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

Safety Evaluation Report

Related to the License Renewal of Comanche Peak Nuclear Power Plant, Units 1 and 2

Docket Nos. 50-445 and 50-446

Vistra Operations Company LLC

Issued: March 2024

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 Comanche Peak (CPNPP), Units 1 and 2 license renewal application (LRA).

CPNPP is located in Glen Rose, TX. The NRC issued the initial operating licenses on April 17, 1990, for Unit 1, and April 6, 1993, for Unit 2. Units 1 and 2 are four-loop, pressurized water-reactor Nuclear Steam Supply System supplied by Westinghouse Electric Corporation with a license thermal power of 3,612 megawatts thermal each.

Vistra Operations Company LLC (Vistra or the applicant), by letter dated October 3, 2022 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML22297A247), as supplemented, submitted an application for license renewal for CPNPP. Vistra requested renewal for a period of 20 years beyond the current expiration at midnight on February 8, 2030, for Unit 1 (Renewed Facility Operating License No. NPF-87) and at midnight on February 2, 2033, for Unit 2 (Renewed Facility Operating License No. NPF-89).

This SE documents the NRC staff's technical review of information submitted by Vistra through January 31, 2024. On the basis of the review of the LRA, the NRC staff determined that Vistra has met the requirements of Title 10 of the *Code of Federal Regulations* Section 54.29(a).

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ACRONYM LIST

(10 CFR)	Title 10 of the Code of Federal Regulations
AC	Alternative current
ACRS	Advisory Committee on Reactor Safeguards
ADAMS	Agencywide Documents Access and Management System
AEA	Atomic Energy Act
AERM	Aging effect requiring management
AMP	Aging management programs
AMR	Aging management review
AMSAC	ATWS mitigation system actuation circuitry
ARC	Alternate repair criteria
ART	Adjusted reference temperature
ASME	American Society of Mechanical Engineers
ASR	Alkali-silica reaction
ASTM	American Society for Testing and Materials
ATWS	Anticipated transient without scram
AVB	Anti-vibration bar
B&W	Babcock and Wilcox
BFB	Baffle-former bolts
BWR	Boiling Water Reactor
CASS	Cast austenitic stainless steel
CLB	Current licensing basis
CMAA	Crane Manufacturers Association of America
CPNPP	Comanche Peak Nuclear Power Plant
CRDM	Control rod drive mechanism
CST	Condensate storage tank
CUF	Cumulative usage factor
CUI	Corrosion under insulation
DBA	Design-basis accidents
DBD	Design-basis documents
DBE	Design-basis event
DDFP	Diesel driven fire pump
DFOST	Diesel fuel oil storage tanks
DMW	Dissimilar metal welds
EAF	Environmentally assisted fatigue
ECCS	Emergency core cooling system
EDG	Emergency diesel generator
EFPM	Effective full-power months
EFPY	Effective full-power years
EIC	Electrical instrumentation and control
EPR	Ethylene Propylene Rubber
EPRI	Electric Power Research Institute
EQ	Environmental qualification

ESF	Engineered safety feature
ESFAS	Engineered Safety Features Actuation System
FCG	Fatigue crack growth
FD	Flow diagrams
FIV	Flow-induced vibration
FP	Fire protection
FPS	Fire Protection System
FSAR	Final safety analysis report
FWST	Fire water storage tank
GALL	Generic Aging Lessons Learned
GEIS	Generic Environmental Impact Statement for License Renewal of Nuclear Plants
HELB	High-energy line break
I&C	Instrumentation and control
IEEE	Institute of Electrical and Electronics Engineers
IGSCC	Intergranular stress corrosion cracking
INPO	Institute of Nuclear Power Operations
IPA	Integrated plant assessment
ISBA	In-scope bounding approach
ISG	Interim staff guidance
ISI	Inservice inspection
LBB	Leak-before-break
LEFM	Leading edge flow-meter
LER	Licensee Event Reports
LR	License renewal
LRA	License renewal application
LRBD	License renewal boundary drawings
LTOP	Low temperature overpressure protection
LWR	Light Water Reactor
MEB	Metal enclosed bus
MEL	Master Equipment List
MIC	Microbiologically influenced corrosion
MR	Maintenance Rule
NACE	National Associated of Corrosion Engineers
NEPA	National Environmental Policy Act of 1969
NNS	Non-nuclear safety-related
NRC	Nuclear Regulatory Commission
NSR	Nonsafety-related
NSSS	Nuclear steam supply system
OBE	Operating basis earthquake
OE	Operating experience
P&ID	Piping and instrumentation diagrams
PA	Protected area
PDR	Public Document Room
PEO	Period of extended operation

