Aging Analyses on Reactor Vessel Integrity for Subsequent License Renewal" (ADAMS Accession No. ML20329A264). RPV beltline and extended beltline fast neutron fluences (E > 1.0 MeV) at the end of 80 years of operation were calculated for PBN. The analysis methodologies used to calculate the Unit 1 and Unit 2 RPV neutron fluences satisfy the guidance set forth in Regulatory Guide (RG) 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence" (ADAMS Accession No. ML010890301) and are consistent with the NRC-approved methodology described in WCAP-18124-NP-A, Revision 0, "Fluence Determination with RAPTOR-M3G and FERRET" (ADAMS Accession No. ML18204A010).

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 NRC staff noted that neutron fluence projections through 72 EFPY are included in WCAP-18555-NP, Revision 1. The RPV beltline neutron fluence values projected for a 20-year subsequent license renewal period are calculated for PBN. The analysis methodologies used to calculate the RPV neutron fluences are consistent with the guidance set forth in RG 1.190. Additionally, the methods used to develop the calculated RPV neutron fluence values for the subsequent license renewal period are consistent with the NRC -approved methodology described in WCAP-18124-NP-A.

The NRC provides guidance for acceptable neutron fluence calculations in RG 1.190. The NRC staff has approved the methods described in WCAP-18124-NP-A based on the adherence to the guidance contained in RG 1.190.

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 are acceptable. In addition, the staff noted that the applicant based the remaining TLAAs in SLRA Section 4.2 on a 72-EFPY projection, which assumes a 95-percent capacity factor for the duration of the 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.

SRP-SLR Section 4.2.2.1.1.3 states that in NUREG-2191, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report” (ADAMS Accession Nos. ML17187A031 and ML17187A204), 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). 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 SER 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).

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 Point Beach.

4.2.1.3 UFSAR Supplement

SLRA Appendix A, Section 16.2.1.2, provides the UFSAR supplement summarizing the Neutron Fluence Monitoring TLAA. The NRC staff reviewed SLRA Appendix A, Section 16.2.1.2, 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 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 Monitoring 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 RPV pressurized thermal shock (PTS). The applicant dispositioned the PTS TLAA in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the PTS analyses for Point Beach Units 1 and 2 have been projected to the end of the subsequent period of extended operation.

The applicant provided supporting information for RPV component-specific neutron fluence exposure levels (i.e., in units of n/cm^2 (E > 1.0 MeV), including those through 72 EPFY), copper (Cu) and nickel (Ni) alloying chemistries (i.e., in units of Wt.% Cu and Wt.% Ni), initial adjusted reference temperature values (i.e., $RT_{NDT(U)}$ values), and unirradiated reference temperature variance values (i.e., σ_I values). These values are contained in WCAP-18555-NP, Revision 1. Alternatively, for the Cu and Ni chemistry, $RT_{NDT(U)}$, and σ_I values of the Linde 80 welds in the RPVs, the values are as referenced in the NRC staff-approved Topical Report BAW-2308, Revision 2-A, "Initial RT_{NDT} of Linde 80 Weld Materials" (ADAMS Accession No. ML081270388).

4.2.2.2 Staff Evaluation

The NRC staff reviewed the applicant's TLAA on PTS and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii) consistent with the acceptance criteria in SRP-SLR Section 4.2.2.1.3.2 and the review procedures in SRP-SLR Section 4.2.3.1.3.2.

During the period from January 19 through March 26, 2021, the NRC staff performed an audit of the TLAA on PTS to verify that the TLAA appropriately projects the RT_{PTS} values for the RPV beltline and extended beltline materials (as described in SLRA Table 4.2.2-1) to the end of the subsequent period of extended operation (i.e., to 72 EFPY) in accordance with 10 CFR 54.21(c)(1)(ii), as summarized in the audit report section entitled "SLRA TLAA Section 4.2.2, Pressurized Thermal Shock."

In addition, the NRC staff performed independent confirmatory calculations of the RT_{PTS} values for the RPV materials in accordance with the calculational criteria in 10 CFR 50.61 to verify the validity of the RT_{PTS} values that were provided and calculated in SLRA Table 4.2.2-1 for the PBN Units 1 and 2 RPV materials. The staff reviewed the document sources and bases for the Cu and Ni alloying contents (in units of Wt.% Cu and Wt.% Ni), nil ductility transition initial reference temperature values (i.e., $RT_{NDT(U)}$ values), and σ_I reference temperature variance values that were used as input parameters for the RT_{PTS} calculations, and the sources of any RPV surveillance data that may be applicable to the calculations of RT_{PTS}.

The NRC staff confirmed that for welds made from Linde 80 flux materials, the Wt.% Cu and Wt.% Ni input values, $RT_{NDT(U)}$ values, and σ_I values for the PBN Units 1 and 2 RPV welds were consistent with the generic values reported and approved for the applicable Linde 80 weld heats contained in BAW-2308, Revision 2-A. Similarly, the staff confirmed that, for the relevant PBN Units 1 and 2 forgings, plates, and welds made from Linde 1092 flux material, the Wt.% Cu and Wt.% Ni values, $RT_{NDT(U)}$ values, and σ_I values were consistent with the values cited for the components in either the latest PTLR that was submitted for the units in accordance with Technical Specification 5.6.5.c (ADAMS Accession No. ML20009E096), or else for the Wt.% Cu chemistries of the RPV nozzle belt forgings (extended beltline components), as confirmed to be conservative in WCAP-18555-NP, Revision 1. The staff also confirmed that the RPV component-specific neutron fluence values used in the component-specific RT_{PTS} calculations for 72 EPFY were as reported in WCAP-18555-NP, Revision 1 and approved in Section 4.2.1 of this SER.

The NRC staff also reviewed the data from the Point Beach reactor vessel surveillance capsules and the applicant's analysis of that data and its credibility (in accordance with 10 CFR 50.61(c)(2)) provided in Appendix A of WCAP-18555-NP, Revision 1. Since the surveillance welds in each unit's program are not representative of welds in the RPV, only the data for base metals are evaluated in WCAP-18555-NP, Revision 1. The staff confirmed the adequacy of the applicant's evaluation of the surveillance data and agrees with the credibility evaluation that identified the data for each material as credible. The chemistry factor for each of these base metals is appropriately used to calculate RT_{PTS} values in SLRA Table 4.2.2-1.
The NRC staff's independent confirmatory calculations verified the accuracy of the applicant's RT_{PTS} calculations for the PBN Units 1 and 2 RPV materials at 72 EFPY, as described in SLRA Table 4.2.2-1.

Based on its review of the TLAA and its independent confirmatory calculations, the NRC staff verified that the RT_{PTS} calculations for all RPV beltline and extended beltline materials at 72 EPFY were performed in accordance with 10 CFR 50.61. The staff also verified that the RT_{PTS} values for the materials meet the PTS screening criteria in 10 CFR 50.61. Therefore, the staff finds that the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for PTS have been projected to the end of the subsequent period of extended operation.

Additionally, the SLRA meets the acceptance criteria in SRP-SLR Section 4.2.2.1.3.2 because the PTS analysis is based on neutron fluence values which have been projected to the end of the subsequent period of extended operation and meet the acceptance criteria of SRP-SLR Section 4.2.2.1.1; therefore, the PTS analysis meets the requirements of 10 CFR 54.21(c)(1)(ii).

4.2.2.3 UFSAR Supplement

SLRA Appendix A, Section 16.3.2.2, "Pressurized Thermal Shock," provides the UFSAR supplement summarizing the TLAA on PTS. The NRC staff reviewed SLRA Appendix A, Section 16.3.2.2, 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 TLAA on PTS, as required by 10 CFR 54.21(d).

4.2.2.4 Conclusion

Based on its review, the NRC staff concludes that the applicant provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the TLAA on PTS has been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate 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

The NRC's regulation in 10 CFR Part 50, Appendix G, establishes the regulatory requirements for evaluation of Charpy impact upper shelf energy (USE) fracture toughness properties for those ferritic base metal and weld metals that comprise RPVs.

4.2.3.1 Summary of Technical Information in the Application

SLRA Section 4.2.3 describes the applicant's TLAA on USE of the ferritic base metal and weld metals in the PBN RPVs. The SLRA states that the TLAA on USE is an analysis that meets the definition of a TLAA in 10 CFR 54.3. The SLRA identifies 72 EFPY to represent plant operation through the end of the subsequent period of extended operation. The SLRA states that the USE values for all ferritic RPV beltline and extended beltline material have been projected to 72 EFPY. The SLRA also states that equivalent margins analyses (EMAs) have been performed and projected to 72 EFPY for those RPV materials whose projected values of USE could not meet the 50 ft-lb requirement specified in 10 CFR Part 50, Appendix G. The applicant dispositioned the TLAA on USE in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the TLAA calculations have been projected to the end of the subsequent period of extended operation.

4.2.3.2 Staff Evaluation

The NRC staff reviewed the applicant's TLAA on USE and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the acceptance criteria in SRP-SLR Section 4.2.2.1.2.2 and the review procedures in SRP-SLR Section 4.2.3.1.2.2.

The NRC staff performed its review to confirm that either RPV USE values for 72 EFPY would meet the 50 ft-lb requirement in 10 CFR Part 50, Appendix G, or that the applicant performed appropriate EMAs to demonstrate that the weld and base materials would have adequate safety margins against fracture equivalent to those required by ASME Code Section XI. For those welds and base materials requiring an EMA, the staff confirmed that the applicant used the methods in Appendix K of the 2007 Edition of ASME Code Section XI as the basis for performing the J-integral flaw tolerance analyses under both normal operating and upset loading conditions (i.e., ASME Code Service Level A and B loading conditions) and under emergency and faulted loading conditions (i.e., ASME Code Service Level C and D loading conditions). As stated in Position 1.2 and reflected in Figure 2 of RG 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," the USE is projected to decrease as a function of neutron fluence when credible surveillance data are not available. If credible surveillance data are available, as stated in Position 2.2 of RG 1.99, Revision 2, the decrease in USE may be projected by plotting the reduced plant surveillance data on Figure 2 and fitting the data with a line drawn parallel to the existing lines as the upper bound of all of the data.

The NRC staff performed independent calculations of the USE values for the RPV materials to confirm the validity of the USE values provided for PBN Unit 1 in SLRA Tables 4.2.3-1 and 4.2.3-3 and for PBN Unit 2 in SLRA Tables 4.2.3-2 and 4.2.3-4. For those weld and base materials that required an EMA, the staff performed independent EMA calculations to verify that the applicant performed acceptable analyses consistent with ASME Code, Section XI, Appendix K.

The NRC staff confirmed the information provided in SLRA Tables 4.2.3-1 through 4.2.3-4; specifically, that the USE values for the RPV materials in PBN Units 1 and 2 at 72 EFPY identified to exceed the 50-ft-lb requirement in Appendix G remain above 50 ft-lb at the end of the subsequent period of extended operation. For the materials that do not meet the 50-ft-lb criterion of Appendix G, the staff confirmed that the applicant submitted EMAs to demonstrate compliance with 10 CFR Part 50, Appendix G, Paragraph IV.A.1.a, that the material toughness will "provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code." The staff also verified the acceptability of the Wt.% Cu, as described in SER Section 4.2.2.2, and the consistency of the unirradiated USE values with the CLB values.

For the Linde 80 welds in PBN Units 1 and 2, the NRC staff confirmed that the EMA methodologies in Topical Report BAW-2192, Revision 0, Supplement 3P/3NP, Revision 0, "Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels A & B Service Loads" (ADAMS Accession No. ML20329A264, Attachment 4), and Topical Report BAW-2178, Revision 0, Supplement 2P/2NP, Revision 0, "Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W Owners Reactor Vessel Working Group for Levels C & D Service Loads" (ADAMS Accession No. ML20329A264, Attachment 5), were followed and applicable for 72 EFPY. For PBN Unit 1 intermediate shell plate A9811-1, the staff reviewed the EMA procedure reported in Pressurized Water Reactor Owners Group (PWROG) Topical Report ANP-3886NP, Revision 0, PWROG-20043-NP, "PWROG – PBN Unit 1 IS Plate A9811-1 Equivalent Margins Analysis for [Subsequent License Renewal]." The EMA methodology is in accordance with ASME Code, Section XI, Appendix K, 2017 Edition, and the selection of design transients is based on RG 1.161, "Evaluation of Reactor Pressure Vessels with Charpy Upper-Shelf Energy Less Than 50 Ft-Lb." For this material, the staff reviewed the EMA methodology and performed independent EMA calculations to confirm the applicant's analyses and to verify the values provided by the applicant. The staff observed that the EMAs in all cases satisfy the acceptance criteria defined in ASME Code, Section XI, Appendix K.

Based on the above, the NRC staff finds that the applicant demonstrated, in accordance with 10 CFR 54.21(c)(1)(ii), that the USE analyses or EMAs have been projected to the end of the subsequent period of extended operation (i.e., to 72 EPFY). Additionally, the staff finds that the TLAA on USE meets the acceptance criteria in SRP-SLR Section 4.2.2.1.2.2 because, for each material, (a) the applicant has projected the USE analyses to the end of the subsequent period of extended operation and demonstrated that it meets the 50-ft-lb criterion or (b) for each material whose USE values for 72 EFPY are projected to be less than 50 ft-lb, the applicant has performed an EMA projected to the end of the subsequent period of extended operation that meets the requirements of 10 CFR Part 50, Appendix G.

4.2.3.3 UFSAR Supplement

SLRA Appendix A, Section 16.3.2.3, “Upper-Shelf Energy,” provides the UFSAR supplement summarizing the applicant’s TLAA on USE. The NRC staff reviewed the UFSAR supplement 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 USE, as required by 10 CFR 54.21(d).

4.2.3.4 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)(ii), that the USE analyses for the ferritic RPV beltline and extended beltline materials 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 the adjusted reference temperature (ART) of the reactor vessel beltline materials. Detailed calculations for the ART are in WCAP-18555-NP, Revision 1. The applicant dispositioned the TLAA for the ART in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analyses have been projected to the end of the subsequent period of extended operation.

4.2.4.2 Staff Evaluation

The NRC staff reviewed the applicant’s TLAA for the ART 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.

The NRC staff evaluated the applicant’s analysis and determined that it adequately describes the following.

- projection of fluence to 72 EFPY for all beltline materials at both 1/4T and 3/4T locations and evaluation of these fluence projections as discussed in Section 4.2.1 of this SER
- chemistry factor for all beltline materials and the basis for the chemistry factor (e.g., Position 1.1 or 2.1 of RG 1.99, Revision 2)
- unirradiated RT_{NDT} for all beltline materials and the basis for unirradiated RT_{NDT} (e.g., measured or generic data, in accordance with 10 CFR 50.61) and staff confirmation that unirradiated RT_{NDT} values are consistent with the CLB
- margin values for all beltline materials, consistent with the requirements of the applicable position of RG 1.99, Revision 2

- calculation of ART to 72 EFPY in SLRA Tables 4.2.4-2 and 4.2.4-3 for all beltline materials at both 1/4T and 3/4T locations, consistent with the applicable equations in RG 1.99, Revision 2

As described in SER Section 4.2.2.2, the NRC staff confirmed the acceptability of the Wt.% Cu and Wt.% Ni used in the calculation of ART values. The staff determined that the applicant's analysis is adequate because the ART calculations were performed consistent with the methodology of RG 1.99, Revision 2, and because the analysis was projected to the end of the subsequent period of extended operation.

The NRC staff finds that the applicant demonstrated, in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses for the ART have been projected to the end of the subsequent period of extended operation.

Additionally, the SLRA meets the acceptance criteria in SRP-SLR Section 4.2.2 because the ART analysis is based on neutron fluence projections that meet the acceptance criteria of SRP-SLR Section 4.2.2.1.1 and because the projections described above are adequately projected to the end of the subsequent period of extended operation.

4.2.4.3 UFSAR Supplement

SLRA Appendix A, Section 16.3.2.4, provides the UFSAR supplement summarizing the TLAA for the ART of the reactor vessel beltline materials. The NRC staff reviewed SLRA Appendix A, Section 16.3.2.4, 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 ART TLAA, as required by 10 CFR 54.21(d).

4.2.4.4 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)(ii), that the ART analyses 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 LTOP setpoints at PBN. The applicant dispositioned the TLAA for P-T limits and LTOP setpoints in accordance with 10 CFR 54.21(c)(1)(iii). According to the applicant, the effects of aging on the intended function(s) of the reactor vessels will be adequately managed for the subsequent period of extended operation. The applicant stated that the Reactor Vessel Material Surveillance AMP, as discussed in SLRA Section B.2.3.19, will ensure that the updated P-T limits and LTOP setpoints are developed based upon the updated adjusted nil-ductility transition reference temperature RT_{NDT} values.

4.2.5.2 Staff Evaluation

The NRC staff reviewed the applicant's TLAA for P-T limits and LTOP setpoints and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii) and the review procedures in SRP-SLR Section 4.2.3.1.4.3.

SRP-SLR Section 4.2.2.1.4 specifies that P-T limits in the technical specifications are required to be updated when necessary through the licensing process described in 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit." The process in 10 CFR 50.90 ensures that the P-T limits and LTOP setpoints for the subsequent period of extended operation will be updated before expiration of the P-T limits and LTOP setpoints for the initial period of extended operation.

SRP-SLR Section 4.2.2.1.4.3 states that (1) updated P-T limits for the subsequent period of extended operation must be established and completed using the applicable technical specification change process before the plant's entry into the subsequent period of extended operation and (2) the 10 CFR 50.90 process for P-T limits located in the plant technical specifications or the administrative controls process for P-T limits that are administratively amended through a 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 NRC staff approved the existing P-T limits and LTOP setpoints as discussed in the NRC letter dated June 30, 2014 (ADAMS Accession No. ML14126A378). As part of its review of SLRA Section 4.2.5, the staff determined that the applicant developed the existing heatup and cooldown P-T curves using the most limiting value of adjusted RT_{NDT} corresponding to the limiting material in the beltline region of the reactor vessel and locations outside of the beltline region, such as nozzles, penetrations, and other discontinuities. The staff further determined that the current P-T limits are based upon neutron fluence projections that were considered to represent plant operating conditions through 50 EFPY, including power uprated conditions.

PBN Technical Specification 3.4.3 requires that the reactor coolant system pressure, temperature, and heatup and cooldown rates be maintained within the limits specified in the PTLR. The NRC staff verified that PBN Technical Specification 3.4.3 contains the PTLR that maintains the appropriate P-T limit curves and LTOP setpoints. The staff finds acceptable that, as stated in SLRA Section 4.5.2 and as required by the PBN technical specifications, before exceeding 50 EFPY (approximately the end of 2029), the applicant will generate new P-T limit curves to cover plant operation beyond 50 EFPY.

PBN Technical Specification 3.4.12 refers to the PTLR for the power operated relief valve (PORV) lift settings to mitigate the consequences of LTOP events. The applicant indicated that whenever the P-T limit curves are revised, the LTOP PORV setpoints will also be revised; therefore, LTOP setpoints are considered part of the calculation of the P-T curves. By letter dated July 26, 2021 (ADAMS Accession No. ML21207A066), the applicant submitted Supplement 3, Revision 1, to revise the statement in SLRA Section 4.2.5 on updating the P-T limits and LTOP PORV setpoints. Specifically, the applicant stated that the P-T limit curves and LTOP PORV setpoints will be updated (if required) and will be submitted before exceeding the current 50 EFPY limits. The NRC staff finds it acceptable that the applicant will submit the updated P-T limits and LTOP setpoints because that is consistent with Generic Letter 96-03, "Relocation of the Pressure Temperature Limit Curves and Low Temperature Overpressure Protection System Limits."

The applicant stated that it will follow the Reactor Vessel Material Surveillance AMP when updating the P-T limit curves for the subsequent period of extended operation. The NRC staff determined that the Reactor Vessel Material Surveillance AMP is appropriate to manage the applicable aging effects of the reactor vessel shell materials because the materials from the reactor vessel surveillance capsules will provide material property information to determine the adjusted RT_{NDT}, which is a parameter in the P-T limit calculation. The staff's evaluation of the Reactor Vessel Material Surveillance AMP is documented in SER Section 3.0.3.2.22, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects.

The NRC staff determined that, because the P-T limits and LTOP setpoints are based on a defined operating period, they satisfy the criteria of 10 CFR 54.3 and have been identified as TLAAs. SRP-SLR Section 4.2.2.1.4.3 specifies that an applicant's 10 CFR 50.90 license amendment process is adequate to disposition P-T limit TLAAs in accordance with 10 CFR 54.21(c)(1)(iii) and applies to licensing bases that have P-T limit curves in the limiting conditions of operation of the plant-specific technical specifications. As such, the staff finds that the applicant's basis for disposition of the TLAA under 10 CFR 54.21(c)(1)(iii) is consistent with the basis in SRP-SLR Section 4.2.2.1.4.3. The staff noted that, when the applicant updates the P-T limit curves, it will also update the LTOP setpoints accordingly. Therefore, in accordance with 10 CFR 54.21(c)(1)(iii), the staff finds that the P-T limits and LTOP setpoints will be adequately managed during the subsequent period of extended operation, based on the Reactor Vessel Material Surveillance AMP and the 10 CFR 50.90 process.

4.2.5.3 UFSAR Supplement

SLRA Appendix A, Section 16.3.2.5, "Pressure -Temperature Limits and Low Temperature Overpressure Protection (LTOP) Setpoints," provides the UFSAR supplement summarizing the P-T limits and LTOP setpoints TLAA. The NRC staff reviewed SLRA Appendix A, Section 16.3.2.5, 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 of its actions to address the P-T limits and LTOP setpoints TLAA, as required by 10 CFR 54.21(d).

4.2.5.4 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 P-T limits and LTOP setpoints will be adequately managed during the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.3 <u>Metal Fatigue</u>

4.3.1 Metal Fatigue of Class 1 Components

4.3.1.1 Metal Fatigue of Class 1 Components Due to Design Transients

4.3.1.1.1 Summary of Technical Information in the Application

SLRA Section 4.3.1, as supplemented by letters dated August 11, 2021 and November 3, 2021 (ADAMS Accession Nos. ML21223A308 and ML21307A286, respectively), describes the applicant's TLAA on the metal fatigue of ASME Code Section III, Class 1 components. The fatigue analyses pertain to the reactor vessels, reactor vessel internals, pressurizers, pressurizer surge lines, steam generators (SGs), and reactor coolant pumps to evaluate the effects of cyclic loadings resulting from changes in system temperature and pressure. The fatigue analyses are based on the explicit numbers and amplitudes of thermal and pressure transients described in the design specifications.

In the fatigue analysis for the pressurizer spray piping, the applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the fatigue analysis has been projected to the end of the subsequent period of extended operation. For the other components, the applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of cumulative fatigue damage on the intended functions of the components will be adequately managed by the Fatigue Monitoring AMP for the subsequent period of extended operation. These evaluations on fatigue analyses demonstrate that the cumulative usage factors (CUFs) will not exceed the design limit of 1.0.

4.3.1.1.2 Staff Evaluation

The NRC staff reviewed the applicant's fatigue TLAA for the pressurizer spray 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 4.3.3.1.1.2 and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.2. For the other components, the staff reviewed the applicant's 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 Section 4.3.3.1.1.3 and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3.

SLRA Table 4.3.1-1 provides the 80-year transient cycle projections for PBN Units 1 and 2. The cycle projections are based on the linear extrapolation of actual transient cycles as of 2019. The applicant also stated that PBN Units 1 and 2 have experienced a significant declining trend in the accumulation of transient cycles over time. The NRC staff noted that the projected 80-year transient cycles are less than the 80-year allowable transient cycles that are bounded by the CLB design cycles. In addition, the staff noted that the CUF values of ASME Code Section III, Class 1 components for the CLB for 60 years of operation are less than the design limit (i.e., 1.0), as approved by the NRC in the extended power uprate license amendment (ADAMS Accession No. ML111170513).

As part of its review, the NRC staff determined that the design transients and transient cycles were not consistent between SLRA Table 4.3.1-1 (fatigue TLAA table) and SLRA Appendix A, Table 4.1 8 (UFSAR change table). For example, SLRA Appendix A, Table 4.1-8 did not identify the accumulator safety injection, loss of charging flow, loss of letdown flow, or pressurizer heatup transient as a design transient, while these transients were included in SLRA

Table 4.3.1-1. In addition, SLRA Appendix A, Table 4.1-8 specifically identified the more limiting 80-year allowable cycles for reactor vessel internal (RVI) baffle former bolts in addition to the general design cycle limits that are applied to the other RVI and piping components. The staff issued an RAI to address this matter.

In its August 11, 2021 RAI response, the applicant explained that the design transients listed in SLRA Appendix A, Table 4.1-8 only apply to reactor coolant system design transients used for equipment design purposes but are not intended to reflect operating experience. The applicant also clarified that SLRA Table 4.3.1-1 includes the design cycles from SLRA Appendix A, Table 4.1-8 and additional system transients used in the fatigue analysis of components based on plant operating experience (e.g., accumulator injection, loss of charging and loss of letdown). The applicant further explained that SLRA Table 4.3.1-1 also includes transient cycle projections and allowable cycles for 80 years of operation. In addition, in its November 3, 2021 response, the applicant revised SLRA Table 4.3.1-1 to be consistent with the more limiting design transient cycles for the baffle former bolts as specified in SLRA Appendix A, Table 4.1-8.

The NRC staff finds the applicant's response acceptable because (1) the applicant clarified that the main purpose of SLRA Appendix A, Table 4.1-8 is to list the design transients for equipment design purposes, (2) the applicant clarified that SLRA Table 4.3.1-1 includes additional transients for the fatigue monitoring and analysis based on operating experience, (3) SLRA Table 4.3.1-1 provides the 80-year transient cycle projections and allowable cycle numbers that the applicant will use for fatigue monitoring and management for 80 years of operation, and (4) SLRA Table 4.3.1-1 has been revised to adequately identify the design transient cycles for the baffle former bolts, consistent with SLRA Appendix A, Table 4.1-8.

With respect to the fatigue TLAA for the pressurizer spray piping, the applicant projected the 60-year CUF (0.277) to the end of the subsequent period of extended operation by conservatively projecting the thermal stratification cycles of the piping. Specifically, the 80-year projected CUF (0.369) is based on the assumption that a spray control value (isolation valve) continues to leak throughout the 80 years and thermal stratification continues to result from the leakage. The NRC staff noted that the applicant's assumption for the continuously leaking value since 1990 is very conservative because the applicant confirmed that corrective maintenance such as changes to the valve internals was performed after the measurement of thermal stratification data and leakage is unlikely to occur in the repaired valve.

Considering the overly conservative fatigue analysis and the relatively low value of the 80-year CUF, the applicant stated that cycle monitoring is not required for the pressurizer spray piping. However, the NRC staff needed to confirm that the inservice inspection results support the applicant's disposition of the TLAA (i.e., disposition per 10 CFR 54.21(c)(1)(ii) without fatigue monitoring) and, therefore, issued an RAI.

In its August 11, 2021 RAI response, the applicant explained that the pressurizer spray piping location with the maximum calculated fatigue usage is the PBN Unit 1 weld location RC-03-PS-1002-24. The applicant also clarified that this weld location is inspected every 10 years and that the ultrasonic examinations performed at this location have not identified any recordable indications. The NRC staff finds the applicant's response acceptable because (1) the maximum fatigue usage location of the pressurizer spray piping is included in the inservice inspection and (2) the inspections have not identified any relevant indication, which supports the applicant's disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii).

Based on the above, the staff finds that the disposition of the fatigue TLAA for the pressurizer spray piping in accordance with 10 CFR 54.21(c)(1)(ii) is acceptable because (1) the applicant projected the 80-year CUF value with a very conservative assumption (i.e., leaking valve for 80 years), (2) the projected 80-year CUF is relatively low and does not exceed the design limit of 1.0, and (3) the inservice inspection results also support that the pressurizer spray piping is not subject to significant fatigue damage.

In addition, the applicant addressed the metal fatigue TLAA for the following components: (1) reactor vessels and attached components (e.g., control rod drive mechanism nozzles, instrument port head adaptors, and core exit thermocouple nozzle assemblies); (2) control rod drive mechanism pressure housings; (3) SGs; (4) reactor coolant pumps; (5) pressurizers including surge lines; and (6) RVI components.

Based on its review, the NRC staff finds that the metal fatigue TLAA for these components is acceptable because (1) the 80-year projected transient cycles are less than the 80-year allowable cycles as described in SLRA Table 4.3.1-1, (2) the 80-year projected transient cycles, which are less than the design cycles, provide reasonable assurance that the CUF values for these components will remain less than the design limit of 1.0 during the subsequent period of extended operation, consistent with the CLB fatigue analysis results, and (3) the Fatigue Monitoring AMP will track the actual transient cycles to ensure that the CUF values do not exceed the 80-year allowable cycles and the applicant will implement corrective action as needed (e.g., fatigue reevaluation and repair/replacement). The staff's evaluation finding the Fatigue Monitoring AMP acceptable is documented in SER Section 3.0.3.2.1.

In summary, for the pressurizer spray piping, the NRC staff finds that the applicant demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the fatigue analysis has been projected to the end of the subsequent period of extended operation. Additionally, the application meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.2 because the applicant provided a revised projection of the CUF value based on a conservative assumption for the transient cycles and demonstrated that the projected CUF value remains less than the design limit (1.0) for the subsequent period of extended operation.

For the other components, the NRC staff finds that the applicant demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of cumulative fatigue damage on the intended functions of the components will be adequately managed for the subsequent period of extended operation. Additionally, the application meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3 because the applicant proposed to use the Fatigue Monitoring AMP for managing the effects of cumulative fatigue damage.

4.3.1.1.3 UFSAR Supplement

SLRA Appendix A, Section 16.3.3.1, provides the UFSAR supplement summarizing the metal fatigue TLAA for the ASME Code Section III, Class 1 components. The NRC staff reviewed SLRA Appendix A, Section 16.3.3.1, consistent with the review procedures in SRP-SLR Section 4.3.3.2.

Based on its review, the NRC staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR Section 4.3.2.2, and is, therefore, acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the metal fatigue TLAA for the ASME Code Section III, Class 1 components, as required by 10 CFR 54.21(d).

4.3.1.1.4 Conclusion

Based on its review, the NRC staff concludes the following: (a) the applicant provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the fatigue analysis for the pressurizer spray piping has been projected to the end of the subsequent period of extended operation and (b) the applicant provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of cumulative fatigue damage on the intended functions of the other ASME Code Section III, Class 1 components will be adequately managed by the Fatigue Monitoring 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).

4.3.1.2 Metal Fatigue of SG Tubes Due to Flow-induced Vibration

4.3.1.2.1 Summary of Technical Information in the Application

SLRA Section 4.3.1 describes the applicant's TLAA for evaluating metal fatigue of the SGs; however, the statement about the fatigue evaluation only referenced CUFs that were previously evaluated as part of the Point Beach extended power uprate. SLRA Section 4.3.1 did not specifically address high-cycle fatigue of the SG tubes, so the NRC staff requested additional information about the SG tube high-cycle fatigue analysis

Beginning at North Anna Power Station in 1987, and at a few other plants since that time, operating experience has shown that some plants with drilled carbon steel tube support plates can become susceptible to flow-induced vibration that results in fluid-elastic instability and an SG tube high-cycle fatigue failure. The most significant contributors to the occurrence of fluid-elastic instability were tube denting at the uppermost tube support plate and high flow velocities caused by the nonuniform insertion of antivibration bars (AVBs) into the tube bundle. As a result of both U.S. and international operating experience with high-cycle fatigue failure of SG tubes at tube support plates, the NRC issued Bulletin No. 88-02, "Rapidly Propagating Fatigue Cracks in Steam Generator Tubes" (ADAMS Accession No. ML031220043); Information Notice 2005-29, "Steam Generator Tube and Support Configuration" (ADAMS Accession No. ML052280011); and Information Notice 2007-37, "Buildup of Deposits in Steam Generators" (ADAMS Accession No. ML072910750).

The SG tube support design at PBN Unit 1 is different than the original North Anna SG design and, therefore, is not susceptible to tube denting within the support plate. However, Westinghouse issued Nuclear Safety Advisory Letter 12-7, "Insufficient Insertion of Anti-Vibration Bars in Alloy 600 TT Steam Generators with Quatrefoil Tube Support Plates," on September 24, 2012, in response to NRC staff communications for licensees to identify the as-built anti-vibration bar insertion depths in applicable steam generators, so as to identify the potential for additional tube fatigue failures. Therefore, the potential for tube fatigue in PBN Unit 1 SG tubes must be evaluated for 80 years of operation. The design of the PBN Unit 2 SGs is not susceptible to either tube denting or high flow velocities.

The applicant dispositioned the TLAA for the Class 1 components in the SGs in accordance with 10 CFR 54.21(c)(1)(i) by stating that the original SG design analyses remain valid for the subsequent period of extended operation.

4.3.1.2.2 Staff Evaluation

The NRC staff reviewed the applicant's TLAA and August 11, 2021 RAI response for the applicant's disposition that the original SG design analyses remain valid for the subsequent period of extended operation, consistent with the review procedures in SRP-SLR Section 4.7.3.1.1.

As noted in the applicant's August 11, 2021 RAI response, Electric Power Research Institute (EPRI) Technical Report 3003007562, "Steam Generator Management Program: Generic Elements of U-bend Tube Vibration Induced Fatigue Analysis for Westinghouse Model 44F Steam Generators," concludes that plants affected by the high-cycle fatigue issue were limited to Westinghouse-designed SGs built before 1987. The report recommends performing AVB mapping to determine the as-built condition of the SGs, and if the mapping determines that the AVBs were not in the design configuration, then performing a site-specific high-cycle fatigue analysis. Since the PBN Unit 1 SGs were listed as being potentially affected, the applicant analyzed the as-built condition to determine if the AVB supports were inserted to the design specifications and to identify AVB insertion conditions that could result in locally increased flow conditions (i.e., flow peaking). An AVB mapping effort was completed for the PBN Unit 1 Model 44F SGs, which confirmed that all AVB supports satisfy the insertion depth that the design specification required and that all tubes are supported in the U-bend region. The as-built AVB conditions are generally uniform and without insertion depth variations that could lead to flow peaking. Since all as-built AVB insertion depths satisfy the design specification criteria and no local flow peaking conditions are present, the applicant did not perform a site-specific high-cycle fatigue analysis.

The NRC staff finds that the applicant demonstrated, in accordance with 10 CFR 54.21(c)(1)(i), that the as-built configuration of the AVBs conforms to the SG design, which is adequate to prevent high-cycle fatigue during the subsequent period of extended operation and that, therefore, an additional analysis for SG tube high-cycle fatigue is not required. Additionally, the application meets the acceptance criteria in SRP-SLR Section 4.7.2.1.i because the original SG design analysis remains valid for the subsequent period of extended operation, which meets the requirements of 10 CFR 54.21(c)(1)(i).

4.3.1.2.3 UFSAR Supplement

SLRA Appendix A, Section 16.3.3.1, provides the UFSAR supplement summarizing the high-cycle fatigue evaluation of SG components. The NRC staff reviewed SLRA Appendix A, Section 16.3.3.1, consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the NRC 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 high-cycle fatigue of SG components, as required by 10 CFR 54.21(d).

4.3.1.2.4 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)(i), that the analysis for SG tube high-cycle fatigue 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).

4.3.2 ASME Code Section III, Class 1 Components Fatigue Waivers

4.3.2.1 Summary of Technical Information in the Application

SLRA Section 4.3.2 describes the applicant's TLAA on the fatigue waivers for ASME Code Section III, Class 1 components. The applicant indicated that the following SG components conform to the ASME Code Section III provisions for the waiver of fatigue analysis requirements: (1) shop-installed weld tube plugs; (2) ribbed mechanical tube plugs; and (3) tube wall undercut. The applicant dispositioned the TLAA for the ASME Code Section III, Class 1 components in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of cumulative fatigue damage on the intended functions of the components will be adequately managed by the Fatigue Monitoring AMP for the subsequent period of extended operation.

4.3.2.2 Staff Evaluation

The NRC staff reviewed the applicant's TLAA for ASME Code Section III, Class 1 component fatigue waivers 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.

The applicant explained that, as discussed in Section 2.2.2.5.9 of its extended power uprate (EPU) license amendment request (ADAMS Accession No. ML110750120), the Class 1 components listed above conform to the provisions for waivers of fatigue analysis requirements. Specifically, the applicant evaluated the conditions for fatigue waivers in N-415.1 of ASME Code Section III (1965 Edition through Summer 1966 Addenda) for the SG components in lieu of an explicit calculation of the fatigue usage factor.

The fatigue waiver evaluation considers the normal and upset EPU design transients for the subject Class 1 components, which are consistent with the design transients listed in SLRA Table 4.3.1-1. As shown in SLRA Table 4.3.1-1, the original 40-year design cycles, which are also the 60-year CLB cycles, bound the transient cycles projected for 80 years of operation. To ensure that the design cycles remain bounding and valid in the fatigue waivers of the Class 1 components, the Fatigue Monitoring AMP will be used to track cycles for the design transients and to ensure that corrective action is taken before potentially exceeding the design cycles specified in SLRA Table 4.3.1-1.

Based on its review, the NRC staff finds that the applicant's TLAA on the fatigue waivers for the ASME Code Section III, Class 1 components is acceptable because (1) the TLAA is based on the existing fatigue waiver analysis in the CLB and (2) the Fatigue Monitoring AMP is used to track the actual transient cycles of the Class 1 components and to ensure that the actual cycles are bounded by the design transient cycles for the subsequent period of extended operation. The staff's evaluation of the Fatigue Monitoring AMP is documented in SER Section 3.0.3.2.1, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects.

The NRC staff finds that the applicant demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of cumulative fatigue damage on the intended functions of the ASME Code Section III, Class 1 components will be adequately managed for the subsequent period of extended operation. Additionally, the application meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3

4.3.2.3 UFSAR Supplement

SLRA Appendix A, Section 16.3.3.2, provides the UFSAR supplement summarizing the fatigue wavier TLAA for the ASME Code Section III, Class 1 components. The NRC staff reviewed SLRA Appendix A, Section 16.3.3.2, consistent with the review procedures in SRP-SLR Section 4.3.3.2.

Based on its review, the NRC staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the TLAA for the ASME Code Section III, Class 1 components covered by fatigue waivers, as required by 10 CFR 54.21(d).

4.3.2.4 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 cumulative fatigue damage on the intended functions of the ASME Code Section III, Class 1 components covered by fatigue waivers 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).

4.3.3 Metal Fatigue of Non-Class 1 Components

4.3.3.1 Summary of Technical Information in the Application

SLRA Section 4.3.3, as supplemented by letters dated April 21, 2021 and August 11, 2021, describes the applicant's TLAA on metal fatigue of non-Class 1 components. The components designed in accordance with the American National Standards Institute (ANSI) B31.1 code 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 cycle projections in SLRA Table 4.3.3-2 indicate that the non-Class 1 components will not exceed 7,000 temperature cycles for 80 years of operation, which means that no stress reduction is required. The applicant also identified HELB analysis as a TLAA since the HELB location postulation is based on the maximum allowable stress range for thermal expansion, which may need to be adjusted by the stress range reduction factor.

The applicant dispositioned the TLAA on the metal fatigue of non-Class 1 components in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the fatigue analysis, including its potential impact on the HELB location postulation, has been projected to the end of the subsequent period of extended operation.

4.3.3.2 Staff Evaluation

The NRC staff reviewed the applicant's fatigue TLAA for the non-Class 1 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 4.3.3.1.1.2 and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.2.

SLRA Section 4.3.3 describes the fatigue TLAA for the non-Class 1 components designed to the ANSI B31.1 code. The reactor coolant primary loop and balance-of-plant piping systems within the scope of subsequent license renewal were originally designed to the requirements of the ANSI B31.1 code. Since the commencement of plant operation, some piping systems were further evaluated in accordance with the provisions of ASME Code Section III for Class 1 components, as discussed in SER Section 4.3.1.

The ANSI B31.1 code does not require an explicit fatigue analysis that involves calculations of fatigue CUF values. Instead, the cyclic qualification of the piping designed in accordance with ANSI B31.1 is based on the number of equivalent full temperature cycles and corresponding stress range reduction factors. If the total number of equivalent full temperature cycles is 7,000 or less, a stress range reduction factor of 1.0 is applied to the allowable stress range for the component, which means that the allowable stress does not need to be reduced due to the effects of cyclic loading.

The applicant explained that, to exceed 7,000 cycles, a piping system would be required to experience a full thermal cycle approximately once every 4 days and that such a high number of cycles is not applicable to the PBN non-Class 1 piping systems. The NRC staff also noted that the existing 60-year fatigue TLAA, as well as the proposed 80-year fatigue TLAA, identifies the plant sampling system as the most frequently cycled system for the fatigue analysis of the non-Class 1 piping systems.

In SLRA Table 4.3.3-2, the applicant provided the projected cycle numbers of the equivalent full temperature cycles for the non-Class 1 piping systems. However, the NRC staff noted that the SLRA did not clearly address which design transients can contribute to the equivalent full temperature cycles, in addition to the plant heatup and cooldown transients. Specifically, the staff needed to confirm that the consideration of the other transients does not affect the applicant's conclusion that the projected numbers of the equivalent full temperature cycles do not exceed 7,000 cycles for the following systems as described in the SLRA Section 4.3.3: (1) feedwater and condensate system; (2) main and auxiliary steam system; (3) reactor coolant system, non-Class 1; and (4) safety injection system. Therefore, the staff issued an RAI to address this matter.

In its August 11, 2021 RAI response, the applicant explained that the following design transients can contribute to the equivalent full temperature cycles for the systems discussed above, in addition to the plant heatup and cooldown transients: (1) reactor trip; (2) trip due to loss of reactor coolant pump; (3) loss of load; (4) loss of power; (5) loss of flow; (6) 10-percent step load increase or decrease; (7) 50-percent step load decrease; and (8) unit loading or unloading 5 percent. Considering these design cycles, the number of 80-year equivalent full temperature cycles (including the heatup and cooldown cycles) for these systems is significantly less than 7,000 cycles, as documented in revised SLRA Table 4.3.3-2.

Based on its review, the NRC staff finds the applicant's response acceptable because (1) the applicant identified all of the design transients that can contribute to the equivalent full temperature cycles, (2) the total number of 80-year equivalent full temperature cycles for these systems does not exceed 7,000 cycles, (3) the number of cycles is estimated very conservatively since some of the transient cycles are not full but partial temperature cycles, and (4) the applicant's evaluation demonstrates that a stress range reduction factor of 1.0 is applicable to the allowable stress range for the non-Class 1 components, consistent with the original design analysis.

The applicant also addressed the following piping systems, which are not directly tied to the reactor coolant system (RCS) heatup and cooldown transient cycles: (1) auxiliary feedwater system; (2) chemical and volume control system; (3) emergency power system; (4) fire protection system; (5) heating steam system; (6) plant sampling system; (7) residual heat removal system; and (8) waste disposal system. The applicant estimated the number of the 80-year equivalent full temperature cycles for these systems in SLRA Table 4.3.3-2. The applicant identified the number of cycles for a certain time period and projected the cycle numbers for 80 years of operation. The NRC staff finds that the projected numbers of the 80-year equivalent full temperature cycles are acceptable because the cycle projections are based on the transient cycles for a certain time period (e.g., yearly cycles according to surveillance test requirements or conservative operating cycles) and the projected cycles do not exceed 7,000 cycles.

In its supplement dated April 21, 2021, the applicant stated that UFSAR Appendix A, Section 2.5 describes the HELB analysis methodology for break location postulation. Specifically, the maximum allowable stress range for thermal expansion (S_a) is used as part of the criteria for HELB location postulation. The applicant explained that the determination of the S_a value accounts for the stress range reduction factor based on the total number of equivalent full temperature cycles. Accordingly, the applicant identified the HELB analysis as a TLAA. The applicant dispositioned the HELB TLAA in accordance with 10 CFR 54.21(c)(1)(ii) in the evaluation of the metal fatigue TLAA for non-Class 1 components.

Based on its review, the NRC staff finds that the metal fatigue TLAA for non-Class 1 components, including the HELB location postulation, is acceptable because (1) the equivalent full temperature cycles are less than 7,000 cycles and, therefore, there is no need to apply a stress range reduction factor less than 1.0 on the allowable stress, consistent with the CLB, and (2) the implicit fatigue analysis for the 80-year operation does not affect the break location postulations of the existing HELB analysis.

The NRC staff finds that the applicant demonstrated, in accordance with 10 CFR 54.21(c)(1)(ii), that the fatigue analysis for non-Class 1 piping and components, including its impact on the HELB location postulation, has been projected to the end of the subsequent period of extended operation. Additionally, the application meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.2 because the applicant demonstrated that the conservatively determined equivalent full temperature cycles are less than 7,000 cycles and that the stress range reduction factor (1.0) remains valid for the subsequent period of extended operation.

4.3.3.3 UFSAR Supplement

SLRA Appendix A, Section 16.3.3.3, provides the UFSAR supplement summarizing the metal fatigue of non-Class 1 components. The NRC staff reviewed SLRA Appendix A, Section 16.3.3.3, consistent with the review procedures in SRP-SLR Section 4.3.3.2.

Based on its review, the NRC staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR Section 4.3.2.2, and is, therefore, acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the metal fatigue TLAA for the non-Class 1 components, as required by 10 CFR 54.21(d).

4.3.3.4 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)(ii), that the fatigue analysis for non-Class 1 components, including its potential impact on the HELB location postulation, has been projected to the end of the subsequent period of extended operation. The staff finds that there is no impact on the HELB break location postulation. 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 Environmentally Assisted Fatigue

4.3.4.1 Summary of Technical Information in the Application

SLRA Section 4.3.4, as supplemented on August 11, 2021, describes the applicant's TLAA on the environmentally assisted fatigue (EAF) of RCS pressure boundary components, which include ASME Code Section III components and ANSI B31.1 piping. The EAF analysis also considers the NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components" (ADAMS Accession No. ML031480219), locations and other 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 [Light-Water Reactor] Water Environments on the Fatigue Life of Reactor Materials" (ADAMS Accession No. ML16319A004). As described in the SLRA, the evaluation reviewed the CLB fatigue evaluations for all ASME Code Section III RCS pressure boundary components and ANSI B31.1 piping, including the NUREG/CR-6260 locations, to determine the lead indicator (also referred to as sentinel) locations for EAF.

For the pressurizer spray piping including the auxiliary spray line, the applicant dispositioned the EAF TLAA in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the EAF analysis has been projected to the end of the subsequent period of extended operation. For the other RCS pressure boundary components, 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 will be adequately managed by the Fatigue Monitoring AMP, Steam Generators AMP, and ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP.

4.3.4.2 Staff Evaluation

The NRC staff reviewed the applicant's EAF TLAA for the pressurizer spray 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 4.3.3.1.2.2 and the acceptance criteria in SRP-SLR Section 4.3.2.1.2.2. For the other RCS pressure boundary components, 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 Section 4.3.3.1.2.3 and the acceptance criteria in SRP-SLR Section 4.3.2.1.2.3.

ASME Code Section III Components

In the EAF screening process for ASME Code Section III components, the applicant reviewed the components that are in contact with reactor coolant and have CUF values in the CLB. The applicant chose conservative values for each of the F_{en} input parameters, including sulfur content, service temperature, strain rate, and dissolved oxygen. The applicant calculated the screening CUF_{en} values in accordance with NUREG/CR-6909, Revision 1.

The NRC staff noted that the applicant used conservative temperature, sulfur content, strain rate, and dissolved oxygen values for the F_{en} calculations in accordance with NUREG/CR-6909, Revision 1. The staff finds this screening approach acceptable because it results in conservative F_{en} values for the EAF screening process.

Based on its review, the NRC staff finds that the EAF screening process for ASME Code Section III components is acceptable because (1) the screening CUF_{en} values were calculated in accordance with NUREG/CR-6909, Revision 1, by using conservative input values and (2) NUREG/CR-6909, Revision 1, is appropriate guidance for EAF analyses, as addressed in RG 1.207, Revision 1, "Guidelines for Evaluating the Effects of Light-Water Reactor Water Environments in Fatigue Analyses of Metal Components" (ADAMS Accession No. ML16315A130), which is cited in SRP-SLR Section 4.3.3.1.2.

As listed in SLRA Table 4.3.4-1, the following ASME Code Section III component locations were selected for further evaluation based on the screening process: (1) reactor vessel (control rod drive mechanism nozzle and vessel flange); (2) control rod drive mechanism (upper latching housing); (3) pressurizer upper head and shell (spray nozzle and safety and relief nozzle); (4) pressurizer lower head (nozzle to safe end weld); and (5) steam generator (primary chamber, tubesheet, and stub barrel complex).