PM	Preventive maintenances
PTLR	Pressure-temperature limit report
PTS	Pressurized thermal shock
PWR	Pressurized water reactor
PWROG	Pressurized Water Reactor Owners Group
QA	Quality assurance
RAI	Requests for additional information
RCB	Reactor containment building
RCI	Requests for confirmation of information
RCP	Reactor coolant pump
RCS	Reactor coolant system
RCSC	Research Council on Structural Connections
RG	Regulatory Guide
RHR	Residual heat removal
RIC	Recurring internal corrosion
RMWST	Reactor makeup water storage tank
RPV	Reactor pressure vessel
RT_{NDT}	Nil-ductility transition reference temperature
RT_{PTS}	Reference temperature for pressurized thermal shock
RTD	Resistance temperature detectors
RTS	Reactor Trip System
RV	Reactor vessel
RVI	Reactor vessel internal
RWST	Refueling water storage tank
SBO	Station blackout
SC	Structures and components
SCC	Stress corrosion cracking
SE	Safety evaluation
SER	Safety evaluation reports
SFP	Spent fuel pool
SFS	Spent Fuel Pool Cooling and Cleanup System
SG	Steam generator
SI	Safety injection
SLR	Subsequent license renewal
SLRA	Subsequent license renewal applications
SSC	Systems, structures, and components
SSE	Safe shutdown earthquake
SSI	Safe shutdown impoundment
SSW	Secondary Shield Wall
SWIS	Service Water Intake Structure
TB	Turbine building
TLAA	Time-limited aging analyses
TRM	Technical requirements manual
TRMB	Technical requirements manual bases
TS	Technical Specifications

TSB	Technical Specifications bases
TSP	Tube support plate
UFSAR	Updated final safety analysis report
USE	Upper-shelf energy
UT	Ultrasonic testing
WPS	Waste processing system

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 license renewal application (LRA) for Comanche Peak Nuclear Power Plant, Units 1 and 2 (Comanche Peak or the applicant), as filed by Vistra Operations Company LLC (Vistra or the applicant), by letter dated October 3, 2022, (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML22297A247).

Vistra's application seeks to renew Comanche Peak Renewed Facility Operating License Nos. NPF-87 and NPF-89 for an additional 20 years beyond the current expiration of their licenses on February 8, 2030, for Unit 1, and February 2, 2033, for Unit 2. The staff performed a safety review of Vistra'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." The NRC project manager for the LRA review is Mr. Mark Yoo, who can be contacted by email at Mark.Yoo@nrc.gov.

Comanche Peak is located in Glen Rose, TX. Units 1 and 2 are four-loop, pressurized water-reactor (PWR) Nuclear Steam Supply System supplied by Westinghouse Electric Corporation. Both units were each originally licensed and operated at 3,411 megawatts thermal (MWt). In 1999, Unit 2 was uprated to 3445 MWt through the use of leading edge flow-meter (LEFM) technology. In 2001, both units were uprated to 3458 MWt using LEFM technology. In 2008, both units were uprated to 3612 MWt as a result of a Stretch Power Uprate, which was a 4.5 percent increase from the previous uprate. The NRC issued the initial operating licenses on April 17, 1990, for Unit 1, and April 6, 1993, for Unit 2. The initial operating licenses for Units 1 and 2 expire on February 8, 2030, and February 2, 2033, respectively. The Comanche Peak final safety analysis report (FSAR) describes the plant and the site (ML22277A832).

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 Comanche Peak license renewal is based on Vistra's LRA, the NRC staff's audits, responses to the staff's requests for additional information (RAIs), and response to the staff's requests for confirmation of information (RCIs). Vistra 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 31, 2024.

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

This SE summarizes the results of the staff's safety review of the LRA and describes the technical details the staff considered in evaluating the safety aspects of the units' proposed operation for an additional 20 years beyond the term of the initial operating licenses. The staff reviewed the LRA in accordance with NRC regulations and the guidance in NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), dated December 2010 (ML103490036).

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

SE Appendix A, "License Renewal Commitments," contains a table showing Vistra's commitments for renewal of the operating licenses. SE Appendix B, "Chronology," contains a chronology of the principal correspondence between the staff and the applicant, as well as other relevant correspondence, regarding the LRA review. SE Appendix C contains a list of principal contributors to the SE, and Appendix D 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 period of extended operation. There are no limitations in the AEA or NRC regulations limiting the number of times a license may be renewed.