The EAF further evaluations for ASME Section III components were performed in accordance with the guidelines in RG 1.207, Revision 1. In these evaluations, the design fatigue curves in NUREG/CR-6909, Revision 1, Section A.2.1 were used to calculate CUF values and the F_{en} equations in NUREG/CR-6909, Revision 1, Section A.2 were used to calculate CUF_{en} values.

In the further evaluations, the applicant refined the EAF analyses and removed conservatisms of the stress and fatigue analyses in the analysis of records, if possible. The CUF_{en} was initially calculated by conservatively applying the maximum F_{en} to the CUF. For those component locations where this method was overly conservative (i.e., the resultant CUF_{en} values were greater than 1.0), strain rate dependent F_{en} values were calculated by using the modified rate approach. The modified rate approach considers the effects of varying stain rates and associated temperatures on the F_{en} values, consistent with NUREG/CR-6909, Revision 1. The refined analyses also used the design fatigue curves in NUREG/CR-6909, Revision 1, which is consistent with provisions of RG 1.207, Revision 1. These refinements are acceptable because they reflect more realistic modeling of the actual component loads and history.

For some components (e.g., reactor vessel flange and control drive mechanism nozzle), reduced cycles were used in the refined calculations of CUF_{en} values. These reduced allowable cycles for EAF analysis are specified in Note 1 of SLRA Table 4.3.1-1 that addresses the 80-year allowable transient cycles. The NRC staff finds that the use of the reduced cycles is acceptable because the reduced allowable cycle numbers are specified in SLRA Table 4.3.1-1 and the Fatigue Monitoring AMP will monitor the transient cycles to ensure that the actual cycles do not exceed these reduced allowable cycles.

SLRA Table 4.3.4-1 describes the further evaluation results, including the leading EAF locations (or sentinel locations) and their 80-year projected CUF_{en} values. The NRC staff finds that the EAF further evaluations are acceptable for the ASME Code Section III components because (1) the CUF_{en} values were calculated in accordance with NUREG/CR-6909, Revision 1, and RG 1.207, Revision 1, (2) the EAF analyses were refined by appropriately removing excess conservatism (e.g., by considering the more detailed strain rates and the design fatigue curves per NUREG/CR-6909, Revision 1) using acceptable means, and (3) the 80-year projected CUF_{en} values for the leading EAF locations are less than the design limit (1.0).

ANSI B31.1 Piping

The original code of record for PBN RCS piping is the ANSI B31.1 code, which uses a stress range reduction factor and does not require calculation of fatigue usage values. Over the operating history of PBN, CUF values have been calculated for several locations of the ANSI B31.1 piping in accordance with ASME Code Section III, as follows: (1) pressurizer surge lines in response to NRC Bulletin 88-11, "Pressurizer Surge Line Thermal Stratification"; (2) pressurizer spray piping including the auxiliary spray line connection in response to NRC Bulletin 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant Systems"; (3) RCS cold-leg branch nozzles such as charging and safety injection (accumulator) nozzles in support of initial license renewal (60-year operation); and (4) residual heat removal (RHR) tees in support of initial license renewal. The evaluation of the EAF analysis below addresses these piping locations and the other ANSI B31.1 piping locations. The NRC staff finds that the applicant adequately identified the piping lines that were designed in accordance with the ANSI B31.1 code and subsequently revaluated in accordance with the fatigue analysis provisions of ASME Code Section III.

As part of the EAF screening for the ANSI B31.1 piping to ensure that all relevant ANSI B31.1 locations have been identified, the applicant reviewed the EAF evaluations of the plants most similar in design to PBN (i.e., other Westinghouse 2-loop pressurized water reactors). As documented in Structural Integrity Associates, Inc. (SIA) Report No. 2000088.402, Revision 1, "Environmentally-Assisted Fatigue Evaluation for 80 Years of Plant Operation for Point Beach Nuclear Units 1 and 2," SIA concluded that none of the EAF evaluations for these plants identified locations other than those considered in NUREG/CR-6260 and already included for PBN.

In addition, the applicant reviewed the EAF evaluation results of the subsequent license renewal of Surry Power Station. Although Surry is a Westinghouse 3-loop plant design, the code of record for Surry RCS piping is also the ANSI B31.1 code. The applicant noted that the EAF screening for Surry identified the applicable NUREG/CR-6260 piping locations and the pressurizer spray piping as the leading (sentinel) locations for EAF.

In its August 11, 2021 RAI response, the applicant also explained that Surry was not used as a direct comparison to Point Beach but that the fatigue analysis results for Surry were considered because none of the Westinghouse 2-loop plants have had as similar a comprehensive review as that performed for Surry. The applicant further clarified that Surry was used as an example of a comprehensive review of the Class 1 ANSI B31.1 piping demonstrating that the plant design and locations selected in NUREG/CR-6260 are reasonably representative of the most limiting locations. In addition, the applicant explained that, since there is no requirement to perform ASME Code Class 1 fatigue analysis of additional locations that were designed to the B31.1 code, it is reasonable to conclude that the locations other than the NUREG/CR-6260 piping locations and the pressurizer spray piping are not more limiting.

The NRC staff finds that the applicant's RAI response and discussion regarding the EAF analysis of the B31.1 piping is acceptable because (1) the applicant evaluated CUF_{en} for all of the ANSI B31.1 locations that have CLB CUF values, (2) the evaluated locations include all of the NUREG/CR-6260 locations in the B31.1 piping, and (3) the use of results from other Westinghouse 2-loop plants and Surry is used only to verify that the limiting ANSI B31.1 locations from these other plants are already included in the PBN EAF TLAA.

Based on the screening process discussed above, the applicant identified the following locations as the leading EAF locations, including the four NUREG/CR-6260 locations and pressurizer spray piping, as follows: (1) hot leg surge nozzle; (2) charging nozzle; (3) safety injection (accumulator) nozzle; (4) RHR tee (limiting location of RHR piping); and (5) pressurizer spray piping.

The NRC staff finds that the EAF screening process for the ANSI B31.1 piping is acceptable because (1) the screening process considered the CUF analysis results, as updated for the piping locations originally designed to the ANSI B31.1 code, (2) the applicant's evaluation included all locations in the existing fatigue analyses as well as the NUREG/CR-6260 locations, (3) the applicant performed a review of the EAF evaluations of other Westinghouse 2-loop plants, which pertain to the applicant's plant design and confirmed that the evaluations did not identify any leading locations other than the NUREG/CR-6260 locations, and (4) the pressurizer spray piping is additionally identified as the piping location that could be more limiting than the NUREG/CR-6260 locations.

The 80-year projected CUF_{en} values of the five leading locations discussed above are provided in SLRA Table 4.3.4-1. The NRC staff finds that the EAF evaluations are acceptable because (1) the existing fatigue analyses for the 60-year operation are used as the inputs to the subsequent license renewal EAF analysis (such as transient loads and component materials), (2) conservative values are used as the F_{en} input parameters, including sulfur content, service temperature, strain rate, and dissolved oxygen, and (3) the CUF_{en} values are calculated in accordance with NUREG/CR-6909, Revision 1.

Aging Management

For the pressurizer spray piping, the applicant's fatigue analysis is based on the assumption that a spray control value continues to leak throughout 80 years and the thermal stratification due to leakage continues to occur, as previously discussed in SER Section 4.3.1. The applicant has performed corrective maintenance such as changes to the internals on the isolation valve after the measurement of thermal stratification data. The assumption for the continuously leaking valve for 80 years is very conservative. Based on this conservative assumption, the applicant estimated the 80-year CUF_{en} value of this piping to be 0.744 in accordance with NUREG-6909, Revision 1, as described in SLRA Table 4.3.1-4. In its August 11, 2021 RAI response, the applicant further clarified that the leading fatigue location of the pressurizer spray piping is periodically examined using an ultrasonic technique in the applicant's inservice inspection and that the examination results do not have any recordable indications.

The NRC staff finds that the disposition of the EAF TLAA for the pressurizer spray piping in accordance with 10 CFR 54.21(c)(1)(ii) is acceptable because (1) the applicant projected the 80-year CUF_{en} value with a very conservative assumption (i.e., leaking valve for 80 years), (2) the projected 80-year CUF_{en} does not exceed the design limit of 1.0, and (3) the inservice inspection results support that the pressurizer spray piping has not been subject to cracking due to EAF.

For the SG primary side tube location, the effects of fatigue will be managed by the Steam Generators AMP. The Steam Generators AMP will volumetrically examine the SG tubes such that fatigue cracks will be detected and corrective actions will be initiated as appropriate to maintain the intended functions of the SG tubes, consistent with GALL-SLR AMP XI.M19.

The NRC staff finds that the disposition of the EAF TLAA for the SG tubes in accordance with 10 CFR 54.21(c)(1)(iii) is acceptable because the Steam Generators AMP includes adequate inspection and repair activities to examine and maintain the integrity of the SG tubes that may be subject to EAF. The staff's evaluation of the Steam Generators AMP is documented in SER Section 3.0.3.2.13, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects.

For the pressurizer spray nozzle safe end, the effects of fatigue will be managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP during the subsequent period of extended operation based on the results of the flaw tolerance evaluation conducted in accordance with ASME Code Section XI, Nonmandatory Appendix L in the 2017 Edition of the Code.

The flaw tolerance evaluation includes the crack growth evaluation with postulated flaws and crack stability evaluation that is consistent with the provisions in Appendix C of ASME Code Section XI. The applicant considered fatigue crack growth because the pressurizer spray nozzle safe end and associated welds are fabricated with stainless steel materials that are not susceptible to primary water stress corrosion cracking. As described in SLRA Table 4.3.4-2, the final flaw size of the most limiting case was less than the maximum allowable flaw size for the evaluation period of 12 years.

The NRC staff finds that the disposition of the EAF TLAA for the pressurizer spray nozzle safe end in accordance with 10 CFR 54.21(c)(1)(iii) is acceptable because the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP performs periodic volumetric examination, which can ensure the integrity of the components that are subject to EAF based on the flaw tolerance evaluation in accordance with ASME Code Section XI, Appendix L. The staff's evaluation of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP is documented in SER Section 3.0.3.2.5, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects.

In addition, the effects of fatigue on the intended functions of the ASME Code Section III components and B31.1 piping locations will be managed by the Fatigue Monitoring AMP through transient cycle monitoring. The NRC staff finds that the disposition of the EAF analysis for the components and piping locations in accordance with 10 CFR 54.21(c)(1)(iii) is acceptable because the Fatigue Monitoring AMP will track the transient cycles that are the inputs to the EAF analysis and will require corrective action as needed to ensure that the CUF_{en} values do not exceed the design limit (1.0). The staff's evaluation of the Fatigue Monitoring AMP is documented in SER Section 3.0.3.2.1, which determined that the AMP will be adequate to manage the applicable aging effects.

As discussed above, for the pressurizer spray piping, the NRC staff finds that the applicant demonstrated pursuant to 10 CFR 54.21(c)(1)(ii) that the EAF analysis for the piping has been projected to the end of the subsequent period of extended operation. Additionally, the application meets the acceptance criteria in SRP-SLR Section 4.3.2.1.2.2 because the applicant provided a projection of the CUF_{en} value based on the conservative assumption for the transient cycles and demonstrated that the resulting CUF_{en} value remains less than the design limit (1.0) for the subsequent period of extended operation.

For the other RCS pressure boundary components, the NRC staff finds that the applicant demonstrated pursuant to 10 CFR 54.21(c)(1)(iii) that the effects of EAF on the intended functions of the components will be adequately managed for the subsequent period of extended operation. Additionally, the application meets the acceptance criteria in SRP-SLR Section 4.3.2.1.2.3 because the applicant proposed to use the Fatigue Monitoring AMP, the Steam Generators AMP, and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP in conjunction with the flaw tolerance evaluation per ASME Code Section XI, Appendix L to manage the effects of EAF, consistent with the guidance in SRP-SLR Section 4.3.2.1.2.3.

4.3.4.3 UFSAR Supplement

SLRA Appendix A, Section 16.3.3.4, provides the UFSAR supplement summarizing the EAF of the RCS pressure boundary components. The NRC staff reviewed SLRA Appendix A, Section 16.3.3.4, consistent with the review procedures in SRP-SLR Section 4.3.3.2.

Based on its review, the NRC staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. Additionally, the staff finds that the applicant provided an adequate summary description to address the EAF TLAA for the RCS pressure boundary components, as required by 10 CFR 54.21(d).

4.3.4.4 Conclusion

Based on its review, the NRC staff concludes the following: (a) for the pressurizer spray piping, the applicant provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the EAF analysis for the piping has been projected to the end of the subsequent period of extended operation and (b) for the other RCS pressure boundary components, the applicant provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of EAF on the intended functions of the components will be adequately managed by the Fatigue Monitoring Program, the SG Program, and the ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD Program 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).

4.4 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 evaluating the 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 EQ of electric components on the intended functions will be adequately managed by the EQ of Electric Equipment AMP described in SLRA Section B.2.2.4, as amended by letter dated April 21, 2021, for the subsequent period of extended operation.

4.4.2 Staff Evaluation

The NRC staff reviewed the applicant's TLAA for the EQ of electric equipment and the corresponding disposition of 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.4.3.1.3, which states that, in accordance with 10 CFR 54.21(c)(1)(iii), an applicant must demonstrate that the effects of aging on the intended functions will be adequately managed for the subsequent period of extended operation.

The EQ requirements established by general design criterion 4, "Environmental and dynamic effects design bases," of Appendix A to 10 CFR Part 50 and 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, in accordance with the requirements of 10 CFR 50.49, is considered an adequate AMP for the purposes of subsequent license renewal. Electric components in the applicant's EQ program identified as having a qualified life equal to, or greater than, the current renewed operating term (i.e., 60 years) are considered a TLAA for subsequent license renewal.

The NRC staff reviewed SLRA Section 4.4 and the associated program basis documents to determine if the applicant's EQ program meets the requirement of 10 CFR 54.21(c)(1). The applicant's EQ program is implemented in accordance with the requirements of 10 CFR 54.21(c)(1)(iii) to show that components reviewed under the applicant's TLAA evaluation are adequately managed during the subsequent period of extended operation. The staff reviewed the applicant's EQ program, 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 NRC staff also conducted an audit of the information provided in SLRA Section B.2.2.4 and the program basis documents, including reports provided to the staff during the audit. Based on the staff review of SLRA Section B.2.2.4, as amended by letter dated April 21, 2021, and the results of the audit, the staff concludes that the applicant's EQ program elements are consistent with the GALL-SLR Report AMP X.E1, "Environmental Qualification of Electric Equipment." SER Section 3.0.3.2.4 documents the staff's evaluation of the applicant's EQ of Electric Equipment AMP, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects.

The NRC staff also reviewed the applicant's evaluation of its EQ program reanalysis attributes 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 stated that EQ components not qualified for the current license term are to be refurbished, replaced, or have their qualification extended before reaching the aging limits established in the evaluation.

The NRC staff finds that the applicant demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of thermal, radiation, and cyclical aging of plant electrical and instrumentation and control components located in harsh environments, qualified to meet 10 CFR 50.49 requirements on the intended functions of the EQ electric equipment, will be adequately managed for the subsequent period of extended operation. The applicant's EQ program manages the effects of thermal, radiation, and cyclical aging using an 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 before reaching the aging limit established in the evaluation.

Additionally, the applicant's TLAA for EQ of electric equipment meets the acceptance criteria in SRP-SLR Section 4.4.2.1.3 because the EQ program 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 program provides assurance that the aging effects will be managed and that 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 A, Section 16.2.1.4, provides the UFSAR supplement summarizing the EQ of electric equipment. The NRC staff reviewed SLRA Appendix A, Section 16.2.1.4, consistent with the review procedures in SRP-SLR Section 4.4.3.2.

The NRC staff also noted that the applicant committed (Commitment No. 4) to continue the existing EQ of Electric Equipment AMP, including 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 being performed before the subsequent period of extended operation.

Based on its review, the NRC staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR Section 4.4.2.2 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 NRC staff concludes that the applicant provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of thermal, radiation, and cyclical 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 TLAA for posttensioned containment tendon prestress forces for the subsequent period of extended operation. The SLRA notes that the prestressing forces are measured and plotted, and trend lines developed, to ensure that the average tendon group prestressing values remain above the respective minimum required values (MRV) until the next scheduled surveillance. SLRA Figures 4.5-1 through 4.5-6 show the trend lines projected to the end of the 80-year subsequent period of extended operation. In addition to projecting the forces to the end of the subsequent period of extended operation, the applicant noted that the Concrete Containment Unbonded Tendon Prestress AMP and the ASME Code Section XI, Subsection IWL AMP will monitor tendon forces and manage the effects of aging related to prestress force losses during the subsequent period of extended operation; this will also confirm the continued validity of the prestress force projections. Therefore, the applicant dispositioned the TLAA for the unbonded containment tendons in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of loss of prestressing forces on the intended functions will be adequately managed by the Concrete Containment Unbonded Tendon Prestress AMP and the ASME Code Section XI, Subsection IWL AMP for the subsequent period of extended operation.

4.5.2 Staff Evaluation

The NRC staff reviewed the applicant's TLAA for the concrete containment unbonded tendon system 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 4.5.3.1.3. The review procedures state that the applicant may reference the GALL-SLR Report in its SLRA for a TLAA AMP that is consistent with GALL-SLR Report AMP X.S1, "Concrete Containment Unbonded Tendon Prestress," to manage the effects of aging (i.e., loss of tendon prestress) for the subsequent period of extended operation. The SRP-SLR also recommends further evaluation of the applicant's operating experience related to the containment prestress force.

The NRC staff reviewed SLRA Section 4.5 and noted that it credits the TLAA "Concrete Containment Unbonded Tendon Prestress" AMP, described in SLRA Section B.2.2.3, to manage the loss of tendon prestress aging effect for the subsequent period of extended operation. The staff confirmed that the applicant identified the appropriate GALL-SLR Report TLAA AMP, in accordance with the review procedures of SRP-SLR Section 4.5.3.1.3. The staff determined that the applicant's TLAA AMP, with enhancements, is consistent with the GALL-SLR Report X.S1 AMP, and SER Section 3.0.3.2.3 documents the staff's evaluation of the applicant's TLAA AMP. The staff also noted that the applicant appropriately designated SLRA Section B.2.3.30, "ASME Section XI, Subsection IWL," for tendon selection and examinations performed in accordance with the ASME Code, Section XI, Subsection IWL. SER Section 3.0.3.2.32 documents the staff's evaluation of the applicant's AMP described in SLRA Section B.2.3.30.

The NRC staff also reviewed the operating experience in the application, including the trend lines and predicted forces captured in SLRA Figures 4.5-1 through 4.5-6, and Tables 4.5-1 through 4.5-7. The staff noted that the trend lines were developed using regression analysis based on actual measured tendon forces from all previous examinations, and that the projected forces at 80 years remain above the MRV for all tendon groups (i.e., dome, hoop, and vertical). Based on its review, the staff finds that the applicant properly incorporated data from past surveillances and developed acceptable regression trend lines based on all previous inspections, and that the SLRA B.2.2.3 AMP will also serve to confirm the continued validity of the prestress force projections.

The NRC staff finds the applicant demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of loss of prestress on the intended functions of the containment tendon prestressing system will be adequately managed for the subsequent period of extended operation.

Additionally, the application meets the acceptance criteria in SRP-SLR Section 4.5.2.1.3 because the applicant properly addressed operating experience related to concrete containment prestress forces and the applicant's Concrete Containment Unbonded Tendon Prestress TLAA AMP, with enhancements, assesses the continued adequacy of concrete containment tendon prestressing forces; the staff determined that the program is an acceptable way to manage loss of prestress forces in the containment prestressing tendons.

4.5.3 UFSAR Supplement

SLRA Appendix A, Section 16.3.5, provides the UFSAR supplement summarizing the Concrete Containment Unbonded Tendon Prestress TLAA. The NRC staff reviewed SLRA Appendix A, Section 16.3.5, consistent with the review procedures in SRP-SLR Section 4.5.3.2.

Based on its review, the NRC staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.5.2.2 and is, therefore, acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the concrete containment prestress TLAA, as required by 10 CFR 54.21(d).

4.5.4 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 loss in prestressing forces on the intended functions of the containment prestressing system will be adequately managed by the Concrete Containment Unbonded Tendon Prestress 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).

4.6 Containment Liner Plate and Penetrations Fatigue

4.6.1 Summary of Technical Information in the Application

SLRA Section 4.6, as amended by Attachment 29 of Supplement 1, dated April 21, 2021, and related Attachment 15 of SLRA Enclosure 4, describe the applicant's TLAA for fatigue of the containment liner plate and containment piping penetrations of carbon steel material. The applicant dispositioned the TLAA for the containment liner plate and piping penetrations 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

The NRC staff reviewed the applicant's TLAA for the containment liner plate and carbon steel piping penetrations 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.

Containment Liner Plate. The NRC staff reviewed UFSAR Section 5.1.2.2 and confirmed that the thermal cycling design values used for the analysis of the containment liner plate are 500 thermal cycles due to containment interior temperature variations during startup and shutdown of the reactor system, 60 thermal cycles due to annual outdoor temperature variations for 60 years of operation, and 1 thermal cycle due to a design basis accident. Because an additional 20 thermal cycles from annual outdoor temperature variations are expected to occur during the subsequent period of extended operation, the SLRA stated that the number of thermal cycles would increase from 60 to 80 to account for this projected variation. The staff noted that the SLRA maintains all other design values for the subsequent period of extended operation.

Metal Containments. PBN is a prestressed concrete containment with a steel liner plate and, therefore, is not a metal containment; therefore, metal containment is not discussed in this SE.

The NRC staff reviewed UFSAR Table 4.1-8 and noted that the number of design cycles for plant heatup and cooldown is 200 cycles. The staff also reviewed SLRA Table 4.3.1-1, "80-Year Projected Cycles – PBN Units 1 and 2," and confirmed that the total number of projected heatup and cooldown cycles for 80 years of operation is 119 cycles, which is enveloped by the 200 design allowable cycles. The staff agreed that the small 20 thermal cycles increase from the annual outdoor temperature variations expected during the subsequent period of extended operation can also be considered bounded by the significant margin in the original conservative design value of 500 thermal cycles during startup and shutdown. The staff noted that the design basis accident has not occurred, which also confirms that the 1 thermal cycle due to a design basis accident assumed by the applicant remains valid for the subsequent period of extended operation. The staff thus concludes that the TLAA for containment liner plate fatigue remains valid for the subsequent period of extended operation because the thermal cycles considered in the original design are conservative and bound the expected cycles for 80 years of operation.

Piping Penetrations. The NRC staff noted from the SLRA that thermal load cycles in the piping system are partly isolated from the liner plate penetrations by concentric sleeves between the pipe and the liner plate, which are designed in accordance with fatigue considerations in the ASME Code, Section III, 1965 edition. The staff also noted that the main steam piping, feedwater piping, blowdown piping, and letdown piping are the only piping systems penetrating the containment wall and liner plate that contribute significant thermal loading on the liner plate. The staff further noted that the CLB evaluation for fatigue of the bounding main steam piping (with higher operating temperature) penetration sleeve and the sleeve end fitting demonstrate that the six conditions for fatigue waiver of the ASME Code, Section III, subarticle N415.1, "Vessels Not Requiring Analysis for Cyclic Operation," are satisfied for the 60-year period of the current renewed operating license, and that a detailed fatigue analysis of the piping penetrations is not required. The conditions of the ASME Code were met in the CLB by evaluating against Code criteria for the fatigue cycles through the end of 60 years of operation due to the following: (i) atmospheric-to-operating pressure change during startup and shutdown; (ii) normal service pressure fluctuation; (iii) temperature difference—startup and shutdown; (iv) temperature difference—normal service; (v) temperature difference—dissimilar materials; and (vi) mechanical loads. The staff noted that the CLB fatigue waiver analysis for 60 years of operation assumed: for conditions (i) and (iii), 400 operating pressure cycles, which is bounded by the 200 plant heatup and cooldown cycles established for the RCS (see SLRA Table 4.3.1-1); for conditions (ii) and (iv), 17,354 normal service pressure fluctuations (from loading and unloading, step load increase or decrease, reactor trips, and tests), which is greater than the 80-year projected cycles, as well as design allowable cycles for these transients in SLRA Table 4.3.1-1. Condition (v) is satisfied; there is no dissimilar materials issue since the two carbon steel materials used have the same elastic modulus and coefficient of thermal expansion properties. Condition (vi) is satisfied for bounding peak stress conditions, based on maximum ASME Code allowable stress intensity for the materials used, evaluated against cycle values corresponding to upper bound allowable stress amplitude, S_a, on the applicable fatigue curve; such conditions have not occurred and remain applicable to the subsequent period of extended operation to 80 years. The staff reviewed SIA's calculation PBCH-06Q-301, Revision 1 (included as Attachment 15 to SLRA Enclosure 4), and confirmed the above information; the staff also noted that the piping penetrations evaluated are carbon steel material conforming to ASTM A516 and ASTM A350 LF1. The staff thus concludes that the CLB fatigue waiver analyses for the bounding containment piping penetration remain valid and bounding of all carbon steel piping penetrations through the subsequent period of extended operation because the applicable normal service transient cycles considered in the CLB fatigue waiver analyses were higher than their corresponding projections or were design allowable for 80 years of operation in SLRA Table 4.3.1-1.

The NRC staff finds that the applicant demonstrated, in accordance with 10 CFR 54.21(c)(1)(i), that the analyses for fatigue of the containment liner plate and carbon steel containment piping penetration sleeves remain valid for the subsequent period of extended operation. Additionally, the application meets the acceptance criteria in SRP-SLR Section 4.6.2.1.1.1 because the numbers of occurrences and severity of assumed cyclic loads considered in the design of the liner plate and in the fatigue waiver analyses of the carbon steel piping penetrations are not expected to be exceeded during 80 years of operation and thus remain valid for the subsequent period of extended operation.

4.6.3 UFSAR Supplement

SLRA Appendix A, Section 16.3.6, provides the UFSAR supplement summarizing the containment liner plate and carbon steel piping penetrations fatigue analysis. The NRC staff reviewed SLRA Appendix A, Section 16.3.6, consistent with the review procedures in SRP-SLR Section 4.6.3.2.

During the review of SLRA Appendix A, Section 16.3.6, the NRC staff noted inconsistency in the TLAA disposition between the summary description and the amended SLRA Section 4.6 evaluation and, therefore, issued an RAI. RAI 16.3.6-1 and the applicant’s response by letter dated August 11, 2021, are documented in ADAMS Accession No. ML21223A308. The staff finds the applicant’s response and related changes to SLRA Appendix A, Section 16.3.6, acceptable because the revised SLRA Appendix A, Section 16.3.6, provided in the response makes the UFSAR supplement summary description and disposition of the TLAA consistent with that in SLRA Section 4.6, as amended by letter dated April 21, 2021.

Based on its review, the NRC staff finds that the UFSAR supplement, as amended by response to RAI 16.3.6-1 by letter dated August 11, 2021, 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 containment liner plate and penetrations fatigue analysis, as required by 10 CFR 54.21(d).

4.6.4 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)(i), that the fatigue analyses for the containment liner plate and carbon steel piping penetrations remain valid for the subsequent period of extended operation. The staff also concludes that the amended 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 <u>Other Plant-Specific TLAAs</u>

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 describes the applicant's TLAA on the leak-before-break (LBB) methodology for the RCS loop piping. WCAP-14439, Revision 1, "Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for the Point Beach Units 1 and 2 Nuclear Power Plants," demonstrated that the dynamic effects of postulated ruptures in the primary loop piping can be excluded from the design basis for Point Beach. Subsequently, additional LBB evaluations were performed in order to maintain an updated analysis of record. In 2003, these evaluations considered the 1.7% mini-uprating program and plant life extension for the 60-year period of extended operation. In 2008, the 2003 primary loop piping LBB analysis conclusions were re-examined for the PBN EPU project. The results of the 2008 EPU evaluation concluded that the 2003 analysis remained applicable for the EPU project.

The updated LBB analysis for 80 years of operation is documented in WCAP-14439, Revision 4, "Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for the Point Beach Nuclear Plant Units 1 and 2 for the Subsequent License Renewal Program (80 Years)" (included as Attachment 16 to SLRA Enclosure 4). Since the piping systems include cast austenitic stainless steel (CASS), fracture toughness properties considering thermal aging were determined for each heat of material in accordance with NUREG/CR-4513, Revision 2, "Estimation of Fracture Toughness of Case Stainless Steels during Thermal Aging in LWR Systems" (ADAMS Accession No. ML16145A082). A fatigue crack growth analysis was performed as a defense-in-depth evaluation to demonstrate that postulated small surface cracks do not become through-wall cracks for 80 years of operation. In addition, Alloy 82/182 welds are present in the PBN Unit 2 SG inlet and outlet nozzle safe ends. To mitigate primary water stress corrosion cracking (PWSCC) due to the existence of Alloy 82/182, Alloy 52/152 weld inlay has been applied to the SG primary nozzle safe end welds that are exposed to primary coolant. In the SLRA, the applicant dispositioned the LBB TLAA for the RCS primary loop piping 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.

4.7.1.2 Staff Evaluation

The NRC staff reviewed the applicant's LBB TLAA for the RCS loop piping and the corresponding disposition of 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. These SRP-SLR sections provide the general guidance for plant-specific TLAAs. In addition, NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Section 3.6.3, Revision 1, "Leak-Before-Break Evaluation Procedures" (ADAMS Accession No. ML063600396), provides detailed guidance for LBB analyses and the staff's review of the analyses. This guidance addresses acceptable methods to meet 10 CFR Part 50, Appendix A, general design criterion 4 regarding LBB analyses, including that LBB analyses should consider the effects of thermal aging on material fracture toughness. For the LBB analysis, the applicant established the critical locations to be used for the analysis based on the fracture toughness properties of the metal-base at the weld points and also on the basis of pipe geometry, welding process, operating temperature, operating pressure, and the highest faulted stresses at the welds.

The NRC staff's review focused on the potential piping degradation, changes or updates to the existing LBB analysis, and time dependent material properties and their effects on the LBB analysis.

The primary loop piping in PBN Units 1 and 2 is constructed from forged stainless steel (A376-TP316) and CASS elbow fittings are fabricated from A351-CF8M. The PBN Unit 2 SG inlet and outlet nozzles contain Alloy 82/182 dissimilar metal welds that are susceptible to PWSCC. The welds were repaired with an Alloy 52/152 inlay to mitigate the PWSCC. During its review, the NRC staff noted that the SLRA did not address the PBN Unit 1 SG material or whether weld inlays were applied to the inlet and outlet nozzles. In response to RAI 4.7.1-1, the applicant stated that the PBN Unit 1 SG inlet and outlet nozzles are a carbon steel base material with austenitic stainless steel buttering (Type 309L and 308L weld filler metal). The applicant stated that a stainless steel field weld joins the stainless steel buttered SG nozzles (inlet and outlet) to the respective reactor coolant line piping elbows, which are cast stainless steel (A351-CF8M). The staff finds that the response addressed the RAI. These welds do not utilize Alloy 82/182 for joining dissimilar materials and, therefore, are not susceptible to PWSCC. As such, an inlay of Alloy 52/152 for the mitigation of PWSCC is not applied to the PBN Unit 1 SG nozzle-to-pipe welds. Since the piping systems include CASS, fracture toughness considering thermal aging was determined for each heat of material. Fully aged fracture toughness properties were used for the LBB evaluation, which is applicable for plants operating beyond 15 EFPY for the CF8M materials (primary loop piping elbows for PBN Units 1 and 2).

With respect to the CF8M CASS materials for elbows, the NRC staff noted that the fracture toughness estimated per Revision 2 of NUREG/CR-4513 is less than that estimated per Revision 1 of NUREG/CR-4513 for each critical location. The staff finds that the use of the lower fracture toughness values is a conservative approach and, therefore, acceptable.

The updates performed for WCAP-14439, Revision 4, 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 elbow fitting Certified Materials Test Reports. The fracture toughness parameters were recalculated using the information from NUREG/CR-4513, Revision 2.

The fatigue crack growth analysis used 40-year design cycles. The results of the analysis in Table 4.3.1-1 of the SLRA show that the 40-year design cycles bound 80 years of plant operations. Therefore, the fatigue crack growth analysis for the LBB analysis has been projected to the end of the subsequent period of extended operation.

The fatigue analysis used the normal, upset, and test transients and their cycles that remain applicable for the 80 years of operation. The applicant also postulated circumferential, semi-elliptical surface cracks and various initial crack depths that are detectable during inservice inspections. The NRC staff noted that the fatigue analysis approach is consistent with that of WCAP-14439, Revision 4, which also considered the environmental effects of the reactor coolant on the fatigue crack growth. The applicant stated that the crack growth is very small, regardless of which material is evaluated. The staff noted that the 80-year fatigue crack growth of the postulated flaws is insignificant. Therefore, the staff finds that the fatigue analysis results provide reasonable assurance that the potential fatigue crack growth would not affect the integrity of the primary coolant loop piping and the crack stability determined in the LBB analysis.

WCAP-14439, Revision 4, provided the fracture mechanics demonstration of the RCS primary loop integrity consistent with the NRC position for exemption from consideration of dynamic effects as specified in NUREG-0800, Section 3.6.3.

The NRC staff reviewed the fracture mechanics demonstration of the RCS primary loop integrity and confirmed that it is consistent with the NRC position for exemption from consideration of dynamic effects as specified in NUREG-0800, Section 3.6.3. The staff finds that the analysis adequately demonstrated that the critical locations meet either of the following acceptance criteria for crack stability and are, therefore, acceptable: (1) the applied J-integral (J_{app}) value is less than the fracture toughness (J_{Ic}) of the material so that the crack will not initiate crack advance or (2) if J_{app} is greater than or equal to J_{Ic}, the applied tearing modulus is less than the material's tearing modulus and J_{app} is less than the maximum fracture toughness of the material (J_{max}) so that the crack advance will be arrested and will not result in pipe rupture. The staff also finds that the fracture mechanics analysis confirms that there is a margin of at least 2 between the critical crack size that was determined in the limit load analysis and the leak crack size at each critical location, consistent with NUREG-0800, Section 3.6.3. The staff finds that the analysis justifies the elimination of RCS primary loop pipe rupture from the structural design basis for the 80-year operation as follows:

a. Stress corrosion cracking is precluded by the use of fracture resistant materials in the primary loop piping and controls on reactor coolant chemistry, temperature, pressure, and flow during normal operation. To mitigate PWSCC due to the existence of Alloy 82/182 welds in the PBN Unit 2 SG inlet and outlet nozzle safe ends, Alloy 52/152 weld inlay has been applied to the SG nozzle safe end welds that are exposed to primary coolant.

b. For global failure mechanisms, all locations were evaluated using the stainless steel material properties (A376-TP316). For local failure mechanisms, all locations were evaluated using the cast stainless steel material properties (A351-CF8M), which present a limiting condition due to the thermal aging effects. Considering the thermal aging effects for the 80-year subsequent period of extended operation to give the most limiting fracture toughness properties and the lower strength of the stainless steel, ensures that each of the material properties is bounded by the LBB results.

c. Water hammer should not occur in the RCS piping because of system design, testing, and operational considerations.

d. The results show that there is ample margin between the leak rate of small stable flaws and the capability of the PBN Units 1 and 2 RCS pressure boundary Leakage Detection System. A margin of 10 exists between the calculated leak rate from the leakage flaw and the plant leak detection capability of 1 gallon per minute (gpm). The PBN Units 1 and 2 RCS pressure boundary leak detection system capability is 1 gpm in 4 hours.

e. The effects of low and high-cycle fatigue on the integrity of the primary piping are negligible.

f. Ample margin exists in the material properties used to demonstrate end-of-service life (fully aged) stability of the critical flaws.

Based on the above, the NRC staff finds that the applicant demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the LBB analysis for the RCS primary loop piping has been projected to the end of the subsequent period of extended operation. Additionally, the LBB TLAA meets the acceptance criteria in SRP-SLR Section 4.7.2.1.2 because the LBB TLAA demonstrates acceptable results for the subsequent period of operation.

4.7.1.3 UFSAR Supplement

SLRA Appendix A, Section 16.3.7.1, provides the UFSAR supplement summarizing the LBB TLAA for the RCS loop piping. The NRC staff reviewed SLRA Appendix A, Section 16.7.3.7.1, consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the NRC staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR Section 4.7.2.1.2 and is, therefore, acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the LBB TLAA for the RCS primary loop piping, as required by 10 CFR 54.21(d).

4.7.1.4 Conclusion

Based on its review, the NRC staff concludes that the applicant provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the LBB TLAA for the RCS primary loop piping 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 Leak-Before-Break of Reactor Coolant System Auxiliary Piping

4.7.2.1 Summary of Technical Information in the Application

SLRA Section 4.7.2 describes the applicant's TLAA on the LBB methodology for the RCS auxiliary piping. The SLRA states that LBB evaluations were performed in 2001 for the PBN Units 1 and 2 pressurizer surge line (WCAP-15065 P-A, Revision 1, "Technical Justification for Eliminating Pressurizer Surge Line Rupture as the Structural Design Basis for Point Beach Units 1 and 2 Nuclear Plants"), RHR line (WCAP-15105 P-A, Revision 1, "Technical Justification for Eliminating Residual Heat Removal (RHR) Rupture as the Structural Design Basis for Point Beach Units 1 and 2 Nuclear Plants"), and accumulator line (WCAP-15107 P-A, Revision 1, "Technical Justification for Eliminating Accumulator Rupture as the Structural Design Basis for Point Beach Units 1 and 2 Nuclear Plants"). The evaluations demonstrated that the dynamic effects of postulated ruptures in these auxiliary piping systems can be excluded from the design basis for PBN Units 1 and 2. In 2008, the RCS auxiliary piping LBB evaluations were re-evaluated as part of the PBN Units 1 and 2 EPU license amendment request. That evaluation was based on EPU loadings, operating pressure, and temperature parameters and concluded that the LBB evaluations, which were applicable for the 60-year period of extended operation, remained valid for the EPU conditions.

The applicant stated that aging effects that must be addressed for SLR include the potential for thermal aging of the auxiliary line piping components and fatigue crack growth. The applicant stated that the only significant thermal aging effect on the auxiliary line piping components would be embrittlement of any CASS components. The SLRA states that PBN pressurizer surge lines, RHR lines, and accumulator lines do not contain any CASS materials. The SLRA also notes that thermal aging of the stainless steel weld material was considered in the LBB evaluations by assuming fully aged, saturated conditions. As described in SLRA Section 4.3.1, the 80-year projected cycles are significantly less than the original PBN 40-year design cycles used in the LBB evaluations and, therefore, the fatigue crack growth analyses remain valid for the subsequent period of extended operation.

The LBB TLAA for the RCS auxiliary piping is dispositioned in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the LBB analysis has been evaluated and determined to remain valid for the subsequent period of extended operation.

4.7.2.2 Staff Evaluation

The NRC staff reviewed the applicant's LBB TLAA for the RCS auxiliary piping 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 for plant-specific TLAAs.

The NRC staff reviewed the LBB analyses for the pressurizer surge line in WCAP-15065-P-A, Revision 1, the accumulator line in WCAP-15107-P-A, Revision 1, and the RHR line in WCAP-15105-P-A, Revision 1. In each case, the LBB evaluation assumed the PBN 40-year design cycles for Class 1 components. As described in SLRA Section 4.3.1, the 80-year projected cycles are significantly less than the original PBN 40-year design cycles. The staff's evaluation finding this conclusion acceptable is provided in SER Section 4.3.1. Therefore, the fatigue crack growth evaluations in each of these reports remain valid for the subsequent period of extended operation.

The SLRA states that PBN pressurizer surge lines, RHR lines, and accumulator lines do not contain any CASS pipe fittings as described in Attachment 17 of Enclosure 4 to the SLRA. As discussed in the SLRA, CASS material is susceptible to thermal aging at the normal reactor operating temperature. Thermal aging of CASS material results in embrittlement, which is a decrease in the ductility, impact strength, and fracture toughness of the material. The NRC staff reviewed the information provided in Attachment 17 of Enclosure 4 to the SLRA and Appendix A of the UFSAR and agrees with the conclusion in the SLRA that these lines do not contain CASS components. Thus, the thermal aging of CASS components in these lines is not an issue for the subsequent period of extended operation.

During its review, the NRC staff noted that the applicant did not address the disposition of the stainless steel welds as described in SLRA Section 4.7.2 and did not provide a basis for that disposition in the SLRA. In response to RAI 4.7.2-1 (ADAMS Accession No. ML21263A052), the applicant stated that thermal aging of the stainless steel weld material was considered with saturated conditions (fully aged) for the pressurizer surge lines, RHR lines, and accumulator lines as based on the original NRC staff SERs for the approval of Westinghouse reports WCAP-15065, WCAP-15105, and WCAP-15107, respectively. In the original SERs for the cited WCAP reports, the staff performed a confirmatory LBB analysis of the stainless steel weld material for the pressurizer surge lines, RHR lines, and accumulator lines and concluded that acceptable margins on leakage and crack size were demonstrated and that these sections of piping will exhibit LBB behavior.

The applicant further stated that the Westinghouse analyses for LBB of the Point Beach reactor coolant line and auxiliary piping systems do not consider thermal aging of stainless steel weld materials. The precedents of the Turkey Point Nuclear Generating and Surry Power Station SLRAs and the Vogtle Electric Generating Plant initial license renewal application demonstrate recent acceptance of LBB evaluations without thermal aging of stainless steel welds. Furthermore, NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report" (ADAMS Accession No. ML103490041), the GALL-SLR, and current Interim Staff Guidances (ISGs) do not specifically identify thermal aging of stainless steel welds. The staff finds the response to be acceptable because the issue of thermal aging of stainless steel welds has not been identified as a technical concern in the GALL or GALL-SLR reports (or their ISGs) and was only assessed by the NRC staff in the proceedings cited above to confirm that there were no impacts on the LBB analyses.

The NRC staff finds that the applicant demonstrated, in accordance with 10 CFR 54.21(c)(1)(i), that the LBB analyses for PBN pressurizer surge lines, RHR lines, and accumulator lines remain valid for the subsequent period of extended operation.

Additionally, the LBB analyses meet the acceptance criteria in SRP-SLR Section 4.7.2.1.1 because, as described in SER Section 4.3.1: (a) the applicant determined the 80-year projected cycles based on an acceptable plant-specific methodology and (b) the transient cycles are not projected to exceed the CLB design limit during the subsequent period of extended operation. In addition, these lines do not contain CASS components and, therefore, are not susceptible to thermal aging.

4.7.2.3 UFSAR Supplement

SLRA Appendix A, Section 16.7.2, "Leak-Before-Break of Reactor Coolant System Auxiliary Piping," provides the UFSAR supplement summarizing the LBB TLAA for the RCS auxiliary piping. The NRC staff reviewed SLRA Appendix A, Section 16.7.2, consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the NRC staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR 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 LBB TLAA for the RCS auxiliary piping, as required by 10 CFR 54.21(d).

4.7.2.4 Conclusion

Based on its review, the NRC staff concludes that the applicant provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the LBB TLAA associated with the pressurizer surge line, RHR line, and accumulator line 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).

4.7.3 Flaw Tolerance Evaluation for Reactor Coolant Loop CASS Piping Components

4.7.3.1 Summary of Technical Information in the Application

SLRA Section 4.7.3 discusses the applicant's TLAA for the reactor coolant primary loop piping elbows made of A-351 Grade CF8M as related to the thermal aging embrittlement of CASS material and its flaw tolerance evaluation. The applicant stated that it developed a flaw tolerance evaluation in 2005, as documented in Westinghouse LTR-PAFM-05-58, Revision 0, "Flaw Tolerance Evaluation for Susceptible Reactor Coolant Loop Cast Austenitic Stainless Steel Piping Components in Point Beach Units 1 and 2 for 80 Years," to address the effect of thermal aging embrittlement of the reactor coolant primary loop piping elbows made of A-351 Grade CF8M in Point Beach's initial period of extended operation. In 2020, the applicant updated its flaw tolerance evaluation, as documented in Westinghouse LTR-PAFM-05-58, Revision 3 (Attachment 18 of Enclosure 4 to the SLRA), to support its SLRA. The applicant dispositioned this 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.

4.7.3.2 Staff Evaluation

The NRC staff reviewed the applicant's TLAA for the reactor coolant primary loop piping elbows made of A-351 Grade CF8M 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.

The NRC staff reviewed Westinghouse LTR-PAFM-05-58, Revision 3, to verify that the applicant performed an acceptable flaw tolerance evaluation consistent with the guidance in the GALL-SLR and SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance" (ADAMS Accession No. ML20181A434), and demonstrated that the thermally aged reactor coolant primary loop piping elbows made of A-351 Grade CF8M will tolerate undetected flaws and be fit for continued service for the duration of the subsequent period of extended operation.

The applicant used the screening criteria in the GALL-SLR in terms of casting method, as well as molybdenum and ferrite contents, to assess the potential significance of thermal aging embrittlement of CASS materials at PBN exposed to the reactor coolant operating temperature. The delta-ferrite content for the CASS piping components is primarily estimated using Hull's Equivalent Factor in NUREG/CR-4513, Revisions 1 and 2. The NRC staff confirmed that the Hull's Equivalent Factor correlations in both revisions of NUREG/CR-4513 are the same. The staff verified that the applicant appropriately computed the delta-ferrite content for all heats of CASS materials in elbows in both PBN units and identified the heats that are susceptible to thermal aging. The susceptible heats were subjected to the flaw tolerance evaluation.

The NRC staff noted that the current code of record at PBN is the 2007 Edition with 2008 Addenda of the ASME Code, Section XI. The applicant used the analytical evaluation procedures and acceptance criteria in IWB-3640 and Appendix C of the 2007 Edition with 2008 Addenda of the ASME Code, Section XI, to perform the flaw tolerance evaluation for the cases where the delta-ferrite content was determined to be less than 20 percent. For the cases where the delta-ferrite content was equal to or greater than 20 percent, the applicant used Appendix C of the 2019 Edition of the ASME Code, Section XI. The staff finds that the applicant's methods of flaw tolerance evaluation are consistent with guidance in SLR-ISG-2021-02-MECHANICAL and, therefore, acceptable.

The applicant used the guidance in NUREG/CR-4513, Revisions 1 and 2, in obtaining the fracture toughness properties for the reactor coolant primary loop piping elbows at hot, crossover, and cold leg locations based on the reactor coolant operating temperatures. The NRC staff noted that the fully aged and saturated fracture toughness properties were used for the reactor coolant primary loop piping elbows of CF8M materials since the PBN units are operating beyond 15 EFPY. The applicant compared the results and concluded that the calculated fracture toughness values using NUREG/CR-4513, Revision 2, are the most limiting and, therefore, used those values in the flaw tolerance evaluation. The staff finds that use of the most limiting fracture toughness values is a conservative approach and, therefore, acceptable.

The SLRA states that the design cycles listed in Table 4.3.1-1 of the SLRA are used conservatively in the fatigue crack growth (FCG) analysis, except that for the evaluation of the longitudinal flaws, the 80-year allowable unit loading and unloading cycles of 3,000 are used to provide a more appropriate cycle count based on historical plant data. Note (c) to Table 4.3.1-1 states that the FCG analysis of longitudinal flaws in reactor coolant loop CASS piping components (LTR-PAFM-05-58, Revision 3) uses a limit of 3,000 loading and unloading cycles.

Westinghouse used the historical plant data for the appropriate loading and unloading cycle count for the longitudinal flaw evaluation. The Westinghouse analysis showed that the longitudinal flaw is limiting when compared to the circumferential flaw size. For example, the allowable initial and final flaw sizes in the crossover leg in the longitudinal direction are 27.2 percent and 53 percent through pipe wall depth, whereas in the circumferential direction they are 44.6 percent and 75 percent depth, respectively. Because the longitudinal flaw is used as the limiting flaw to demonstrate structural integrity of the reactor coolant primary loop piping, the NRC staff finds that use of 3,000 cycles in the FCG calculation for the longitudinal flaw based on historical plant data in lieu of overly conservative cycles is acceptable.