In 1982, the NRC staff anticipated interest in license renewal and held a workshop on nuclear power plant aging. This workshop led the NRC to establish a comprehensive program plan for nuclear plant aging research. From the results of that research, a technical review group concluded that many aging phenomena are readily manageable and pose no technical issues that would prevent life extension for nuclear power plants. In 1986, the NRC staff published a request for comment on a policy statement intended to address major policy, technical, and procedural issues related to license renewal for nuclear power plants.

In 1991, the NRC published what it called the License Renewal Rule as 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," (see Volume 56, page 64943, of the *Federal Register* (56 *Federal Register* (FR) 64943), dated December 13, 1991). After publication of this original License Renewal Rule, the staff participated in an industry-sponsored demonstration program to apply 10 CFR Part 54 to a pilot plant and to gain experience to develop implementation guidance. To establish a scope of review for license renewal, the original 10 CFR Part 54 License Renewal Rule defined age-related degradation unique to license renewal; however, during the industry-sponsored demonstration program on the pilot plant, the NRC staff found that adverse aging effects on plant systems and components are also managed during the period of initial license and that the scope of the license renewal review did not allow sufficient credit for these management programs. In particular, the original 10 CFR Part 54 License Renewal Rule did not sufficiently credit the implementation of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," for regulating management of plant-aging phenomena. As a result of this finding, the NRC amended 10 CFR Part 54 on May 8, 1995 (60 FR 22461). Amended 10 CFR Part 54 establishes a regulatory process that is simpler, more stable, and more predictable than the original 10 CFR Part 54 regulatory process. In particular, the amended License Renewal Rule at 10 CFR Part 54 focuses on the management of adverse aging effects rather than on the identification of age-related degradation unique to license renewal. The NRC made these rule changes to ensure that important systems, structures, and components (SSCs) will continue to perform their intended functions during the period of extended operation. In addition, the amended 10 CFR Part 54 clarifies and simplifies the integrated plant assessment process to be consistent with the revised focus on passive, long-lived structures and components.

Concurrent with these initiatives, the NRC pursued a separate rulemaking effort to focus the scope of the environmental review of license renewal (61 FR 28467, June 5, 1996). This resulted in a rule entitled "Environmental Review for Renewal of Nuclear Power Plant Operating Licenses," which amended 10 CFR Part 51 and describes the NRC staff's responsibilities under the National Environmental Policy Act of 1969 (NEPA) with respect to license renewals.

1.2.1 Safety Review

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

License renewal requirements for power reactors (applicable to both initial and SLR) 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 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:

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

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

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

    (iii) The capability to prevent or mitigate the consequences of accidents 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.

(2) All non-safety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of any of the functions identified in paragraphs (a)(1)(i), (ii), or (iii) of [§ 54.4(a)].

(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, environmental qualification, pressurized thermal shock, anticipated transients without scram, and station blackout (SBO).

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), 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 regulations throughout the period of extended operation.

As required by 10 CFR 54.21(d), an LRA must include an FSAR 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 also requires TLAA identification and updating. Section 54.3 of 10 CFR, "Definitions," establishes 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 LRA, Vistra stated that it used the process defined in NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report" (GALL-LR Report), dated December 2010 (ML103490041), which summarizes staff-approved aging management programs (AMPs) for many SCs subject to an AMR. If an applicant commits to implementing these staff-approved AMPs, the time, effort, and resources for LRA review can be greatly reduced, improving the efficiency and effectiveness of the LRA review process. The GALL-LR 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 applicants and staff reviewers on AMPs and activities that can manage aging adequately during the period of extended operation.

1.2.2 Environmental Review

Part 51 of 10 CFR contains the NRC's regulations implementing the requirements of NEPA, as amended. In December 1996, the 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 10 CFR Part 51. 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).

In June 2013, the NRC staff issued a final rule (78 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. 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 staff reviewed the Comanche Peak plant-specific environmental impacts of LRA, including any new and significant information that was not considered in the GEIS. As part of its scoping process, the staff held public scoping meetings, one via webinar on January 17, 2023 (ML23009A036), and one in person on February 23, 2023 (ML23046A080), to assist the staff in identifying plant-specific environmental issues. The staff issued an environmental scoping summary report on October 17, 2023, which included the comments received during the scoping process and the staff's responses to those comments (ML23289A201).

On October 31, 2023, the staff issued the draft, Comanche Peak-specific GEIS Supplement 60 (ML23299A252), which documents the results of the NRC staff's environmental review and makes a preliminary recommendation on Comanche Peak license renewal based on environmental considerations. The staff will consider comments received from members of the public and local, State, Federal, and Tribal governmental entities. After considering comments on the draft, the staff will publish the final, Comanche Peak-specific GEIS Supplement 60 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 staff's technical review of the LRA 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 Part 54 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), the NRC requires a license renewal applicant to submit general information as specified in 10 CFR 50.22(a) through (e), (h), and (i), which Vistra provided in LRA Section 1. The staff reviewed LRA Section 1 and finds that Vistra has submitted the required information.

Section 54.19(b) requires that the LRA 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, Vistra stated in LRA Section 1.1.8:

> 10 CFR 54.19(b) requires that LRAs include "conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license." The current Indemnity Agreement B-96 for [Comanche Peak Nuclear Power Plant] state in Article VII that the Agreement shall terminate at the time of expiration of the license specified in Item 3 of the Attachment (to the Agreement). Item 3 of the Attachment to the Indemnity Agreement, as revised through Amendment No. 14 (References ML17129A024 and ML17276A337), lists CPNPP operating license numbers NPF-87 and NPF-89. Vistra OpCo has reviewed the original Indemnity Agreement and the Amendments. Neither Article VII nor Item 3 of the Attachment specifies an expiration date for operating license numbers NPF-87 and NPF-89. Therefore, no changes to the Indemnity Agreement are deemed necessary as part of this application. Should the license numbers be changed by NRC upon issuance of the renewed licenses, Vistra OpCo requests that NRC amend the Indemnity Agreement to include conforming changes to Item 3 of the Attachment and other affected sections of the Agreement.

The staff intends to maintain the original license numbers upon issuance of the renewed licenses, if approved. Therefore, conforming changes to the indemnity agreement need not be made and the 10 CFR 54.19(b) requirements have been met.

Paragraph 54.21 of 10 CFR, "Contents of Application—Technical Information," requires that the LRA contain (a) an integrated plant assessment, (b) a description of any CLB changes during the staff's review of the LRA, (c) an evaluation of TLAAs, and (d) a UFSAR supplement. LRA Sections 3 and 4 and Appendix B address the license renewal requirements of 10 CFR 54.21(a), (b), and (c). LRA Appendix A satisfies the license renewal requirements of 10 CFR 54.21(d).

Section 54.21(b) requires that, each year following submittal of the LRA and at least 3 months before the scheduled completion of the staff's review, the applicant submit an LRA amendment identifying any CLB changes that materially affect the contents of the LRA, including the UFSAR supplement. By letter dated October 17, 2023 (ML23290A273), Vistra submitted an LRA update that summarizes the CLB changes that have occurred during the staff's review of the LRA. This submission satisfies 10 CFR 54.21(b) requirements.

Section 54.22, "Contents of Application—Technical Specifications," requires that the LRA include any changes or additions to the technical specifications (TS) that are necessary to manage aging effects during the period of extended operation. In LRA Appendix D, Vistra states that it had not identified any TS changes necessary for issuance of the renewed operating licenses. This statement adequately addresses the 10 CFR 54.22 requirement.

The staff evaluated the technical information required by 10 CFR 54.21 and 10 CFR 54.22 in accordance with NRC regulations and SRP-LR guidance. SE Sections 2, 3, and 4 document the staff's evaluations of the LRA 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 staff's LRA 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 unnecessary 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-LR and GALL-LR 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	SER Section(s)
LR-ISG-2011-01 (ML12286A275)	Aging Management of Stainless Steel Structures and Components in Treated Borated Water, Revision 1	3.0.3.1.6 3.0.3.2.3
LR-ISG-2011-02 (ML11297A085)	Aging Management Program for Steam Generators	3.0.3.2.7
LR-ISG-2011-03 (ML12138A296)	Generic Aging Lessons Learned (GALL) Report Revision 2 AMP XI.M41, "Buried and Underground Piping and Tanks"	3.0.3.
LR-ISG-2011-05 (ML12044A215)	Ongoing Review of Operating Experience	3.0.5
LR-ISG-2012-01 (ML12352A057)	Wall Thinning Due to Erosion Mechanisms	3.0.3.2.5
LR-ISG-2012-02 (ML13227A361)	Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation	3.0.3.1.10 3.0.3.2.16
LR-ISG-2013-01 (ML14225A059)	Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	3.0.3.2.20
LR-ISG-2015-01 (ML15308A018)	Changes to Buried and Underground Piping and Tank Recommendations	3.0.3.2.19
LR-ISG-2016-01 (ML16237A383)	Changes to Aging Management Guidance for Various Steam Generator Components	3.0.3.2.7
SLR-ISG-2021-01-PWRVI (ML20181A395)	Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized-Water Reactors	3.0.3.1.5