The applicant calculated the maximum allowable flaw size in the axial and circumferential direction for the end-of-evaluation period for the hot, crossover, and cold legs based on the plant-specific geometry, material properties, and bounding piping loads for each leg. Based on the maximum allowable flaw size, the applicant obtained the acceptable initial flaw size by the FCG analysis for the axial and circumferential flaws in each leg. Table 6-1 of LTR-PAFM-05-58, Revision 3, tabulates the acceptable initial and allowable final flaws for the hot, crossover, and cold legs obtained by the analysis. The NRC staff finds that the most limiting acceptable initial flaw has a depth of 27.2 percent of crossover pipe wall thickness in the reactor coolant primary loop piping. The applicant stated that an initial flaw size of 27.2-percent depth will be readily detected during inspections. The staff noted that the CASS components were subjected to surface and volumetric inspections by liquid penetrant (PT) and radiographic testing (RT) techniques during fabrication and preservice inspections before placing the CASS component in service. Any potential surface-connected or subsurface fabrication flaw within the 27 percent of pipe wall thickness, if it existed, would be detected by the fabrication and preservice inspections.

4.7.3.3 UFSAR Supplement

SLRA Appendix A, Section 16.3.7.3, provides the UFSAR supplement summarizing the flaw tolerance evaluation for the reactor coolant primary loop piping elbows susceptible to thermal aging embrittlement. The NRC staff reviewed SLRA Appendix A, Section 16.3.7.3, consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the NRC staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is, therefore, acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the thermal aging embrittlement of the reactor coolant primary loop piping elbows, as required by 10 CFR 54.21(d).

4.7.3.4 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)(ii), that the flaw tolerance evaluation for the reactor coolant primary loop piping elbows has been projected satisfactorily 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 FCG

4.7.4.1 Summary of Technical Information in the Application

SLRA Section 4.7.4 describes the applicant's TLAA related to deterministic and risk-informed evaluations for the reactor coolant pump (RCP) flywheel FCG at PBN. The applicant dispositioned the RCP flywheel FCG TLAA in accordance with 10 CFR 54.21(c)(1)(i) because it has demonstrated that the RCP flywheel FCG analysis remains valid through the subsequent period of extended operation.

To support its disposition, the applicant referenced PWROG topical report PWROG-17011-NP-A, Revision 2, "Update for Subsequent License Renewal: WCAP-14535-A, 'Topical Report on Reactor Coolant Pump Flywheel Inspection Elimination,' and WCAP-15666-A, 'Extension of Reactor Coolant Pump Motor Flywheel Examination'" (ADAMS Accession No. ML19318D189). The applicant stated that PWROG-17011-NP-A, Revision 2, confirms that the analyses performed under WCAP-14535-A and WCAP-15666-A justify inspection of the RCP flywheel once every 20 years for 80 years of operation.

4.7.4.2 Staff Evaluation

The NRC 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. Specifically, the staff reviewed the applicant's FCG analysis by confirming that its implementation of the PWROG-17011-NP-A, Revision 2, methodology is acceptable for demonstrating that the CLB analyses of the RCP flywheel FCG will remain valid for the subsequent period of extended operation.

By letter dated September 12, 1996 (ADAMS Accession No. ML18312A151), the NRC conditionally approved the use of WCAP-14535-A. WCAP-14535-A proposed to eliminate periodic inservice examinations of the RCP flywheel based on a fatigue flaw growth analysis. At the time, the NRC did not accept the complete elimination of the flywheel examination as documented in the safety evaluation for WCAP-14535-A. Subsequently, WCAP-15666 was submitted to extend the flywheel examination interval from 10 years to 20 years, based on the risk assessment and FCG analyses for a plant life of 60 years. By letter dated May 5, 2003 (ADAMS Accession No. ML031250595), the NRC approved the use of WCAP-15666. The NRC-approved version, WCAP-15666-A, Revision 1, is available at ADAMS Accession No. ML18303A413. The applicant used WCAP-15666-A, Revision 1, as a basis for a revision to PBN technical specification 5.5.6 to increase the flywheel inspection interval from 10 years to 20 years based on, among other analyses, the FCG analysis.

PWROG-17011-NP-A, Revision 2, demonstrates that the 20-year flywheel examination interval is acceptable for the 80-year subsequent period of extended operation based on FCG calculations. For the RCP flywheel, the applicant projected 500 cycles for the RCP start-and-stop events for 80 years, as shown in SLRA Table 4.7.4-1. The applicant stated that the 500-cycle projection for 80 years is based on the same projection methodology used for the 60-year period of extended operation, which was documented in an applicant's letter to the NRC dated January 25, 2005 (ADAMS Accession No. ML050340169). For the 60-year plant life, the applicant projected 400 cycles for the RCP start-and-stop events. The NRC staff approved the 60-year transient cycle projection method for the applicant's 60-year initial license renewal application. The staff determined that the use of this cycle projection methodology to extend the number of RCP start-and-stop cycles to 500 for the 80-year subsequent period of extended operation is acceptable because it uses the same methodology that the staff previously approved. In addition, as described below, the projected number of cycles is well below that used in the PWROG-17011-NP-A, Revision 2, analysis. Therefore, the staff finds that the applicant appropriately projected RCP start-and-stop cycles for the 80-year subsequent period of extended operation.

PWROG-17011-NP-A, Revision 2, uses 6,000 RCP start-and-stop cycles for the FCG calculations. The NRC staff finds that there is significant margin between the projected 500 cycles and the 6,000 cycles used in the FCG calculation. The staff notes that FCG depends on the number of cycles of the transients. The fatigue flaw growth calculation in PWROG-17011-NP-A, Revision 2, in concert with the 20-year inspection interval, shows that the RCP flywheel design will maintain its structural integrity over the 80-year subsequent period of extended operation. Therefore, the staff finds that the applicant adequately implemented the PWROG-17011-NP-A, Revision 2, methodology.

The NRC staff finds that the applicant demonstrated, in accordance with 10 CFR 54.21(c)(1)(i), that the FCG analysis for the RCP flywheel remains valid for the subsequent period of extended operation. Additionally, the analysis meets the acceptance criteria in SRP-SLR Section 4.7.2.1.1 because the applicant demonstrated that the existing RCP flywheel FCG analysis supporting the current inspection interval remains bounding for the subsequent period of extended operation.

4.7.4.3 UFSAR Supplement

SLRA Appendix A, Section 16.3.7.4, provides the UFSAR supplement summarizing the RCP flywheel FCG analysis. The NRC staff reviewed SLRA Appendix A, Section 16.3.7.4, consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the NRC 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 NRC staff concludes that the applicant provided an acceptable demonstration, in accordance with 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 casing. The TLAA aspects of the analysis are the thermal aging of CASS and its consequence on FCG. The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that its analyses related to ASME Code Case N-481 remain valid for the subsequent period of extended operation.

4.7.5.2 Staff Evaluation

The NRC staff reviewed the applicant's TLAA for the RCP casing integrity 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 staff focused its review on the validity of the crack stability analysis and FCG analysis of the RCP casings through the subsequent period of extended operation.

In September 1991, Westinghouse published WCAP-13045, "Compliance to ASME Code Case N-481 of the Primary Loop Pump Casings of Westinghouse Type Nuclear Steam Supply Systems" (ADAMS Accession No. ML20079M333), which presented a generic structural integrity evaluation of the RCP casing to demonstrate compliance with ASME Code Case N-481, Item (d). WCAP-13045 was based on structural integrity evaluations for a 40-year service life. A plant-specific flaw tolerance evaluation for PBN was performed and documented in WCAP-14705, "A Demonstration of Applicability of ASME Code Case N-481 to the Primary Loop Pump Casings of the Point Beach Units 1 and 2" (non-publicly available), in August 1996.

In 2004, the applicant submitted for NRC review and approval the initial license renewal application for PBN. To validate the acceptability of Code Case N-481 for the RCP casings during the initial extended period of operation, the applicant confirmed that the analysis documented in WCAP-14705 remained valid for the 60-year licensed operation period. In December 2005, the NRC staff approved the renewed licenses for PBN Units 1 and 2 in NUREG-1839, "Safety Evaluation Report Related to the License Renewal of the Point Beach Nuclear Plant, Units 1 and 2" (ADAMS Accession Nos. ML053420134 and ML053420137).

By letter dated June 14, 2018 (ADAMS Accession No. ML18170A113), the PWROG submitted PWROG-17033, Revision 1, "Update for Subsequent License Renewal: WCAP-13045, 'Compliance to ASME Code Case N-481 of the Primary Loop Pump Casings of Westinghouse Type Nuclear Steam Supply Systems,'" for NRC review and generic approval. The NRC staff determined that PWROG-17033, Revision 1, demonstrates the structural integrity of the Westinghouse-designed RCP casings for the subsequent period of extended operation (80 years) based on the crack stability and FCG analyses. The staff concluded that PWROG-17033, Revision 1, is acceptable for generic use to address the TLAA of the RCP casing integrity to satisfy the requirements of 10 CFR 54.21(c)(1). In addition, the staff concluded that an applicant that uses PWROG-17033, Revision 1, in its SLRA needs to follow the four conditions that the staff imposed as specified in the safety evaluation dated September 26, 2019 (ADAMS Accession No. ML19319A188). To demonstrate that visual inspections, in lieu of volumetric inspections, will continue to ensure the structural integrity of the RCP casings for the duration of the subsequent period of extended operation, the SLRA referenced PWROG-17033, Revision 1, as being applicable to this TLAA for Point Beach. Subsequent to the issuance of PWROG-17033, Revision 1, Westinghouse developed reconciliation letter LTR-SDA-20-020, Revision 1, "Point Beach Units 1 and 2 Reactor Coolant Pump Casings ASME Code Case N-481 Analysis for 80-year Subsequent License Renewal (SLR)" (included as Attachment 19 to SLRA Enclosure 4), which documented the plant-specific fracture mechanics evaluation results.

Condition 1 of the NRC safety evaluation for PWROG-17033, Revision 1, requires that the applicant confirm that its RCPs are Westinghouse-designed models. Condition 2 requires that the applicant confirm that the Westinghouse-designed RCP is either a Model 63, Model 70, Model 93, Model 93A, Model 93A-1, Model 93D, Model 100A, or Model 100D, and fabricated with SA-351 CF8 or CF8M material. Section 2 of LTR-SDA-20-020 specifies that the RCPs at

PBN are the Westinghouse **[[ ]]** design, consisting of **[[ ]]** stainless steel. Therefore, the NRC staff finds that the applicant has satisfied conditions 1 and 2 because the RCP pump design and fabrication materials are consistent with those addressed in PWROG-17033, Revision 1.

Condition 3 states, in part, that:

> For the crack stability analysis, the [applicant] must confirm that the screening loadings (forces, moments, $J_{app,}$ and T_{app}) used in WCAP-13045 bound the plant-specific loadings. The [applicant] must also confirm the limiting material fracture toughness values (J_{Ic}, T_{mat}, and J_{max}) used in WCAP-13045 and PWROG-17033, Revision 1, bound the plant-specific fracture toughness values…. If the screening loadings or material fracture toughness values in the WCAP-13045 and PWROG-17033 reports do not bound plant-specific values, the [applicant] needs to submit a plant-specific crack stability analysis to demonstrate structural integrity of the RCP casing as part of the subsequent license renewal application.

Section 3 of LTR-SDA-20-020 discusses the screening and plant-specific loadings that are applicable to this TLAA. The plant-specific screening loadings were calculated and reported in WCAP-14439, Revision 4. Tables 1 and 2 of LTR-SDA-20-020 show that the plant-specific screening loadings for normal and faulted loads from WCAP-14439 are all bounded by those in WCAP-13045. Additionally, Table 3 contains the stability results for the **[[ ]]** pump casings at Point Beach and confirms that the fracture toughness values used in WCAP-13045 and PWROG-17033, Revision 1, bound the plant-specific fracture toughness values. Therefore, the NRC staff finds that the applicant has satisfied Condition 3 because the plant-specific screening loads and fracture toughness values for PBN are bounded by those used in WCAP-13045 and PWROG-17033, Revision 1.

Condition 4 states, in part, that:

> For the FCG analysis, the [applicant] must confirm that the transient cycles specified in the WCAP-13045 or PWROG-17033 report bound the plant-specific transient cycles for the 80 years of operation. The [applicant] must confirm that the loadings used in the FCG analysis in WCAP-13045 bound the plant-specific applied loadings, considering potential increase in applied loading caused by plant-specific system operational changes, power uprate or piping modifications. If the FCG analysis inputs in WCAP-13045 bound the plant-specific conditions, the [applicant] must discuss how they are bounding in the subsequent license renewal application….

Table 5 of LTR-SDA-20-020 contains the transients and cycles considered in the generic FCG analysis for the RCP casing. Section 5 of the letter reiterates the conclusion from PWROG-17033 that the design transients implemented in the generic FCG analysis remain applicable for the subsequent period of extended operation. Table 6 of the letter contains the Point Beach-specific design transients and cycles that are applicable to a 60-year plant life. The plant-specific transients that match the transients used in the generic analysis have the same design allowable cycles, including the limiting heatup/cooldown transient. There are additional transients and cycles for PBN Units 1 and 2 but the NRC staff determined that the contribution of these additional transients to the FCG analysis are insignificant due to the margin between the final crack growth size and the limiting flaw size. The staff confirmed that these transients and cycles envelop the projected number of transients and cycles for 80 years of plant operation and, therefore, remain bounded by the FCG analysis as documented in WCAP-13045.

Based on the PWROG-17033 assessment of the FCG evaluation, the FCG rate for stainless steel in water based on ASME Code, Section XI, and the rates used in WCAP-13045 are comparable such that there will be no significant impact on the FCG analysis. Additionally, the generic stresses in the FCG analysis envelope the various pump designs, and the stress intensity factors are consistent with current industry standards for similar FCG evaluations. Table 7 of LTR-SDA-20-020 contains the FCG results for the **[[ ]]** pump casing based on the maximum acceptable flaw sizes of 0.3 in., 0.5 in., and 0.8 in. There is such significant margin between the final crack growth size and the flaw size used for stability that the 40-year transient cycles could be doubled and the final flaw size would still be less than the stability flaw size, 1/4T flaw depth, for the stability analysis in WCAP-13045. Therefore, the loading used in the FCG analysis in WCAP-13045 continues to bound the plant-specific loadings for the RCP casings. The NRC staff finds that the applicant appropriately addressed Condition 4 because it verified that the FCG information in PWROG-17033, Revision 1, and WCAP-13045 bound the plant-specific FCG for 80 years of operation at PBN.

Based on the above, the NRC staff concludes that the applicant demonstrated that the conditions of the NRC safety evaluation for PWROG-17033, Revision 1, are satisfied for Point Beach.

Based on its review, the NRC staff finds that the applicant demonstrated, in accordance with 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 A, Section 16.3.7.5, provides the UFSAR supplement summarizing the RCP casing integrity analysis TLAA. The NRC staff reviewed SLRA Appendix A, Section 16.3.7.5, consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the NRC 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 casing integrity analysis TLAA, as required by 10 CFR 54.21(d).

4.7.5.4 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)(i), that the ASME Code Case N-481 analyses for the RCP casing 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 applicant dispositioned the TLAA for the containment polar cranes, auxiliary building crane, and turbine building crane in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analyses remain valid for the subsequent period of extended operation.

4.7.6.2 Staff Evaluation

The NRC staff reviewed the applicant's TLAA for the containment polar crane (both units), auxiliary building crane, and turbine building crane 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 NRC staff reviewed UFSAR Section A.3, "Control of Heavy Loads," and Section 15.4.2, "Fatigue," under Subtitle "Crane Load Cycle Limit," and confirmed that the containment polar crane (both units), auxiliary building crane, and turbine building crane are within the scope of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants" (ADAMS Accession No. ML070250180), as noted in SLRA Table 4.7.6-1. NUREG-0612, Section 5.1.1(7) states that in-scope cranes should be designed to meet the applicable criteria and guidelines of ANSI B30.2-1976, "Overhead and Gantry Cranes," and of Crane Manufacturers Association of America, Inc. (CMAA)-70, "Specifications for Electric Overhead Traveling Cranes."

The NRC staff noted that UFSAR Section 15.4.2 states, in part, that "Cranes designed in accordance with CMAA-70 Class 'A' service are designed from 20,000 to 200,000 load cycles." In SLRA Section 4.7.6 and Appendix A, Section 16.3.7.6, the applicant states, "Table 2.8-1 of CMAA Specification 70 states that a range of load cycles from 20,000 to 100,000 was considered for cranes in Service Class A service…." During the in-office regulatory audit (ADAMS Accession No. ML21208A447), the staff reviewed Section 4.7.6, "Crane Load Cycle Limit," of the application's proprietary document, FPLCORP00036-REPT-038, Revision 0, where the applicant further determined the service life of the cranes as 100,000 load cycles based on CMAA 70-1975. Based on its review, the staff identified a discrepancy in the load cycle limits as 100,000 in the SLRA versus 200,000 in Section 15.4.2 of the UFSAR. To address this issue, the staff issued an RAI.

In its August 11, 2021 RAI response, the applicant stated that the load cycle limit is 20,000 to 200,000 for the cranes that are in the scope of subsequent license renewal, and also provided conforming markups in Sections 4.7.6 and 16.3.7.6 of the SLRA. These markups made the application consistent with Section 15.4.2 of the UFSAR and Section 4.3.13 of NUREG-1839. The NRC staff found the applicant's response acceptable because the markups clearly state the CLB load cycle limit of 20,000 to 200,000 in Sections 4.7.6 and 16.3.7.6 for the PBN cranes within the scope of subsequent license renewal, which is consistent with Section 15.4.2 of the UFSAR and Section 4.3.13 of NUREG-1839.

Containment Polar Crane Evaluation

The applicant conservatively projected 96,000 lifts for the 80-year subsequent period of extended operation by doubling the total projected number of lifts for the 60-year life, which was 48,000 lifts. This estimate assumed 60 outages with 20 days of lifting for each outage and a total of 40 lifts per day. The NRC staff reviewed the estimated number of lifts and finds that it is a reasonable estimate for the expected number of lifts to occur in 60 years. Doubling this 60-year estimate for 80 years adds additional conservatism. This confirms that the applicant's conservative projected number of 96,000 lifts remains below the 200,000 limit, and that the TLAA remains valid for the subsequent period of extended operation.

Auxiliary Building Crane Evaluation

The applicant conservatively projected 8,384 lifts for the 80-year subsequent period of extended operation by doubling the total projected number of lifts for the 60-year life, which was 4,192 lifts. This estimate assumed 2,700 fuel cask lifts, 600 maintenance load lifts, and 892 original fuel cask lifts. The NRC staff reviewed the estimated number of lifts and finds that it is a reasonable estimate for the expected number of lifts to occur in 60 years. Doubling this 60-year estimate for 80 years adds additional conservatism. This confirms that the applicant's conservative projected number of 8,384 lifts remains significantly below the 200,000 limit, and that the TLAA remains valid for the subsequent period of extended operation.

Turbine Building Crane Evaluation

The applicant stated in Note 1 of SLRA Table 4.7.6-1 that the turbine building crane lifts are bounded by the estimates for the polar cranes and the auxiliary building crane. Since the TLAA remains valid for those two analyses, and they bound the turbine building crane, the NRC staff finds that the turbine building crane analysis will also remain valid for the subsequent period of extended operation.

The NRC staff finds that the applicant demonstrated, in accordance with 10 CFR 54.21(c)(1)(i), that the analyses for the containment polar cranes, auxiliary building crane, and turbine building crane remain valid for the subsequent period of extended operation. Additionally, the application 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 A, Section 16.3.7.6, provides the UFSAR supplement summarizing the cranes that are subject to this TLAA and lists the cranes' number of expected lifts for the subsequent period of extended operation, as well as the limiting number of lifts. The NRC staff reviewed SLRA Appendix A, Section 16.3.7.6, consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the NRC 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 NRC staff concludes that the applicant provided an acceptable demonstration, in accordance with 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).

4.8 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 sufficient to satisfy the requirements of 10 CFR 54.21(d). In addition, the staff concludes, as required by 10 CFR 54.21(c)(2), that no plant-specific, TLAA-based exemptions are in effect.

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 Point Beach Nuclear Plant, 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 attended a meeting of the full committee of the ACRS on April 6, 2022, to discuss issues associated with the SLRA. After the ACRS completes its review of the SLRA and the SE, it issues a report discussing the results of its review.

SECTION 6 CONCLUSION

The U.S. Nuclear Regulatory Commission (NRC or the Commission) staff reviewed the subsequent license renewal application (SLRA) for the Point Beach Nuclear Plant, Units 1 and 2 (Point Beach or PBN) in accordance with the NRC's regulations and the guidance in NUREG-2192, "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 (CLB) 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 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 will be documented in NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 23, Second Renewal, Regarding Subsequent License Renewal for Point Beach Nuclear Plant Unit 1 and Unit 2."

APPENDIX A

SUBSEQUENT LICENSE RENEWAL COMMITMENTS

A. Subsequent License Renewal Commitments

During the U.S. Nuclear Regulatory Commission (NRC or the Commission) staff review of the Point Beach Nuclear Plant, Units 1 and 2 (Point Beach or PBN) subsequent license renewal application, NextEra Energy Point Beach, LLC made commitments related to aging management programs (AMPs). These commitments were designed to add clarity 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 Point Beach begins on October 5, 2030, for Unit 1, and March 8, 2033, for Unit 2.

Table A-1 Point Beach Subsequent License Renewal Commitments

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
1	Fatigue Monitoring	X.M1	Continue the existing PBN Fatigue Monitoring AMP. Augment by 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. c) Update the plant procedure to identify the corrective action options to take if component specific fatigue limits are approached. d) Update the plant procedure to include monitoring of "feedwater cycling at hot standby" and "boron concentration equilibrium" transient cycles to ensure they remain within limits. e) Update the plant procedure to include monitoring of the controlling pressurizer spray transient group cycles to ensure they remain within the 225 cycle limit for each 10-year interval within the SPEO for the ASME Code Section XI Appendix L flaw tolerance evaluation of the Point Beach Units 1 and 2 pressurizer spray nozzles.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292 RAI Response Set 2, ML21223A308 RAI Response Set 2, Rev. 1, ML21307A286
2	Neutron Fluence Monitoring	X.M2	Continue the existing PBN Neutron Fluence Monitoring AMP. Augment by including enhancement to: a) Follow the related industry efforts, such as the 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-16083 (equivalent to WCAP-14040-A) or similar methodology for determination of the RPV fluence in regions above or below the active fuel region. b) Draw from Westinghouse's NRC approved RPV fluence calculation methodology and include discussion of the neutron source, synthesis of the flux field and the order of angular quadrature (e.g., S8), etc. used inthe estimates for projection of TLAAs to 80 years.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
3	Concrete Containment Unbonded Tendon Prestress	X.S1	Continue the PBN Concrete Containment Unbonded Tendon Prestress AMP including enhancement to: a) Formalize the update of prestress calculations and trend lines after eachscheduled “physical” inspection, which includes monitoring of tendon forces, in accordance with RG 1.35.1. b) Include the 80--year prestress calculation in place of the current,60--year, acceptance limits in the program plan for each scheduled IWLinspection interval during the SPEO.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155
4	PBN Environmental Qualification of Electric Equipment	X.E1	Continue the existing PBN Environmental Qualification of Electric Equipment AMP, including enhancement to: a) Visually inspect at least once every 10 years, accessible, passive EQ equipment for adverse localized environments that could impact qualified life. Perform the first periodic visual inspection prior to the SPEO.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292
5	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	XI.M1	Continue the existing PBN ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP, including enhancement to: a) Perform In-service inspections of the PBN Units 1 and 2 ASME Code, Section XI, Appendix L pressurizer spray nozzle safe end piping at least once in each 10--year ISI interval with the first periodic inspection being performed no earlier than 10 years prior to the SPEO and no later than the last refueling outage prior to the SPEO.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032 Implement the AMP and start Appendix L inspections and tests no earlier than 10 years prior to the SPEO.	SLRA, ML20329A292

A-3

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
6	Water Chemistry	XI.M2	Continue the existing PBN Water Chemistry AMP, including enhancements to: a) Incorporate monitoring the critical chemistry parameters for the Heating Steam System in accordance with industry standards specifically: ASME standard ISBN-0-7918-1204-9, “Consensus on Operating Practices for the Control of Feedwater and Boiler Water Chemistry in Modern Industrial Boilers.” b) Perform a one-time inspection to verify the effectiveness of monitoring the critical chemistry parameters for the Heating Steam Systems in accordance with industry standards, specifically ASME stands ISBN-0-7918-1204-9: “Consensus on Operating Practices for the Control of Feedwater and Boiler Water Chemistry in Modern Industrial Boilers.”	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032 Implement the AMP 5 years prior to the SPEO and start the one-time inspections no earlier than 5 years prior to the SPEO.	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155
7	Reactor Head Closure Stud Bolting	XI.M3	Continue the existing PBN Reactor Head Closure Stud Bolting AMP, including enhancement to: a) Revise the procurement requirements for reactor head closure stud material to assure that the maximum yield strength of replacement material is limited to a measured yield strength less than 150 ksi.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292
8	Boric Acid Corrosion	XI.M10	Continue the existing PBN Boric Acid Corrosion AMP, including enhancement to: a) Coordinate with the PBN Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components AMP regarding evidence of boric acid residue (plating out of moist steam) inside containment cooler housings orsimilar locations such as cooling unit drain pans.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292
9	Cracking of Nickel-Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components	XI.M11B	Continue the existing PBN 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 nickel alloys 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.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
10	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel	XI.M12	Implement the new PBN Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292
11	Reactor Vessel Internals	XI.M16A	Continue the existing PBN Reactor Vessel Internals AMP, including enhancement to: a) Implement the guidance in MRP 227 Rev. 1-A as supplemented by the gap analysis, or the latest NRC approved version of MRP 227 which addresses 80 years of operation if one is available prior to the subsequent period of extended operation. b) Implement the results of the gap analysis in the Reactor Vessel Internals Program unless it is superseded by the latest NRC approved version of MRP 227 which addresses 80 years of operation. If so, the AMP may beimplemented directly without the use of a gap analysis. c) Incorporate the updated examination acceptance criteria, Primary / Expansion links, expansion criteria, and expansion item examinationcriteria in MRP 227 Rev. 1-A as supplemented by the gap analysis.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292 SLRA Supplement 3, ML21147A115 SLRA Supplement 3, Rev 1, ML21207A066

12	Flow-Accelerated Corrosion	XI.M17	Continue the existing PBN Flow-Accelerated Corrosion AMP, includingenhancement 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 beyond 60 years. b) Formalize a separate erosion program scope, and an erosion susceptibility evaluation (ESE) that will include all components determined to be susceptible to wall loss due to erosion through OE and industry guidance. c) Perform or compile baseline inspections of erosion susceptible locations where site OE indicates periodic monitoring may be warranted instead ofdesign or operational correction to eliminate the cause of erosion. d) Revise or develop procedural guidance relative to erosion based on the results that includes – • Components treated in a manner similar to "susceptible -not -modeled" lines discussed in NSAC-202L-R4. • Consideration of EPRI 1011231 for identifying potential damage locations and EPRI TR-112657 and/or NUREG/CR–6031 guidance for cavitation erosion as warranted. e) 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. f) 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. g) Revise or provide procedure(s) to perform periodic wall thickness measurements of replacement components until the effectiveness ofcorrective actions have been confirmed. h) 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.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155 RAI Responses Set 10, ML21308A282

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			i) Validation and verification of flow accelerated corrosion software (including CHECWORKS™ Steam/Feedwater Application (SFA) and FAC Manager Web Edition (FMWE)) will be performed prior to the SPEO and on a frequency of no longer than every 7 years through the SPEO. j) Revise FAC program procedures to ensure the requirement for error reporting is applied to FAC software.		