1.5 Summary of Open Items

An item is considered open if the staff has not determined in its judgement that an item meets all applicable regulatory requirements at the time of the issuance of this SE. After reviewing the Comanche Peak LRA, including additional information Vistra submitted through January 31, 2024, the staff has determined that no open items exist that require a formal response from Vistra.

1.6 Summary of Confirmatory Items

An item is considered confirmatory if, in the staff's judgment, the staff and the applicant have reached an acceptable resolution that meets all applicable regulatory requirements but at the time of the issuance of this SE, the staff had not received the necessary documentation to confirm the resolution. After reviewing the Comanche Peak LRA, including additional information Vistra submitted through January 31, 2024, the staff has determined that no confirmatory items exist that require a formal response from Vistra.

1.7 Summary of License Conditions

After reviewing the LRA, including additional information and clarifications from Vistra submitted or provided through January 31, 2024, the NRC staff deemed two license conditions appropriate and necessary:

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

2) The second license condition requires Vistra to complete future activities described in the FSAR supplement before the beginning of the period of extended operation. Vistra must complete these activities no later than 6 months before the beginning of the 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 each license renewal application (LRA) to include an integrated plant assessment (IPA). The IPA must be applied to those systems, structures, and components (SSCs) within the scope of license renewal, as delineated in 10 CFR 54.4, “Scope,” and identify and list those structures and components (SCs) subject to an aging management review (AMR).

LRA Section 2.1, “Scoping and Screening Methodology,” describes the scoping and screening methodology used to identify the SSCs at Comanche Peak Nuclear Power Plant, Units 1 and 2 (Comanche Peak or CPNPP), within the scope of license renewal and the SCs subject to an AMR. The U.S. Nuclear Regulatory Commission (NRC) staff reviewed the scoping and screening methodology of Vistra Operations Company, LLC (Vistra or the applicant), to determine whether it meets the scoping requirements of 10 CFR 54.4(a) and the screening requirements of 10 CFR 54.21.

In developing the scoping and screening methodology for the LRA, the applicant stated that it considered 10 CFR Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants” (the Rule), and the guidance in Nuclear Energy Institute (NEI) 95-10, Revision 6, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54—The License Renewal Rule,” issued June 2005. The use of NEI 95-10 has been endorsed by Regulatory Guide (RG) 1.188, Revision 2, “Standard Format and Content for Applications to Renew Nuclear Plant Operating Licenses,” issued April 2020.

2.1.2 Summary of Technical Information in the Application

In LRA Section 2, “Scoping and Screening Methodology for Identifying Structures and Components Subject to AMR, and Implementation Results,” and Section 3, “Aging Management Review Results,” the applicant provided the technical information required by 10 CFR 54.4 and 10 CFR 54.21(a). This safety evaluation (SE) contains sections entitled “Summary of Technical Information in the Application,” which provide information taken directly from the LRA.

In LRA Section 2.1, the applicant described the process used to identify the SSCs that meet the license renewal scoping criteria under 10 CFR 54.4(a) and the process used to identify the SCs that are subject to an AMR, as required by 10 CFR 54.21(a)(1). The applicant provided the results of the process used for identifying the SCs subject an AMR in the following LRA sections:

- Section 2.2, “Plant Level Scoping Results”
- Section 2.3, “Scoping and Screening Results: Mechanical Systems”
- Section 2.4, “Scoping and Screening Results: Structures”
- Section 2.5, “Scoping and Screening Results: Electrical”

2.1.3 Scoping and Screening Program Review

The staff evaluated the LRA scoping and screening methodology in accordance with the guidance contained in Section 2.1, "Scoping and Screening Methodology," of NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," issued December 2010 (SRP-LR). The following regulations form the basis for the acceptance criteria for the staff's scoping and screening methodology review:

- 10 CFR 54.4(a), as it relates to the identification of plant 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)(1) and 10 CFR 54.21(a)(2), as they relate to the methods used by the applicant to identify plant SCs subject to an AMR

As part of the review of the applicant's scoping and screening methodology, the staff reviewed the activities described in the following sections of the LRA using the guidance contained in the SRP-LR:

- Section 2.1, to ensure that the applicant described a process for identifying SCs that are within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a)
- Section 2.2, to ensure that the applicant described a process for determining the SCs that are subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1) and 10 CFR 54.21(a)(2)

In addition, the staff conducted a scoping and screening methodology audit at CPNPP from March 20–22, 2023. The audit focused on ensuring that the applicant had developed and implemented adequate guidance to conduct the scoping and screening of SSCs in accordance with the methodologies described in the LRA and the requirements of the Rule.

The staff evaluated the quality attributes of the applicant's aging management program activities described in Appendix A, "Final Safety Analysis Report Supplement," and Appendix B, "Aging Management Programs," to the LRA.

The purpose of the staff's review was to ensure that the applicant had appropriately implemented the methodology outlined in the administrative controls and to verify that the results are consistent with the current licensing basis (CLB) documentation.

2.1.3.1 Implementation Procedures and Documentation Sources for Scoping and Screening

The staff reviewed the applicant's scoping and screening implementing procedures, as documented in the Scoping and Screening Methodology Audit Summary, dated August 9, 2023 (ML23172A136), to verify that the process used to identify SCs subject to an AMR was consistent with the SRP-LR. Additionally, the staff reviewed the scope of CLB documentation sources and the process used by the applicant to ensure that applicant's commitments, as documented in the CLB and relative to the requirements of 10 CFR 54.4 and 10 CFR 54.21, were appropriately considered and that the applicant adequately implemented its procedural guidance during the scoping and screening process.

2.1.3.1.1 Summary of Technical Information in the Application

In LRA Section 2.1, the applicant addressed the following information sources for the license renewal scoping and screening process:

- Final Safety Analysis Report (FSAR)
- Fire Protection Report (FPR)
- Master Equipment List (MEL)
- Maintenance Rule (MR) Database
- Engineering drawings
- Design-basis documents (DBDs)
- NRC SE, safety evaluation reports (SERs), and supplements pertaining to Comanche Peak licensing submittals
- Licensing correspondence such as relief requests, Licensee Event Reports (LERs), and responses to NRC communications such as NRC inspection and enforcement Bulletins, generic letters, or enforcement actions
- License renewal technical reports
- NRC interim staff guidance

2.1.3.1.2 Staff Evaluation

Scoping and Screening Implementing Procedures. The staff reviewed the applicant's scoping and screening methodology implementing procedures, including license renewal guidelines, documents, and reports, as documented in the audit report, to ensure the guidance is consistent with the requirements of the Rule, the SRP-LR, and RG 1.188, Revision 2. The staff finds that the overall process used to implement the 10 CFR Part 54 requirements described in the implementing procedures and AMRs is consistent with the Rule, the SRP-LR, and industry guidance.

The staff confirmed that the applicant's implementing procedures contain guidance for determining plant SSCs within the scope of the Rule and for determining those SCs within the scope of license renewal that are subject to an AMR. During the review of the implementing procedures, the staff focused on the consistency of the detailed procedural guidance with information in the LRA, including the implementation of staff positions documented in the SRP-LR, and the information in the applicant's Supplement 2 to the LRA, dated April 24, 2023 (ML23114A377).

After reviewing the LRA, supporting documentation, and the applicant's supplement, the staff determined that the scoping and screening methodology instructions are consistent with the methodology description provided in LRA Section 2.1. The applicant's methodology is sufficiently detailed to provide concise guidance on the scoping and screening implementation process to be followed during the LRA activities.

Sources of CLB Information. The staff reviewed the scope and depth of the applicant's CLB review to verify that the applicant's methodology is sufficiently comprehensive to identify SSCs within the scope of the license renewal, as well as SCs requiring an AMR. Pursuant to 10 CFR 54.3(a), the CLB is 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 that are docketed and in effect. The CLB includes applicable NRC regulations, orders, license conditions, exemptions, technical specifications, and design-basis information (documented in the most recent FSAR). The CLB also includes licensee 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 SEs, SERs, or LERs.

During the audit, the staff reviewed pertinent information sources used by the applicant, including the FSAR, design-basis information, and license renewal drawings. The staff confirmed that the applicant's license renewal process identified additional sources of plant information pertinent to the scoping and screening process, including technical correspondence with the NRC, analyses, and reports. The staff further confirmed that the applicant's detailed license renewal program guidelines specified the use of the CLB source information in developing scoping evaluations.