A-7

13	Bolting Integrity	XI.M18	Continue the existing PBN Bolting Integrity AMP, including enhancement to: a) Enhance plant procedures to replace references to NP-5067 Volumes 1 and 2 and EPRI TR-104213 with EPRI Reports 1015336 and 1015337 and incorporate the guidance as appropriate. b) Enhance plant procedures to ensure MoS_2 lubricant will not be used for pressure retaining bolting. c) Enhance plant procedures to 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 in pressure retaining bolting. If 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 with ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1 acceptance standards,extent, and frequency of examination. d) Create a new plant procedure to 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). e) Enhance plant procedures to 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. Plant procedures for visual inspections and examinations will be revised to include the bolting integrity program in their scope. f) Enhance plant procedures to 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	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			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 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. g) Enhance plant procedures to include the guidance for leakage monitoring, sample expansion and additional inspections if inspection results do not meet acceptance criteria as described in NUREG-2191, Chapter XI.M18, Element 7.		
14	Steam Generators	XI.M19	Continue the existing PBN Steam Generators AMP, including enhancement to: a) The Unit 1 steam generator divider plate assemblies are assumed to not be bounded by industry analyses EPRI 3002002850; and PBN will perform a one-time inspection of the Unit 1 steam generator divider plate assemblies prior to the SPEO to confirm that the Water Chemistry and Steam Generator AMPs have mitigated the occurrence of primary water stress corrosion cracking.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155

A-9

15	Open-Cycle Cooling Water System	XI.M20	Continue the existing PBN Open-Cycle Cooling Water System AMP, including enhancement to: a) Update the primary program documents and procedures and applicable preventive maintenance requirements to clearly identify the portions of the service water system, within the scope of GL 89-13, where flow monitoring is not performed. For these portions of the service water system, the procedures will calculate friction (or roughness) factors based on test results from the flow monitored portions of the service water system and use these factors to confirm that design flow rates will be achieved with the overall fouling identified in the system. b) Update the primary program documents and procedures and applicable preventive maintenance requirements to clearly identify the inspections and tests that are within the scope of the ASME Code and those inspections and tests that are not. The procedures and preventive maintenance requirements that perform the ASME Code inspections and tests shall be consistent with and reference the respective ASME Code. The procedures and preventive maintenance requirements that perform the Non-ASME Code inspections and tests shall follow site procedures that include requirements for items such as lighting, distance offset, surfacecoverage, presence of protective coatings, and cleaning processes. c) Update the primary program documents and procedures and applicable PMRQs to state that examinations of polymeric materials (i.e., neoprene expansion joints) shall include visual and tactile inspections whenever the component surfaces are accessible during the performance of periodic surveillances or during maintenance activities or scheduled outages. These inspections shall check for surface cracking, crazing, discoloration,scuffing, loss of material due to wear, dimensional change, and exposure of reinforcing fibers/mesh/metal. Manual or, physical manipulation or pressurization of flexible polymeric components is used to augment visual inspection, where appropriate, to assess loss of material or strength. The sample size for manipulation is at least 10% of accessible surface area, including visually identified suspect areas. Hardening, loss of strength, or loss of material due to wear is expected to be detectable before any loss of intended function. d) Update the primary program documents and procedures and applicable preventive maintenance requirements to perform trending of the observed or calculated friction (or roughness) factors to confirm that the design flowrates will be achieved in	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292

			the portions of the service water system, within the scope of GL 89-13, where flow monitoring is not performed. e) Update the primary program documents and procedures and applicable preventive maintenance requirements to clarify that when previous pipe wall thickness measurements are not available for the determination of a corrosion rate, a corrosion rate that has been calculated from other locations with nearly identical operating conditions, material, pipe size, and configuration may be used to determine re-inspection intervals. This corrosion rate assignment must be documented in an Engineering Evaluation to document the location(s) used, basis for correlation, and final corrosion rate assigned. A mill tolerance of 12.5% shall be used for added conservatism when establishing an initial wall thickness value when determining corrosion rates at new inspection locations if corrosion rates at other locations with nearly identical operating conditions, material,pipe size, and configuration cannot be used. f) Update the primary program documents and procedures and applicable preventive maintenance requirements to clarify that if fouling is identified,the overall effect is evaluated for reduction of heat transfer, flow blockage, loss of material, and chemical treatment effectiveness. For ongoing degradation mechanisms (e.g., MIC and erosion) or recurring loss of material due to internal corrosion, 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 PBN 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 PBN 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		

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			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.		

16	Closed Treated Water Systems	XI.M21A	Continue the existing PBN 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 forevidence of loss of material. 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. c) Create visual inspection procedure(s) and/or preventive maintenance requirements, for heat exchangers that are unable to be functionally tested, to determine the tube surface cleanliness and verify that design heat removal rates are maintained. d) Ensure that visual inspections of closed treated water system components' internal surfaces are conducted whenever the system boundary is opened. The ongoing opportunistic visual inspections can be credited towards the representative samples for the loss of material and fouling; however, surface or volumetric examinations must be used to confirm that there is no cracking. e) 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 detectingloss 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 PBN is a two-unit plant. f) 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.	No later than 6 months prior to the SPEO, or not later than the last refueling outage prior to SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292

A-13

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			g) Ensure that the new inspection and test procedure(s) and/or preventive maintenance requirements identify and evaluate any detectable loss ofmaterial, cracking, or fouling per the PBN corrective action program. h) Ensure that the following additional inspections and actions are required if a post-repair/replacement inspection or subsequent inspection fails to meet acceptance criteria: • The number of increased inspections is determined in accordance with the PBN 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. • Additional samples are inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. Since Point Beach 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.		
17	Inspection of Overhead Heavy Load Handling Systems	XI.M23	Continue the existing PBN Inspection of Overhead Heavy Load Handling Systems AMP, including enhancement to: a) Ensure that NUREG-0612 load handling systems are clearly recognized in the governing procedure. b) Ensure that wear is properly managed for all cranes within the scope of SLR. c) Align procedures with the 2005 Edition of ASME B30.2 to ensure that the correct acceptance criteria and corrective actions are used to evaluate (and repair, if necessary) any visual indication of loss of material, deformation, or cracking,	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			and any visual sign of loss of bolting preload for NUREG-0612 load handling systems. Aligning with the 2005 Edition of ASME B30.2 also ensures that visual inspections are performed at the required frequency. According to ASME B30.2, inspections are performed within the following intervals: • “Periodic” visual inspections by a designated person are required and documented yearly for normal service applications per paragraph 2-2.1.1. • A crane that is used in infrequent service, which has been idle for a period of 1 year or more, shall be inspected before being placed in service in accordance with the requirements listed in paragraph 2-2.1.3 (i.e., periodic inspection). d) Update the governing procedure to state: ” 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 the 2005 Edition of ASME B30.2”. e) Update the governing procedure to state that repairs made to NUREG 0612 load handling systems are performed as specified in the 2005 Edition of ASME B30.2.		

A-15

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
18	Compressed Air Monitoring	XI.M24	Continue the existing PBN 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 EPRITR-108147 and consider the related guidance in the American Society of Mechanical Engineers (ASME) OM-2012, Division 2, Part 28. b) Inspections of internal air line surfaces with maintenance, corrective, orother activities that involve opening of the component or system (For example, with air start valve inspections, check valve inspections, and relief valve or check valve replacements, or G05 air dryer filter checks). c) Include inspection frequency and inspection methods for the opportunistic inspections with guidance of standards or documents such as ASME OM-2012, Division 2, Part 28. d) Review air quality test results. e) Consider ASME OM-2012, Division 2, Part 28 for monitoring and trending guidance.	No later than 6 months prior to the SPEO, or not later than the last refueling outage prior to SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292
19	Fire Protection	XI.M26	Continue the existing PBN Fire Protection AMP, including enhancement to: a) Enhance plant procedures to specify that penetration seals will be inspected for indications of increased hardness, shrinkage and loss of strength, b) Enhance plant procedures to clearly divide corrective actions applicable to fire damper closure test failures from those applicable to visual inspection results and to specify that any loss of material from the fire damper assembly is unacceptable, c) Enhance plant procedures to specify that well-sealed and robustly secured components and fully enclosed cable tray covers credited to prevent internal fires from propagating outside of the component, and fireproofing material sprayed onto structural steel will be inspected for loss of material, cracking, and changes to elastomer properties as appropriate, d) Enhance plant procedures to add spalling and scaling to the	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155 RAI Responses Set 12, ML21343A294

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			degradation effects for which masonry block walls are inspected, e) Enhance plant procedures to indicate that personnel performing FP inspections will be qualified to do so, f) Enhance plant procedures to state that the sample of fire barrier penetration seals visually inspected every 18 months will include at least 10% of each **<u>type</u>** of seal. g) Enhance plant procedures to include inspecting, monitoring, and trending of oil collection channels, trenches, and skids credited to mitigate the spread of combustible liquids for cracking and loss of material at least once every 18 months. The acceptance criteria will be no indication of cracking or loss of material. h) Enhance plant procedures to specify that well-sealed and robustly secured components and fully enclosed cable tray covers credited to prevent internal fires from propagating outside of the component, and fireproofing material sprayed onto structural steel will be inspected every 4.5 years (33% of the population every 18 months), i) Enhance plant procedures to specify that the dry chemical fire extinguishing systems will be inspected semi-annually, j) Enhance plant procedures to specify that the dry chemical fire extinguishing system inspections will be monitored and trended, and k) Enhance plant procedures to require an assessment for additional inspections to be conducted as part of evaluation if one of the inspected penetration seals or fire damper assemblies does not meet acceptance criteria due to current or projected degradation. If evaluation in accordance with the Corrective Action program determines that additional inspection is required, then the expanded inspection sample would be drawn from the remaining population of the penetration seal or fire damper assembly type(s) that exhibited degradation in the initial inspection sample.		

A-17

20	Fire Water System	XI.M27	Continue the existing PBN Fire Water System AMP activities, including enhancement to: a) Update the governing AMP procedure to clearly state which procedures perform visual inspections for detecting loss of material. Such visual inspections will 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. 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 procedures and create new procedures to perform testing and visual inspections in accordance with the surveillance requirements, including methods and intervals, from NUREG-2191 Section XI.M27, Element 4, and Table XI.M27-1 based on NFPA 25, 2011 Edition. d) Update the governing AMP procedure and trending procedure to state that where practical, degradation identified is projected until the next scheduled inspection. Results are 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, flushes, and wall thickness measurements are monitored and trended by either the Engineering or Fire Protection Department per instructions of the specifictest/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 PBN corrective action program and the component is evaluated for repair/replacement. For sampling-based 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 thatperforms the continuous monitoring and evaluation of the fire watersystem discharge pressure.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032 Implement the AMP and start inspections and tests no earlier than 5 years prior to the SPEO.	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155 SLRA Supplement 2, ML21126A239

A-19

			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 the governing AMP procedure to state: ”The minimum design wall thicknesses of the in-scope piping must be maintained”. h) Update the governing AMP procedure to point to the inspection procedures which inspect the wall thicknesses and compare them to theminimum design thicknesses. i) Update the existing flow testing and flushing procedures 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 are conducted. The number of increased tests is determined in accordance with the PBN 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 analysis is conducted to determine the further extent of tests. Since PBN is a multi-unit site, additional tests include inspections at all of the units with the same material, environment, and aging effect combination. j) Update spray and sprinkler system flushing procedures to enable trending of data. Specifically, the existing flushing procedures 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, 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 PBN 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. k) Update the governing AMP procedure to clearly state which procedures perform surface examinations or ASME Code, Section XI, VT-1 visual examinations for identifying SCC within copper alloy (>15% Zn) valve bodies. 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. l) Update the primary program documents and procedures and applicable preventive maintenance activities to state that for ongoing degradation mechanisms (e.g., MIC and erosion) or recurring loss of material due to internal corrosion, 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 PBN 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 PBN 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		

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			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.		

A-21

21	Outdoor and Large Atmospheric Metallic Storage Tanks	XI.M29	Continue the existing PBN Outdoor and Large Atmospheric Metallic StorageTanks AMP, including enhancement to: a) Ensure that caulking or sealant is applied to the concrete-to-tank interface for the FOSTs, T-032A and T-032B, prior to the SPEO. b) Create a new procedure, and/or associated preventive maintenance requirements (PMRQs), to: • Address the interfaces, handoffs, and overlaps between the PBN Outdoor and Large Atmospheric Metallic Storage Tanks AMP and the following AMPs: o PBN Structures Monitoring AMP. o PBN External Surfaces Monitoring of Mechanical ComponentsAMP. o PBN Water Chemistry AMP. o PBN Fuel Oil Chemistry AMP. o PBN One-Time Inspection AMP. o PBN Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP. • Direct periodic (every refueling outage) visual inspection of FOST to concrete caulking/sealants, with mechanical manipulation as appropriate. • Direct periodic (10 -year) surface examination of an RWST's external surface for evidence of cracking, with insulation removed, at the locations most susceptible to degradation and leakage. • Direct periodic (10 -year) bottom thickness measurement of an RWSTand the RMWT using low-frequency electromagnetic testing (LFET) techniques with follow-on ultrasonic testing (UT) examination, as necessary, at discrete tank locations identified by LFET. • Direct periodic (10-year) visual inspections and surface examinations of an RWST's internal nonwetted surface for evidence or loss of material and cracking. For the RMWT, direct periodic (10-year) visual inspections of the RMWT interior above the diaphragm for evidence of loss of material. • Clarify that subsequent inspections are conducted in different locations unless the PBN Outdoor and Large	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032 Implement the AMP and start the one-time and 10-year interval inspections no earlier than 10 years prior to the SPEO.	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155

			Atmospheric Metallic Storage Tanks AMP includes a documented basis for conducting repeated inspections in the same location. • Clarify that inspections and tests are performed by personnel qualified in accordance with site procedures to perform the specified task. • Clarify that non-ASME Code inspections and tests follow site procedures which 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. • Clarify that results are evaluated against acceptance criteria to confirm or adjust timing of subsequent inspections. • State the acceptance criteria as follows: o No degradation of paints or coatings (e.g., cracking, flakes, or peeling), or insulation/jacketing, or the RMWT internal diaphragm. o No non-pliable, cracked, or missing caulking/sealant for theFOST-concrete interface. o No indications of cracking of an RWST. o No tank bottom thickness measurements or thickness projections less than the design thickness and/or no exceedance of the corrosion allowance. • 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. o Repair or replace the degraded component as determined byengineering evaluation and perform follow-up examinations. o Expand the inspection to include both tanks (for FOST or RWSTdegradation). o Double the sample size (for RWST surface examination degradation.)		

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			Sample expansion inspections that happen in the next inspectioninterval are part of the preceding interval. c) Perform baseline LFET tank bottom thickness examinations of a refueling water storage tank and the reactor makeup water tank, with follow-on ultrasonic testing at discrete locations, and a baseline sample surface examination of a refueling water storage tank's exterior (with insulation temporarily removed).		
22	Fuel Oil Chemistry	XI.M30	Continue the existing PBN Fuel Oil Chemistry AMP, including enhancement to: a) Update the frequency for T 072 and G 01 skid/sump tanks internal visual inspections from "on demand" to a 10 year frequency. b) Monitor the following parameters for trending purposes: water content,sediment content, and total particulate concentration for all in-scope tanks. Provide sampling data to the plant quarterly health reports. c) Perform periodic fuel oil sampling of tanks T-031A and B, T-176A and B,T-504, T-505, and the G-01 and G-02 sump/skid-mounted tanks. The sampling methodology shall use either a multilevel sampling technique, such as using an all-level sampling thief or shall obtain a representative sample from the lowest point in the tank if the respective tanks do not allow for multilevel sampling. d) Perform draining and internal visual inspections of the following tanks at least once during the 10--year period prior to the SPEO and repeat the inspection at least once every 10 years: • T-030, P-35B Diesel Driven Fire Pump Fuel Oil Day Tank • T-176A, G-03 EDG Fuel Oil Day Tank • T-176B, G-04 EDG Fuel Oil Day Tank e) Perform volumetric (UT) wall thickness testing, include bottom thickness measurements, of the following tanks at least once during the 10--year period prior to the SPEO and repeat the inspection at least once every 10years: • T-030, P-35B Diesel Driven Fire Pump Fuel Oil Day Tank	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032 Implement the AMP and start the one-time and 10-year interval inspections no earlier than 10 years prior to the SPEO.	SLRA, ML20329A292

A-25

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			• T-031A, G-01 Diesel Generator Day Tank • T-031B, G-02 Diesel Generator Day Tank • T-032A, Fuel Oil Storage Tank • T-032B, Fuel Oil Storage Tank • T-072, Emergency Fuel Oil Storage Tank (buried) • T-176A, G-03 EDG Fuel Oil Day Tank • T-176B, G-04 EDG Fuel Oil Day Tank • T-504, Gas Turbine Generator Starting Diesel Engine Fuel Oil Tank • T-505, G-501 Gas Turbine Generator Auxiliary Power Diesel EngineFuel Oil Tank • EDG G-01 and G-02 Skid/Sump (Base)-Mounted Tanks (no equipment tag/ID) f) Drain and clean the G-01 and G-02 EDG skid tanks to the best extent practical. Perform visual inspection of accessible locations of the skid tank internals and volumetric (UT) inspection of accessible portions of theskid tank as close to the bottom of the skid tank as possible. This draining, cleaning, and surveillance shall occur at least once during the 10--year period prior to the SPEO and repeat at least once every 10 years. g) Project all identified tank degradation through the next scheduled inspection, where practical. h) Evaluate tank inspection 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. i) Report and evaluate all degradation using the corrective action program. Thickness measurements of the tank bottom are evaluated against the design thickness and corrosion allowance. j) Perform corrective actions to prevent recurrence when the specified limits for fuel oil standards are exceeded or when water is drained during periodic surveillance.		

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
23	Reactor Vessel Material Surveillance	XI.M31	Continue the existing PBN Reactor Vessel Material Surveillance AMP. Follow the plan for the Supplemental “A” surveillance capsule in accordance with the NRC approved withdrawal schedule.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292

24	One-Time Inspection	XI.M32	Continue the existing PBN One-Time Inspection AMP, including enhancement to: a) Perform visual exams or other appropriate NDE exams to verify the effectiveness of the PBN Lubricating Oil Analysis AMP for managing the effects of aging of various components in systems containing lubricating oil. b) For steel components exposed to water environments that do not include corrosion inhibitors as a preventive action (e.g., treated water, treated borated water, raw water, waste water), verify that long-term loss of material due to general corrosion will not cause a loss of intended function [e.g., pressure boundary, leakage boundary (spatial), structural integrity (attached)]. Long-term loss of material due to general corrosion for steel components need not be managed if one of the following two conditions is met: (i) the environment for the steel components includes corrosion inhibitors as a preventive action; or (ii) wall thickness measurements on a representative sample of each environment will be conducted between the 50th and 60th year of operation. c) Perform one-time volumetric inspections on each of the steam generator transition cone field welds on both units. This one-time volumetric inspection on each steam generator transition cone field weld is intended to cover essentially 100% of the total weld length. d) Perform one-time inspections of the Unit 1 steam generator divider plate assemblies. The inspections will be capable of detecting primary water stress corrosion cracking in the divider plate assemblies and associated welds, verify the effectiveness of the Water Chemistry and Steam Generators AMP and verify the absence of PWSCC in the divider plate assemblies. e) Inspect a representative sample of each population (defined as components having the same material, environment, and aging effect combination) and, where practical, focus on the bounding or lead components most susceptible to aging due to time in service, and severity of operating conditions. A representative sample size is 20% of the population or a maximum of 25 components at each unit. Otherwise, a technical justification of the methodology and sample size used for selecting components for one-time inspection is included as part of the program documentation. Factors that will be considered when choosing components for	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO, i.e.: PBN1: 4/05/2030 PBN2: 09/08/2032 Perform the one time inspections no earlier than 10 years prior to the SPEO and no later than 6 months prior to the SPEO.	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155

			inspection are time in service, severity of operating conditions, and OE. f) Compare inspection results for each material, environment, and aging effect to those obtained during previous inspections, when available. Where practical, these results are trended in order to project observe degradation to the end of the SPEO. g) Acceptance Criteria: • Consider both the results of observed degradation during current inspections and the results of projecting observed degradation of the inspections for each material, environment and aging effect combinations. • Acceptance criteria may be based on applicable ASME Code or other appropriate standards, design basis information, or vendor-specified requirements and recommendations (e.g., ultrasonic thickness measurements are compared to predetermined limits); however, crack-like indications are not acceptable. • Where it is practical to project observed degradation to the end of the SPEO, the projected degradation will not: (a) affect the intended function of a system, structure, or component; (b) result in a potential leak; or (c) result in heat transfer rates below that required by the CLB to meet design limits. • Enter inspection results into the corrective action plan for future monitoring and trending where measurable degradation has occurred, but acceptance criteria have been met. h) If the cause of the aging effect for each applicable material and environment is not corrected by repair of replacement for all components constructed of the same material and exposed to the same environment, additional inspections are conducted if one of the inspections does not meet acceptance criteria. The number of increased inspections is determined in accordance with the 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. 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. Because PBN is a multi-unit site, the additional		