During the audit, the staff reviewed the applicant's administrative controls for the license renewal database, design-basis information, and other information sources used to verify system information. These controls are described, and implementation is governed, by plant administrative procedures. Based on a review of the administrative controls, and a sample of the system classification information contained in the applicable Comanche Peak documentation, the staff concludes that the applicant has established adequate measures to control the integrity and reliability of Comanche Peak system identification and safety classification data.

Therefore, the staff concludes that the information sources used by the applicant during the scoping and screening process provided a sufficiently controlled source of system and component data to support scoping and screening evaluations.

During the staff's review of the applicant's CLB evaluation process, the applicant explained the incorporation of updates to the CLB and the process used to ensure those updates are adequately incorporated into the license renewal database and license renewal documents. The staff determined that LRA Section 2.1 provided a description of the CLB and related documents used during the scoping and screening process that is consistent with the guidance contained in the SRP-LR.

In addition, the staff reviewed the implementing procedures and results reports used to support identification of SSCs that the applicant relied on to demonstrate compliance with the safety-related, non-safety-related (NSR), and regulated events criteria pursuant to 10 CFR 54.4(a). The staff determined that the applicant's license renewal program guidelines list the documents used to support scoping and screening evaluations. The staff finds these documentation sources to be useful for ensuring that the initial scope of SSCs identified by the applicant was consistent with the plant's CLB.

2.1.3.1.3 Conclusion

On the basis of its review of LRA Section 2.1, the detailed scoping and screening implementing procedures, and the results from the scoping and screening audit, the staff concludes that the applicant's scoping and screening methodology considers CLB information in a manner consistent with the Rule, the SRP-LR, and NEI 95-10 guidance as endorsed in RG 1.188, Revision 2, and therefore is acceptable.

2.1.3.2 Quality Controls Applied to License Renewal Application Development

2.1.3.2.1 Staff Evaluation

The staff reviewed the quality controls used by the applicant to ensure that scoping and screening methodologies used to develop the LRA were adequately implemented. The applicant implemented the following quality control processes during LRA development:

- using corporate and industry license renewal experience to guide LRA development, performing associated activities using qualified and experienced personnel, and assigning document reviewers based on subject matter expertise
- developing the LRA following NRC-endorsed guidance, applicable industry standards, and Comanche Peak instructions and guidelines
- validating the LRA content with source documents by license renewal project leads
- using a controlled and validated license renewal database for scoping and screening
- using the Corrective Actions Program to report discrepancies in the plant equipment database and drawings

During the scoping and screening methodology audit, the staff reviewed the applicant's written procedures and quality control records and determined that the applicant had developed adequate procedures to control LRA development and assess the results of the activities.

2.1.3.2.2 Conclusion

On the basis of its review of pertinent LRA development procedures and guidance, discussion with the applicant's license renewal personnel, and review of the applicant's documentation of the activities performed to assess the quality of the LRA, the staff concludes that the applicant's quality assurance activities provide assurance that LRA development activities were performed in accordance with the applicant's license renewal program requirements, the Rule, and NRC guidance.

2.1.3.3 Training

2.1.3.3.1 Staff Evaluation

The staff reviewed the applicant's training process to ensure the guidelines and methodology for the scoping and screening activities were applied in a consistent and appropriate manner. As outlined in its implementing procedures, the applicant requires training for personnel participating in the development of the LRA. The activities conducted by the applicant included the following:

- training and qualification of personnel preparing, verifying, and approving license renewal documents in accordance with documented instructions
- assigning experienced plant personnel augmented with contracted personnel with license renewal experience to the License Renewal Project Team
- using orientation, computer-based training, activity performance, and observation to accomplish training

During the scoping and screening methodology audit, the staff reviewed the applicant's written procedures and, on a sampling basis, reviewed completed qualification and training records and completed checklists for a sample of the applicant's license renewal personnel. The staff determined that the applicant developed and implemented adequate procedures to control the training of personnel performing LRA activities.

2.1.3.3.2 Conclusion

On the basis of discussions with the applicant's license renewal project personnel responsible for the scoping and screening process and its review of selected documentation, the staff concludes that the applicant's personnel were adequately trained and qualified to implement the scoping and screening methodology described in the applicant's implementing procedures and the LRA and as consistent with the Rule and NRC guidance.