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			inspections include inspections at both units with the same material, environment, and aging effect combination. i) Where an aging effect identified during an inspection does not meet acceptance criteria or projected results of the inspections of a material,environment, and aging effect combination do not meet the above acceptance criteria, a periodic inspection program is developed for the specific material, environment, and aging effect combination. The periodic inspection program is implemented at both units with the same combination(s) of material, environment, and aging effect.		
25	Selective Leaching	XI.M33	Implement the new PBN Selective Leaching AMP.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032 Perform the one time inspections no earlier than 10 years prior to the SPEO and no later than 6 months prior to the SPEO.	SLRA, ML20329A292
26	ASME Code Class 1 Small-Bore Piping	XI.M35	Continue the existing PBN ASME Code Class 1 Small-Bore Piping AMP, includingenhancement to: a) Perform the new one-time inspection of small-bore piping using the methods, frequencies, and acceptance criteria included in a new program procedure; b) Evaluate the results to determine if additional or periodic inspections are required and perform any required additional inspections.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032 Implement AMP and perform inspections 6 years prior to the SPEO and no later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.	SLRA, ML20329A292

27	External Surfaces Monitoring of Mechanical Components	XI.M36	Continue the existing PBN External Surfaces Monitoring of Mechanical Components AMP, including enhancement to: a) Revise procedure(s) to inspect heat exchanger surfaces exposed to air for evidence of reduction of heat transfer due to fouling. b) Specify in procedure(s) that situations where the similarity of the internal and external environments are such that the external surface condition is representative of the internal surface condition, external inspections of components may be credited for managing: • loss of material and cracking of internal surfaces for metallic and cementitious components, • loss of material, and cracking of internal surfaces for polymeric components, and • hardening or loss of strength of internal surfaces for elastomeric components. When credited, the program provides the basis to establish that the external and internal surface condition and environment are sufficiently similar. c) Clarify in procedure(s) that aging effects associated with below grade components that are accessible during normal operations or refueling outages, for which access is not restricted are managed by the PBN External Surfaces Monitoring of Mechanical Components AMP. d) Revise procedure(s) to include an item in the walkdown checklist to inspect insulation metallic jacketing for any damage that would permit in-leakage of moisture. e) Revise procedure(s) to clarify visual inspection of cementitious components for indications [of] loss of material and cracking. Examplesof inspection parameters for cementitious materials include spalling, scaling, and cracking. f) Revise procedure(s) to clarify periodic visual or surface examinations are utilized to manage cracking in stainless steel or aluminum components. g) Revise procedure(s) to add the following inspection parameters for metallic components: • Surface imperfections, loss of wall thickness, oxide coated surfaces	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155

			• Corrosion stains on thermal insulation • Blistering of protective coating • Evidence of leakage (for detection of cracks) on the surfaces of stainless steel and aluminum components • Accumulation of debris on heat exchanger tube surfaces and air-sideheat exchanger surfaces h) Revise procedure(s) to include inspection for elastomeric and polymeric components and its methodology. Elastomeric and flexible polymeric components are monitored through a combination of visual inspection and manual or physical manipulation of the material. Visual inspections cover 100% of accessible component surfaces. Manual or physical manipulation of the material includes touching, pressing on, flexing, bending, or otherwise manually interacting with the material in order 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. The sample size for manipulation is at least 10% of available surface area. The inspection parameters for elastomers polymers shall include the following: • 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 i) Revise procedure(s) to include that flexing of polyvinyl chloride piping exposed directly to 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) is conducted to detect potential reduction in impact strength as indicated by a crackling sound or surface cracks when flexed. j) Revise procedure(s) to include accumulation of debris on in-scope components is monitored.		

			k) Revise procedure(s) to inspect a sample of HVAC closure bolting in reach to ensure that it is not loose. l) Revise procedure(s) to specify that inspections are to be performed by personnel qualified in accordance with site procedures and programs to perform the specified task, and when required by the ASME Code, inspections are conducted in accordance with the applicable code requirements. m) Revise procedure(s) to include inspections for loss of material, cracking, changes in material properties, hardening or loss of strength (of elastomeric components), reduced thermal insulation resistance, loss of preload for ducting closure bolting, and reduction of heat transfer due tofouling at an inspection frequency of every refueling outage for all in-scope non-stainless steel and non-aluminum components, which include metallic, polymeric, insulation jacketing (insulation when not jacketed). Non-ASME Code inspections and tests should include inspection parameters for items such as lighting, distance offset, surface coverage, and presence of protective coatings. Surfaces that are not readily visible during plant operations and refueling outages should be inspected when they are made accessible and at such intervals that would ensure the components' intended functions are maintained. n) Revise procedure(s) to specify that surface examinations, or ASME Code Section XI VT-1 examinations (including those inspections conducted on non-ASME Code components) are conducted every 10 years to detect cracking of stainless steel (SS) and aluminum components. o) Revise procedure(s) to specify that surface examinations, or ASME Code Section XI VT-1 examinations, are conducted on 20% of the surface area unless the component is measured in linear feet, such as piping. Alternatively, any combination of 1-foot length sections and components can be used to meet the recommended extent of 25 inspections. The provisions of GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," to conduct inspections in a more severe environment and combination of air environments may be incorporated for these inspections. p) Revise procedure(s) to specify alternative methods for detecting moisture inside piping insulation (such as thermography, neutron backscatter devices, and moisture		

			meters) are to be used for inspecting piping jacketing that is not installed in accordance with plant-specific procedures (such as no minimum overlap, wrong location of seams, etc.). q) Revise procedure(s) to include the following information: • Component surfaces that are insulated and exposed to condensation(because the in-scope component is operated below the dew point), and insulated outdoor components, are periodically inspected every 10 years during the SPEO. • For all outdoor components and any indoor components exposed to periodic submergence or condensation (because the in-scope component is operated below the dew point), inspections are conducted of each material type (e.g., steel, SS, copper alloy, aluminum) and environment (e.g., raw water, air outdoor, air accompanied by leakage) where periodic submergence, condensation or moisture on the surfaces of the component could occur routinely or seasonally. In some instances, significant moisture can accumulate under insulation during high humidity seasons, even in conditioned air. 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-foot axial length determination (e.g., valve, accumulator, tank) is inspected after the insulation is removed. Alternatively, any combination of a minimum of 25 1-foot axial length sections and components for each material type is inspected. Inspection locations should focus on the bounding or lead components most susceptible to aging because of time in service, severity of operating conditions (e.g., amount of timethat condensate would be present on the external surfaces of the component), and lowest design margin. Inspections for cracking due to SCC in aluminum components need not be conducted if it has been determined that SCC is not an applicable aging effect. r) Revise procedure(s) to specify that: • Visual inspection will identify direct indicators of loss of material due towear to include dimension change, scuffing, and, for flexible polymeric materials with internal reinforcement, the exposure of reinforcing fibers, mesh, or underlying metal.		

A-33

			• Visual inspection of elastomers and flexible polymers will 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. • 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, and the sample size for manipulation is at least 10% of available surface area. s) Revise procedure(s) to formalize sampling-based inspections. The results of sampling-based inspections will be evaluated against acceptance criteria to confirm that the sampling bases (e.g., selection,size, frequency) will maintain intended functions of the components throughout the SPEO based on the projected rate and extent of degradation. t) The AMP owner will interface with the fleet corrosion monitoring actionprogram to identify problem areas and track resolution of deficiencies. u) Revise procedure(s) to add an evaluation to project the degree of observed degradation to the end of the SPEO or the next scheduled inspection, whichever is shorter. v) Revise procedure(s) to specify where practical, acceptance criteria are quantitative (e.g., minimum wall thickness, percent shrinkage allowed inan elastomeric seal). For quantitative analyses, the required minimum wall thickness to meet applicable design standards will be used. Where qualitative acceptance criteria are used, the criteria are clear enough to reasonably ensure that a singular decision is derived based on the observed condition of the systems, structures, and components (e.g. cracks are absent in rigid polymers, the flexibility of an elastomeric sealant is sufficient to ensure that it will properly adhere to surface). w) Revise procedure(s) to include guidance from EPRI TR-1007933 “Aging Assessment Field Guide and TR-1009743 “Aging Identification and Assessment Checklist”		

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			on the evaluation of materials and criteria for their acceptance when performing visual/tactile inspections. x) Revise procedure(s) to specify that additional inspections will be performed if any sampling-based inspections to detect cracking in aluminum and stainless steel components do not meet the acceptance criteria, unless the cause of the aging effect for each applicable material and environment is corrected by repair or replacement. There will be no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20% of each applicable material, environment, and aging effect combination inspected, whichever is less. The additional inspections will be completed within the interval (e.g., 10-year inspection interval) in which the original inspection was conducted. If any subsequent inspections do not meet the acceptance criteria, an extent of condition and extent-of-cause analysis will be conducted to determine the further extent of inspections required. Additional samples will be inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. The additional inspections will include inspections of components with the same material, environment, and aging effect combination at both Unit 1 and Unit 2.		
28	Flux Thimble Tube Inspection	XI.M37	Continue the existing PBN Flux Thimble Tube Inspection AMP, including enhancement to: a) Remove from service the flux thimble tubes that cannot be inspected over the tube length yet are subject to wear due to restriction or other defects but cannot be shown by analysis to be satisfactory for continued service. This maintains the integrity of the RCS pressure boundary.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292
29	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	XI.M38	Implement the new PBN Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP. The following items shall be included in the new AMP: a) Perform an internal inspection of the Unit 1 RHR flow control valves within the next two refueling outages. The need for additional or periodic inspections will be determined based on the inspection results.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
				Note that the Unit 1 RHR flow control valve inspection is to be completed within the next two refueling outages (no later than 2023).	

30	Lubricating Oil Analysis	XI.M39	Continue the existing PBN Lubricating Oil Analysis AMP, including enhancementto: a) Manage aging effects associated with in-scope piping and piping components exposed to an environment of hydraulic oil. b) Manage aging effects associated with reactor coolant pump system components that are exposed to an environment of lubricating oil. In addition, manage other in-scope components exposed to lubricating oil environments and subject to aging management review. c) Maintain contaminants in the in-scope lubricating oil and hydraulic oil systems within acceptable limits through periodic sampling and testing for moisture and particle count in accordance with industry standards. All lubricating oil analysis results will be reviewed and trended to determine ifalert limits have been reached or exceeded, as well as, if there are any unusual or adverse trends associated with the oil sample. d) Sampling and testing of old oil will be performed following periodic oil changes, or on a schedule consistent with equipment manufacturer's recommendations or industry standards [e.g., American Society of TestingMaterials (ASTM) D 6224 02]. Plant specific operating experience associated with lubricating oil systems may also be used to adjust the schedule for periodic sampling and testing, when justified by prior sampling results. e) For hydraulic fluids, if the fluid is replaced based on a periodicity recommended by the fluid manufacturer, equipment vendor, or plant-specific documents, testing is not required. Alternatively, the hydraulic fluid will be tested for water content if the oil is not clear or bright, and for particulate count. f) Compare the particulate count of the samples with the acceptance criteria for particulates. The acceptance criteria for water and particle concentrationwithin the oil must not exceed limits based on equipment manufacturer's recommendations or industry standards. If an acceptance criteria limit is reached or exceeded, actions to address the condition are to be taken. Corrective actions may include increased monitoring, corrective maintenance, further laboratory analysis, and engineering evaluation of the	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			specified lubricating oil system. g) Phase-separated water in any amount is not acceptable. If phase-separated water is identified in the sample, then corrective actionsare to be initiated to identify the source and correct the issue (e.g., repair/replace component or modify operating conditions).		

31	Buried and Underground Piping and Tanks	XI.M41	Continue the existing PBN Buried and Underground Piping and Tanks AMP, including enhancement to: a) Ensure that the cathodic protection system will meet the requirements of GALL-SLR Section XI.M41, including the polarized potential criteria of NUREG 2191 (i.e., -850 mV instant-off). PBN takes an exception to the NUREG-2191 requirementof meeting the cathodic protection requirements of NACE SP0169-2007. Instead, PBN is committed to meeting the cathodic protection system requirements of NACE SP0169-2013 (with the exception of Section 6, “Criteria and Other Considerations for Cathodic Protection”). The information from NACE SP0169-2007 shall be used instead of NACE SP0169-2013 for Section 6. The cathodic protection system for non-aluminum buried piping shall also include a limiting critical potential of -1,200 mV, similar to that stated in NACE SP0169-2007, Section 6.2.3.2.1. Additionally, the cathodic protection system shall also include annual system monitoring. b) Ensure that new or replaced backfill shall meet the requirements of NACESP0169-2007 Section 5.2.3 or NACE RP0285-2002, Section 3.6. c) Perform visual inspection of the external surfaces of controlled low strength material backfill, where such backfill is used, to detect potential cracks that could admit groundwater to the surface of the component. d) Measure wall thickness with volumetric examination and pit depth gages or calipers using techniques that have been determined to be effective for the material, environment, and conditions (e.g., remote methods) during the examination and are capable of quantifying general wall thickness andthe depth of pits. e) Inspect for cracking in steel utilizing a method that has been determinedto be capable of detecting cracking. Coatings that: (a) are intact, well-adhered, and otherwise sound for the remaining inspection interval; and (b) exhibit small blisters that are few in number and completely surrounded by sound coating bonded to the substrate do not have to be removed. Inspections for cracking are conducted to assess the impact of cracks on the pressure boundary function of the component. f) Monitor the pipe-to-soil potential and the cathodic protection	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032 Implement the AMP and start the one-time and 10-year interval inspections no earlier than 10 years prior to the SPEO.	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155 RAI Responses Set 2, ML21223A308 RAI Responses Set 9 Response Supplement, ML21308A283

			current for steel piping and tanks in contact with soil to determine the effectiveness of cathodic protection systems. g) Perform inspections of buried piping in accordance with NUREG-2191 Table XI.M41-2 Category E steel, unless a reevaluation based on future OE and soil conditions, as defined in NUREG-2191, Table XIM41-2, determines that another Preventative Action Category is more applicable. The inspections will be distributed evenly among the units. Since PBN is a two-unit site, the inspection quantities are 50% greater than NUREG-2191 Table XI.M41-2 and are rounded up to the nearest whole inspection. Thus, the number of inspections for each 10--year inspection period, commencing 10 years prior to the SPEO and continuing during the SPEO is as follows: • Buried Piping: The smaller of 5% of the piping length or five 10--footsegments. • Buried Tank: One inspection for tank T-072. • Underground Tanks: In lieu of inspections, monitor annular space of double walled tanksT-175A and T-175B for leakage. When the inspections for a given material type are based on percentage of length and results in an inspection quantity of less than 10 feet, then 10 feet of piping is inspected. If the entire run of piping of that material type is less than 10 feet in total length, then the entire run of piping is inspected. h) Perform surface and/or volumetric nondestructive testing if evidence of wall loss beyond minor surface scale is observed. i) Include the guidance for piping inspection location selection as follows: (a) a risk ranking system software incorporates inputs that include coating type, coating condition, cathodic protection efficacy, backfill characteristics, soil resistivity, pipe contents, and pipe function; (b) opportunistic examinations of nonleaking pipes may be credited toward examinations if the location selection criteria are met; and (c) the use of guided wave ultrasonic examinations may not be substituted for the required inspections. j) Select an alternative to visual examination of piping from NUREG-2191 pages XI.M41-9 and XI.M41-10. k) Perform the examinations of tank T-072 from the external surface of the tank using visual techniques, which include		

			inspection of the air-to-concrete wall interface, and from the internal surface of the tank using volumetric techniques. A minimum of 25% of the tank surface is examined. The inspected area includes at least some of both the top and bottom of the tank. The method must be capable of determining tank wall thickness and general and pitting corrosion and qualified at PBN to identify loss of material that does not meet the acceptance criteria. Volumetric wall thickness measurements must also be recorded for the tank interfaces with the air-to-concrete and concrete-to-soil exterior environment transitions. The double wall tanks, T-175A and T-175B shall be examined by monitoring the annular space for leakage. l) Utilize the potential difference and current measurements from the periodic cathodic protection testing for trending. m) Perform trending of wall thickness measurements and project to the next scheduled inspection. n) Evaluate inspection and test results against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the component intended functions throughout the SPEO based on the projected rate and extent of degradation. Utilize an acceptance criterion of no evidence of coating degradation. Otherwise have the type and extent of coating degradation evaluated as insignificant by an individual: o) (a) possessing a NACE Coating Inspector Program Level 2 or 3 inspector qualification; (b) who has completed theElectric Power Research Institute Comprehensive Coatings Course andcompleted the EPRI Buried Pipe Condition Assessment and Repair Training Computer Based Training Course; or (c) a coatings specialist qualified in accordance with an ASTM standard endorsed in Regulatory Guide 1.54, Revision 2, “Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants.” Ensure projected wall thickness continues to meet the minimum wallthickness requirements through the end of the SPEO. p) Ensure projected wall thickness continues to meet minimum wall thickness requirements through the end of the SPEO.		

A-41

			q) Evaluate all backfill caused damage to the respective component coatings or the surface of the component r) Perform corrective action on cracks in cementitious backfill that could admit groundwater to the surface of the component. s) Utilize the Table XI.M41-3 acceptance criteria (i.e., -850 mV instant-off) for pipe-to-soil potential when using a saturated copper/copper sulfate (CSE). t) Perform an extent of condition evaluation when damage to the coating has been evaluated as significant and the damage was caused by nonconforming backfill. u) Evaluate the coated and uncoated metallic piping and tanks that show evidence of corrosion to ensure that the minimum wall thickness is maintained throughout the SPEO. This may include different values for large area minimum wall thickness and local area wall thickness. If the wall thickness extrapolated to the end of the SPEO meets the minimum wall thickness requirements, the NUREG-2191 Section XI.M41 recommendations for expansion of sample size do not apply. v) Expand the sample size when the depth or extent of degradation of the base metal could have resulted in a loss of pressure boundary function when the loss of material is extrapolated to the end of the SPEO in the following manner: The number of inspections within the affected piping categories are doubled or increased by five, whichever is smaller. If the acceptance criteria are not met in any of the expanded samples, an analysis is conducted to determine the extent of condition and extent of cause. The number of follow-on inspections is determined based on the extent of condition and extent of cause. The timing of the additional examinations is based on the severity of the degradation identified and is commensurate with the consequences of a leak or loss of function. However, in all cases, the expanded sample inspection is completed within the 10 year interval in which the original inspection was conducted or, if identified in the latter half of the current 10-year interval, within 4 years after the end of the 10-year interval. These additional inspections conducted during the 4 years following the end of an inspection interval cannot also be credited towards the number of required inspections for the following 10-year interval. The number of inspections may be limited by the extent of piping or tanks subject to the observed degradation		

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			mechanism. The expansion of sample inspections may be halted in a piping system or portion of system that will be replaced within the 10-year interval in which the inspections were conducted or, if identified in the latter half of the current 10-year interval, within 4 years after the end of the10-year interval. w) Perform soil sample analyses in accordance with NUREG-2191, Table XI.M41-2, as follows to confirm that the soil is not corrosive for the respective piping material type: • Obtain a minimum of three sets of soil samples in each soil environment (e.g., moisture content, soil composition) in the vicinity in which in-scope components are buried. • Test the soil for soil resistivity, corrosion accelerating bacteria, pH, moisture, chlorides, sulfates, and redox potential. • Determine the potential soil corrosivity for each material type of buried in-scope piping. In addition to evaluating each individual parameter, the overall soil corrosivity shall be determined. • Conduct soil testing no earlier than 10 years prior to the SPEO, but no later than 6 months or last refueling outage prior to the SPEO, and conduct soil testing every 10 years thereafter through the SPEO. x) Perform inspections on the uncoated/unwrapped portions of the buried fire protection system piping no earlier than 10 years prior to the SPEO and at least every 10 years during the SPEO. The inspections include at least two 10-ft segments of uncoated/unwrapped fire protection piping. y) Perform at least 3 inspections of non-cathodically protected steel piping as part of the 5 preventive action category E inspections performed in each 10 year interval beginning no earlier than 10 years, prior to the SPEO and at least every 10 years during the SPEO.		

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
32	Internal Coatings/Linings for in-Scope Piping, Piping Components, Heat Exchangers, and Tanks	XI.M42	Implement the new PBN Internal Coatings/Linings for In-Scope Piping, PipingComponents, Heat Exchangers, and Tanks AMP and complete the 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.: PBN1: 04/05/2030 PBN2: 09/08/2032 Perform the baseline inspections no earlier than 10 years or no later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.	SLRA, ML20329A292
33	ASME Section XI, Subsection IWE	XI.S1	Continue the existing PBN ASME Section XI, Subsection IWE AMP, including enhancement to: a) Augment existing procedures to specify that whenever replacement of bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants are in accordance with the guidelines of EPRINP-5769, “Degradation and Failure of Bolting in Nuclear Power Plants,” EPRI TR-104213, “Bolted Joint Maintenance & Application Guide,” and the additional recommendations of NUREG-1339, “Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants.” b) Augment existing procedures to specify that for structural bolting consisting of ASTM A325, ASTM F1852, and/or ASTM A490 bolts, the preventive actions for storage, lubricants, and stress corrosion cracking potential discussed in Section 2 of RCSC (Research Council for StructuralConnections) publication “Specification for Structural Joints Using ASTM A325 or A490 Bolts,” will be used. c) Augment existing procedures to specify that pressure retaining bolting is inspected for loosening and material condition affecting leak tightness or structural integrity.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO, i.e.: PBN1: 4/05/30 PBN2: 09/08/32 Start the one-time inspections for cracking due to SCC no earlier than five years prior to the SPEO. Complete one-time inspection of containment liner locations in both units if degradation from inaccessible (concrete) side is identified, in either unit, on a	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155 RAI Responses Set 2, ML21223A308

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			d) Augment existing procedures to implement periodic supplemental surface examinations or enhanced visual examination (EVT-1) at intervals no greater than 10-years to detect cracking due to cyclic loading of all non-piping penetrations (hatches, electrical penetrations,etc.) that are subject to cyclic loading but have no current licensing bases fatigue analysis and are not subject to local leak rate testing. e) Augment existing procedures to implement supplemental one-time surface examinations or enhanced visual examinations (EVT-1) performed by qualified personnel using methods capable of detecting cracking, comprising (a) a representative sample (two) of the stainless steel penetrations or dissimilar metal welds associated with high-temperature (temperatures above 140°F) stainless steel piping systems in frequent use on each unit; and (b) the stainless steel fuel transfer tube on each unit. If cracking is detected as a result of the supplemental one-time inspections, additional inspections will be conducted in accordance with the site's corrective action process. This will include 1 additional penetration with dissimilar metal welds associated with greater than 140 degree stainless steel piping systems for each unit until SSC is no longer detected. Periodic inspection of subject penetrations with dissimilar metal welds for cracking will be added to the PBN ASME Section XI, Subsection IWE AMP is necessary, depending on the inspection results. f) Augment existing procedures to implement a one-time supplemental volumetric inspection of metal liner surfaces that samples randomly selected as well as focused locations susceptible to loss of thickness due to corrosion from the concrete side if triggered by plant-specific OE after the date of issuance of the first renewed license for each unit. This sampling is conducted to demonstrate with 95% confidence, that 95% of accessible portion of the liner is not experiencing greater than 10% wall loss.	schedule established by the PBN Corrective Action Program. Inspection will be scheduled to provide reasonable assurance that the metal liner intended function is maintained consistent with the CLB through the SPEO.	

A-45

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
34	ASME Section XI, Subsection IWL	XI.S2	Continue the existing PBN ASME Section XI, Subsection IWL AMP, including enhancement to: a) Augment existing procedures to specify that inspection results be compared to previous results to identify changes from prior inspections, and that quantitative measurements and qualitative information are recorded and trended for applicable parameters monitored or inspected. b) Augment existing procedures to specify that inspection results be compared to previous results to determine if degradation is passive for application of second-tier acceptance criteria as specified in ACI 349.3R.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/30 PBN2: 09/08/32	SLRA, ML20329A292

35	ASME Section XI, Subsection IWF	XI.S3	Continue the existing PBN ASME Section XI, Subsection IWF AMP, including enhancement to: a) 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. b) Augment existing procedures to include vibration isolation elements ofASME Section XI Class 1, 2, and 3 supports within the ISI Program scope. c) Augment existing procedures to specify that whenever replacement of bolting is required, bolting material, installation torque or tension, and use of lubricants and sealants are in accordance with the guidelines of EPRI NP-5769, “Degradation and Failure of Bolting in Nuclear Power Plants,” EPRI TR-104213, “Bolted Joint Maintenance & Application Guide,” and the additional recommendations of NUREG-1339, “Resolution of GenericSafety Issue 29: Bolting Degradation of Failure in Nuclear Power Plants.” d) Augment existing procedures to specify that for structural bolting consisting of ASTM A325, ASTM F1852, ASTM F2280, and/or ASTM A490 bolts, the preventive actions for storage, lubricants, and stress corrosion cracking potential discussed in Section 2 of RCSC publication “Specification for Structural Joints Using ASTM A325 or A490 Bolts,” will be used. Additionally, molybdenum disulfide and other lubricants containing sulfur will not be used. 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 elastomeric or polymeric vibration isolation elements are monitored for cracking, loss of material,and hardening. 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.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO, i.e.: PBN1: 04/05/30 PBN2: 09/08/32 Start the one-time inspections no earlier than five years prior to the SPEO.	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155 RAI Responses Set 2, ML21223A308

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			h) Augment existing procedures to include tactile inspection (feeling, prodding) of elastomeric vibration isolation elements to detect hardening if the vibration isolation function is suspect. i) Augment existing procedures to specify that, for ASME Class 1, 2, or 3 component supports, high-strength bolting greater than one inch nominal diameter,volumetric examination comparable to that of ASME Code, Section XI, Table IWB2500-1, Examination Category B-G-1 will be performed to detect cracking in addition to the VT3 examination. In each 10-year period during the SPEO, a representative sample of bolts will be inspected. The sample will be 20% of the population (for a material / environment combination) up to a maximum of 25 bolts. j) 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. k) 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; cracking or sheared bolts, including high-strength bolts, and anchors; loss of material,cracking, and hardening of elastomeric or polymeric vibration isolation elements that could reduce the vibration isolation function; and cracks.		
36	10 CFR Part 50, Appendix J	XI.S4	Continue the existing PBN 10 CFR Part 50, Appendix J AMP	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/30 PBN2: 09/08/32	SLRA, ML20329A292
37	Masonry Walls	XI.S5	Continue the existing PBN Masonry Walls AMP, including enhancement to: a) Revise implementing procedures to also monitor and inspect for spalling,scaling, shrinkage and/or separation as well as loss of material at the mortar joints, and gaps between the	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/30 PBN2: 09/08/32	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			supports and masonry walls that could potentially impact the intended function or potentially invalidate its evaluation basis. b) Revise implementing procedures to also include specific monitoring, measurement, and trending of widths and lengths of cracks and of gaps between supports and masonry walls. c) Revise implementing procedures to ensure degraded conditions (shrinkage and/or separation, cracking of masonry walls, cracking or loss of material at the mortar joints, and gaps between supports and masonry walls) are assessed against the evaluation basis to confirm that the degradation has not invalidated the original evaluation assumptions or impacted the capability to perform the intended functions.		
38	Structures Monitoring	XI.S6	Continue the existing PBN Structures Monitoring AMP, including enhancement to: a) Revise inspection procedures to include guidance and acceptance criteria on inspections of stainless steel and aluminum components for pitting andcrevice corrosion, and evidence of cracking due to SCC. Perform an evaluation if stainless steel or aluminum surfaces exhibit evidence of SCC, pitting, or crevice corrosion. b) Revise inspection procedure scope to include polystyrene foam that is mounted to the underside of manhole covers as an elastomer material. c) Revise implementing procedures to include preventive actions to ensure bolting integrity for replacement and maintenance activities by specifying proper selection of bolting material and lubricants, and appropriate installation torque or tension to prevent or minimize loss of bolting preload and cracking of high strength bolting. Also, ensure proper selection and storage of high strength bolting in accordance with Section 2 of the Research Council for Structural Connections publication,“Specification for Structural Joints Using High-Strength Bolts”. Additionally, molybdenum disulfide and other lubricants containing sulfur will not be used. d) Revise inspection procedures to additionally inspect for the following items:	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/30 PBN2: 09/08/32 Perform the first inspection for tightness (torque check) of all anchors within the scope of license renewal that are embedded in epoxy resin-based grout no later than the last refueling outage prior to the SPEO.	SLRA, ML20329A292 RAI Responses Set 1, 7/8/21, ML21189A173 SLRA Supplement 1, ML21111A155 RAI Responses Set 2, ML21223A308 RAI Responses Set 10, ML21308A282

A-49

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			• Increase in porosity and permeability, loss of strength, and reduction in anchor capacity due to local concrete and grout (including epoxy resin-based grout) degradation in concrete and grout (including epoxy resin-based grout) structures. • Loss of material, blistering, and loss of strength for elastomers/polymers (including polystyrene inserts for manhole covers) • Pitting and crevice corrosion, and evidence of cracking due to SCC for stainless steel and aluminum components • Confirmation of the absence of water in-leakage through concrete. • Localized distortion of the biological shield wall liner as a leading indicator of radiation induced volumetric expansion of the underlying concrete. • Loss of form of the earthen berm surrounding the fuel oil storage tanks. e) Revise inspection procedures to include guidance on MEB inspection for loss of material (external bus duct enclosure surfaces and structural supports) and elastomer degradation (exterior housing gaskets, boots, and sealants). f) Clarify that if ground water leakage is identified then engineering evaluation, more frequent inspections, or destructive testing of affected concrete (to validate properties and determine pH) are required. When leakage volumes allow, assessments may include analysis of the leakage pH, along with mineral, chloride, sulfate, and iron content in the water. g) Update the governing AMP procedure and other applicable procedures to specify inspection of structural support applications employing epoxy (adhesive) anchors and epoxy resin-based grout for degradation that could cause a loss of anchor capacity. h) Revise inspection procedure to specify that the responsible engineer (RE) shall be a registered professional engineer with knowledge in the design, evaluation, and in-service		

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			inspection of concrete structures and performance requirements of nuclear safety-related structures; or a degreed civil or structural engineer with at least ten years' experience in the design, construction, and inspection of concrete structures, with knowledge of the performance requirements of nuclear safety-related structures and potential degradation processes. i) Update the governing procedure to specify that, for non-ASME high-strength bolting in scope for SLR and greater than one inch nominal diameter, volumetric examination capable of detecting cracking will be performed in addition to the VT-3 examination. Within 10 years prior to entering the SPEO, and in each 10-year period during the SPEO, a representative sample of bolts will be inspected. The sample will be 20% of the population (for a material / environment combination) up to a maximum of 25 bolts. j) Revise inspection procedure to specify that accessible areas subject to similar conditions (material, environment, etc.) may be inspected in lieu of inaccessible areas, and include guidance for evaluating the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to the inaccessible areas. k) Ensure quantitative baselines have been established for all structures within the scope of SLR prior to entering the SPEO. l) Revise inspection procedure to include the following acceptance criteria: • For Elastomers/polymers (including polystyrene inserts for manhole covers): No loss of material, no blistering, and no indications of loss of strength such as unacceptable surface cracking, crazing, scuffing, dimensional change (e.g., “ballooning” and “necking”), shrinkage,discoloration, or hardening. • For Bolting and Fasteners: Loose bolts and nuts are not acceptableunless accepted by engineering evaluation. • For Structural Sealants: Observed loss of material, cracking, andhardening will not result in loss of sealing		

A-51

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			• For earthen berm: No evidence of: o Settlement - unusual localized or overall settlement, depressions, sinkholes, o Slope instability - variance from originally constructed slopes, unusual changes from original crest alignment and elevation, evidence of movement o Erosion – gullies or notches in slope m) Revise the implementing procedure to include periodic inspections for tightness (e.g., torque checks, as applicable) of all anchors within the scope of license renewal that are embedded in epoxy resin based grout during normally scheduled walkdowns to ensure that proper installation is maintained and verify that preload has not been lost due to creep. n) Revise implementing documents to prohibit the use of epoxy resin based grout in safety-related applications in locations where normal temperatures exceed 120°F, or in posted high radiation areas as defined in 10 CFR Part 20.		

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
39	Water-Control Structures	XI.S7	Continue the existing PBN Water-Control Structures AMP, including enhancement to: a) Revise implementing procedures to include preventive actions to ensure bolting integrity for replacement and maintenance activities by specifying proper selection of bolting material and lubricants, and appropriate installation torque or tension to prevent or minimize loss of bolting preload and cracking of high-strength bolting. For structural bolting consisting of ASTM A325, ASTM A490, ASTM F1852 and/or ASTM F2280 bolts, the preventive actions for storage, lubricant selection, and bolting and coating material selection discussed in Section 2 of the Research Council for Structural Connections publication, “Specification for Structural Joints Using High-Strength Bolts,” will be used. b) Revise the implementing procedure to also monitor concrete to confirmthe absence of water leakage. c) Revise the implementing procedure to include provisions for special inspections immediately following the occurrence of significant naturalphenomena, such as large floods, earthquakes, tornadoes, or intense local rainfalls. d) Revise the implementing procedure to clarify that if water leakage is identified, then engineering evaluation, more frequent inspections, ordestructive testing of affected concrete (to validate properties and determine pH) are required. e) Revise the implementing procedure to indicate that loose bolts and nuts are unacceptable unless they are determined to be acceptable by engineering evaluation or subject to corrective actions	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/30 PBN2: 09/08/32	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
40	Protective Coating Monitoring and Maintenance	XI.S8	Continue the existing PBN Protective Coating Monitoring and Maintenance AMP,including enhancements to: a) Revise implementing procedures to specify that follow-up inspections be performed by individuals trained and certified in the applicable reference standards of ASTM Guide D5498. b) Revise implementing procedures to ensure a thorough visual inspection shall be carried out on all coatings near sumps or screens associated with the ECCS. c) Revise implementing procedures to include coating specifications in the list of pre-inspection documentation available to the inspection team. d) Revise the implementing procedures to reference Position C.4 of Regulatory Guide 1.54 Rev. 3 for Maintenance of Service Level ICoatings.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/30 PBN2: 09/08/32	SLRA, ML20329A292
41	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	XI.E1	Continue the existing PBN Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP 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 warranted on a large number of cables and connections, deemed necessary, utilize sampling methodology consistent with the guidance in Section XI.E1 of NUREG-2191.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/30 PBN2: 09/08/32	SLRA, ML20329A292 SLRA Supplement 1, ML21111A155

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
42	Electrical Insulation for Electrical Cablesand Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	XI.E2	Continue the existing PBN 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, i.e.: PBN1: 04/05/30 PBN2: 09/08/32	SLRA, ML20329A292
43	Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	XI.E3A	Continue the existing PBN Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/30 PBN2: 09/08/32	SLRA, ML20329A292
44	Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	XI.E3B	Implement the new PBN Electrical Insulation for Inaccessible Instrument and Control Cables 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, i.e.: PBN1: 04/05/30 PBN2: 09/08/32	SLRA, ML20329A292
45	Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	XI.E3C	Implement the new PBN Electrical Insulation for Inaccessible Low-Voltage PowerCables 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, i.e.: PBN1: 04/05/30 PBN2: 09/08/32	SLRA, ML20329A292

Item No.	Program/Topic	NUREG -2192 Section	Commitment	Implementation Schedule	Source
46	Metal Enclosed Bus	XI.E4	Implement the new PBN Metal Enclosed Bus AMP.	Implement AMP and complete initial inspections no later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/30 PBN2: 09/08/32	SLRA, ML20329A292
47	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	XI.E6	Implement the new PBN 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, i.e.: PBN1: 04/05/2030 PBN2: 09/08/2032	SLRA, ML20329A292
48	High-Voltage Insulators	XI.E7	Implement the new PBN High-Voltage Insulators AMP.	Implement AMP and complete initial inspections no later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/30 PBN2: 09/08/32	SLRA, ML20329A292
49	Quality Assurance Program	Appendix A	Continue the existing NEE QA Program at PBN.	Ongoing	SLRA, ML20329A292
50	Operating ExperienceProgram	Appendix B	Continue the existing PBN OE Program	Ongoing	SLRA, ML20329A292
51	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 RV support steel and corresponding aging management recommendations, including: a) Ensure their applicability to the PBN Unit 1 and Unit 2 primary shield wall and associated reactor vessel supports; b) Update design calculations, as appropriate, and; c) Develop an informed site-specific program, if needed.	No later than 6 months prior to the SPEO, i.e.: PBN1: 04/05/30 PBN2: 09/08/32	SLRA, ML20329A292

APPENDIX B

CHRONOLOGY

B. Chronology

This appendix lists chronologically the routine licensing correspondence between the U.S. Nuclear Regulatory Commission (NRC or the Commission) staff and NextEra Energy Point Beach, LLC (NextEra). This appendix also lists other correspondence under Point Beach Nuclear Plant, Units 1 and 2 (Point Beach or PBN) Docket Nos. 50-266 and 50-301 related to the staff's review of the Point Beach 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
11/16/2020	ML20329A293	Point Beach Nuclear Plant, Units 1 and 2 (Point Beach) - Application for Subsequent Renewed Facility Operating Licenses
12/22/2020	ML20328A075	NRC, Point Beach Nuclear Plant, Units 1 and 2 – Receipt and Availability of the Subsequent License Renewal Application
01/15/2021	ML21006A427	NRC, Point Beach Nuclear Plant, Units 1 and 2 – Determination of Acceptability and Sufficiency for Docketing, Proposed Review Schedule, and Notice of Opportunity to Request a Hearing Regarding the NextEra Energy Point Peach, LLC Application for License Renewal (EPID No. L-2020-SLR-0002)
01/15/2021	ML21005A058	NRC, Point Beach Nuclear Plant, Units 1 and 2 – Subsequent License Renewal Application Online Reference Portal (EPID No. L-2020- SLR-0002)
01/15/2021	ML21007A260	NRC, Point Beach Nuclear Plant, Units 1 and 2 – Aging Management Audit Plan Regarding the Subsequent License Renewal Application Review
03/21/2021	ML21036A217	NRC, U.S. Nuclear Regulatory Commission Approval of NextEra Energy Point Beach, LLC's Request for Withholding Information from Public Disclosure, Regarding the Application for Subsequent License Renewal of Point Beach Nuclear Plant, Units 1 and 2 (EPID No. L-2020-SLR-0002)
04/21/2021	ML21111A155	Point Beach – Subsequent License Renewal Application – Aging Management Supplement 1
05/06/2021	ML21126A239	Point Beach – Subsequent License Renewal Application – Aging Management Supplement 2
05/27/2021	ML21147A115	Point Beach – Subsequent License Renewal Application – Aging Management Supplement 3
06/01/2021	ML21148A116	Point Beach SLRA June 3, 2021, Public Meeting Summary Discussion Questions
06/10/2021	ML21161A112	NRC, Point Beach Nuclear Plant, Units 1 and 2 (PBN) Subsequent License Renewal Application (SLRA) Requests for Additional Information (RAIs) and Requests for Confirmation of Information (RCIS) Safety – Set 1 – Aging Management of Irradiated Concrete and Steel Reactor Vessel Supports

Date	ADAMS Accession No.	Subject
06/28/2021	ML21172A235	Email from Hector Rodriguez-Luccioni (NRC) to Robert Coffey, Point Beach SLRA Draft Safety RAIs Set 2
07/08/2021	ML21189A173	Point Beach Nuclear Plant, Units 1 and 2 – Subsequent License Renewal Application – Aging Management Requests for Confirmation of/Additional Information (RCI/RAI) Set 1 Responses
07/13/2021	ML21208A185	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Final Safety RAIs Set 2
07/20/2021	ML21214A070	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Draft Safety RAIs Set 3
07/26/2021	ML21207A066	Point Beach – Subsequent License Renewal Application – Aging Management Supplement 3 Revision 1
07/27/2021	ML21214A082	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Final Safety RAIs Set 3
08/02/2021	ML21237A004	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Draft Safety RAIs Set 4
08/02/2021	ML21214A043	NRC, Point Beach SLRA June 30, 2021, Audit Teleconference Topics
08/04/2021	ML21238A224	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Final Safety RAIs Set 4
08/05/2021	ML21242A198	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Draft Safety RAIs Set 5
08/09/2021	ML21242A208	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Draft Safety RAIs Set 6
08/11/2021	ML21223A308	Point Beach Nuclear Plant, Units 1 and 2 – Subsequent License Renewal Application – Aging Management Requests for Additional Information (RAI) Set 2 Responses
08/12/2021	ML21242A202	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Final Safety RAIs Set 3 Point Beach SLRA Final Safety RAIs Set 5
08/12/2021	ML21242A014	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Final Safety RAIs Set 3 Point Beach SLRA Final Safety RAIs Set 6
08/13/2021	ML21242A212	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Draft Safety RAIs Set 4 Point Beach SLRA Draft Safety RAIs Set 7
08/16/2021	ML21208A447	NRC, Point Beach Nuclear Plant, Units 1 and 2 – Report for the Aging Management Audit Regarding the Subsequent License Renewal Application Review (EPID No. L-2020-SLR-0002)
08/20/2021	ML21242A218	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Final Safety RAIs Set 7
08/23/2021	ML21242A221	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Draft Safety RAIs Set 8
08/25/2021	ML21237A055	Point Beach, Units 1 and 2 -Subsequent License Renewal Application – Aging Management Requests for Confirmation of/Additional Information (RCI/RAI) Set 3 Responses
08/26/2021	ML21242A246 ML21242A247	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Final Safety RAIs Set 8
08/27/2021	ML21214A151	NRC, Point Beach Nuclear Plant, Units 1 and 2, Subsequent License Renewal Application – Summary of June 3, 2021, Public Meeting on Proposed Aging Management Activities of Irradiated Concrete and Steel Reactor Vessel Supports

Date	ADAMS Accession No.	Subject
08/27/221	ML21214A165	NRC, Point Beach Nuclear Plant, Units 1 and 2, Subsequent License Renewal Application – Summary of June 30, 2021, Public Meeting on Proposed Aging Management of Reactor Vessel Internals
08/30/2021	ML21242A230	Point Beach, Subsequent License Renewal Application – Aging Management Requests for Additional Information (RAI) Set 4 Responses
09/10/2021	ML21253A138	Point Beach Nuclear Plant, Units 1 and 2, Submittal of Subsequent License Renewal Application – Aging Management Requests for Confirmation of/Additional Information (RCI/RAI) Set 1 Responses Supplement 1
09/10/2021	ML21253A140	Point Beach Nuclear Plant Units 1 and 2, L-2021-157 Subsequent License Renewal Application - Aging Management Requests for Additional Information (RAI) Set 6 Responses
09/13/2021	ML21256A129	Point Beach Nuclear Plant, Units 1 and 2, Subsequent License Renewal Application - Aging Management Requests for Additional Information Set 5 Responses
09/16/2021	ML21259A153	Point Beach Nuclear Plant, Units 1 and 2 – Subsequent License Renewal Application – Aging Management Requests for Additional Information (RAI) Set 8 Responses
09/20/2021	ML21263A052	Point Beach Nuclear Plant, Units 1 and 2, Subsequent License Renewal Application – Aging Management Requirement for Additional Information Set 7, Response
09/29/2021	ML21273A022 ML21273A023	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Final Safety RAIs Set 9
10/01/2021	ML21274A053	NextEra Energy Point Beach, LLC - Subsequent License Renewal Application - Aging Management Request for Additional Information (RAI) Set 9 Response
10/05/2021	ML21286A603 ML21286A604	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Final Safety RAIs Set 10
10/14/2021	ML21287A085 ML21287A086	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Final Safety RAIs Set 11
10/25/2021	ML21298A090	Point Beach Nuclear Plant Units 1 and 2 - Subsequent License Renewal Application - Aging Management Requests for Additional Information (RAI) Set 11 Response
10/25/2021	ML21295A029	Point Beach Subsequent License Renewal Application 9-2-21 Public Meeting Summary
11/03/2021	ML21307A286	Subsequent License Renewal Application - Aging Management Requests for Additional Information (RAI) Set 2 Responses Revision 1
11/04/2021	ML21308A283	Subsequent License Renewal Application - Aging Management Requests for Additional Information (RAI) Set 9 Response Supplement 1
11/04/2021	ML21308A282	Point Beach Nuclear Plant Units 1 and 2 – Subsequent License Renewal Application – Aging Management Requests for Additional Information (RAI) Set 10 Responses
11/10/2021	ML21312A519	Point Beach Nuclear Plant, Units 1 And 2, Subsequent License Renewal Application - Summary of October 19, 2021, Public Meeting on Proposed Aging Management Activities
11/10/2021	ML21312A520	Point Beach Proprietary Determination Letter SLRA Safety RAIs Set 1 Response
11/16/2021	ML21341A610 ML21341A611	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Final Safety RAIs Set 12

Date	ADAMS Accession No.	Subject
11/19/2021	ML21327A033	Point Beach Nuclear Plant Units 1 and 2, Subsequent License Renewal Application - Aging Management Requests for Additional Information (RAI) Set 10 Responses Supplement 1
11/30/2021	ML21334A293	Point Beach Nuclear Plant - Subsequent License Renewal Application - First Annual Update
12/15/2021	ML21362A670 ML21362A671	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Final Safety RAIs Set 13
12/17/2021	ML21362A681 ML21362A682	NRC, Email from Bill Rogers (NRC) to Robert Coffey, Point Beach SLRA Final Safety RAIs Set 14
01/06/2022	ML22006A046	Point Beach Nuclear Plant Units 1 and 2 - Subsequent License Renewal Application Aging Management Requests for Additional Information (RAI) Set 14 Response
01/06/2022	ML22006A074	Point Beach Nuclear Plant, Units 1 and 2, Subsequent License Renewal Application - Aging Management Request for Additional Information Set 13 Response
02/11/2022	ML22020A281	Point Beach Nuclear Plant, Units 1 And 2, Subsequent License Renewal Application - Summary of December 2, 2021, Public Meeting on Proposed Aging Management Activities

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 Guilloty	Reviewer—Mechanical and Materials
Bloom, Steve	Management Oversight
Bradford, Anna	Management Oversight
Buford, Angela	Management Oversight
Caldwell, Robert (Bob)	Management Oversight
Chien, Nan	Reviewer—Mechanical and Materials
Colaccino, Joseph	Management Oversight
Collins, Jay	Reviewer—Mechanical and Materials
Davis, Robert	Reviewer—Mechanical and Materials
Dijamco, David	Reviewer—Mechanical and Materials
Fairbanks, Carolyn	Reviewer—Mechanical and Materials
Forsaty, Fred	Reviewer—Neutron Fluence
Fu, Bart	Reviewer—Mechanical and Materials
Fuentes, Luis	Reviewer—Structural
Gardner, William (Tony)	Reviewer—Mechanical and Materials
Gavula, James	Reviewer—Mechanical and Materials
Gibson, Lauren	Management Oversight
Heller, Kevin	Reviewer—Nuclear
Hiser, Allen	Senior Technical Advisor
Iqbal, Naeem	Reviewer—Scoping and Screening Methodology
Istar, Ata	Reviewer—Structural
Jenkins, Joel	Reviewer—Mechanical and Materials
Johnson, Andrew	Reviewer—Mechanical and Materials
Johnston, Jeanne	Management Oversight
Johnson, Marieliz	Project Manager
Jones, Steve	Reviewer—Mechanical and Materials
Kalikian, Roger	Reviewer—Mechanical and Materials
Karipineni, Nageswara	Reviewer—Mechanical and Materials
Klein, Paul	Reviewer—Mechanical and Materials
Krepel, Scott	Management Oversight
Lehman, Bryce	Reviewer—Structural
López, Juan	Reviewer—Structural
Lukes, Robert	Management Oversight
Makar, Gregory	Reviewer—Mechanical and Materials
McConnel, Matthew	Review—Electrical
Medoff, James	Reviewer—Mechanical and Materials
Min, Seung	Reviewer—Mechanical and Materials
Mitchell, Jeffrey	Special Assistant

Name	Area of Responsibility
Mitchell, Matthew (Matt)	Management Oversight
Nguyen, Duc	Reviewer—Electrical
Prinaris, Andrew	Reviewer—Structural
Reichelt, Eric	Reviewer—Mechanical and Materials
Rezai, A	Reviewer—Mechanical and Materials
Rogers, Bill	Project Manager; Reviewer—Scoping and Screening Methodology
Sadollah, Mohammad (Mo)	Reviewer—Electrical
Scully, Derek	Reviewer—Mechanical and Materials
Smith, Brian	Management Oversight
Terry, Leslie	Reviewer—Mechanical and Materials
Thomas, George	Reviewer—Structural
Tsao, John	Reviewer—Mechanical and Materials
Vettori, Robert	Reviewer—Fire Protection
Wang, George	Reviewer—Structural
Wagage, Henry	Reviewer—Mechanical and Materials
Wittick, Brian	Management Oversight
Xi, Zuhan	Reviewer—Structural
Yoder, Matthew	Reviewer—Chemical
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 Point Beach Nuclear Plant, Units 1 and 2 subsequent license renewal application.

Table D-1 References

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