2.1.3.4 Scoping and Screening Program Review Conclusion

On the basis of a review of information provided in LRA Section 2.1, a review of the applicant's scoping and screening implementing procedures, discussions with the applicant's license renewal personnel, review of the quality controls applied to LRA development, training of personnel participating in LRA development, and the results from the scoping and screening methodology audit, the staff concludes that the applicant's Scoping and Screening Program is consistent with the SRP-LR and the requirements of 10 CFR Part 54 and, therefore, is acceptable.

2.1.4 Plant Systems, Structures, and Components Scoping Methodology

LRA Section 2.1 describes the applicant's methodology used to scope SSCs pursuant to the requirements of 10 CFR 54.4(a). The LRA states that the scoping process examined all SSCs with respect to license renewal. According to the LRA, SSCs were evaluated against criteria provided in 10 CFR 54.4(a)(1), 10 CFR 54.4(a)(2), and 10 CFR 54.4(a)(3) to determine whether the SSCs should be considered within the scope of license renewal. The LRA states that the scoping process identified the following SSCs:

- SSCs that are safety related and perform or support an intended function for responding to a design-basis event (DBE)
- SSCs that are NSR but their failure could prevent satisfactory accomplishment of a safety-related function
- SSCs that support a specific requirement for one of the five regulated events applicable to license renewal

LRA Section 2.1 states that the scoping methodology used at Comanche Peak is consistent with 10 CFR Part 54 and with the industry guidance contained in NEI 95-10.

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

2.1.4.1.1 Summary of Technical Information in the Application

LRA Section 2.1.5.1, "Nuclear Safety Related—10 CFR 54.4(a)(1)," states, in part, the following:

> In accordance with 10 CFR 54.4(a)(1), the SSCs within the scope of LR [license renewal] include:
>
> > *Safety-related systems, structures, and components, which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49 (b)(1)) to ensure the following functions—*
> >
> > *(i) The integrity of the reactor coolant pressure boundary;*
> >
> > *(ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or*
> >
> > *(iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in §50.34(a)(1), §50.67(b)(2), or §100.11 of this chapter, as applicable.*
>
> The CPNPP definitions of nuclear safety-related and safety-related SSCs (which are synonymous at CPNPP) do not address the exposure guidelines referred to in 10 CFR 50.67(b)(2).
>
> Section 50.67(b) reads,
>
> > *(1) A licensee who seeks to revise its current accident source term in design-basis radiological consequence analyses shall apply for a license amendment under §50.90. The application shall contain an evaluation of the consequences of applicable design-basis accidents previously analyzed in the safety analysis report…*
>
> CPNPP has retained its original accident source term in radiological consequence analyses and the offsite dose limits discussed in Subpart A of 10 CFR 100 are applicable to CPNPP, whereas a revised accident source term is not. Furthermore, 10 CFR 50.34(a)(1)(i) is applicable to CPNPP as the construction permit was issued before January 10, 1997. 10 CFR 50.34(a)(1)(i) indicates "special attention should be directed to the site evaluation factors in part 100 of this chapter" (10 CFR Part 50). Therefore, the extent to which these limits affect the CPNPP definitions of nuclear safety-related and safety-related (SR) SSCs are consistent with the definition of a SR SSC in 10 CFR 54.4(a)(1) and with the definition of DBEs in 10 CFR 50.49(b)(1).
>
> Fluid system components important to safety are classified in accordance with the American National Standards Institute (ANSI) N18.2-1973, Nuclear Safety Criteria for the Design of Stationary PWR Plants classification except as

> described below. This [fluid system component] classification system is compatible with requirements of NRC RG 1.26 and is submitted as an alternate acceptable method of meeting the intent of NRC RG 1.26.
>
> The plant structures, Reactor Coolant System, engineered safety features, and safety-related systems and components are identified and classified in accordance with the seismic requirements of General Design Criterion 2 of Appendix A to 10 CFR Part 50, General Design Criteria for Nuclear Power Plants. NRC RG 1.29 designates those structures, systems, and components which must remain functional during the safe shutdown earthquake as Seismic Category I items.
>
> Mechanical systems with components that perform a safety function are classified as nuclear safety-related, meet 10 CFR 54.4(a)(1), and are included in the scope of LR. Likewise, Seismic Category I structures meet the 10 CFR 54.4(a)(1) criteria and are in the scope of LR. EIC [electrical instrumentation and control] systems, and EIC portions of other systems, are included withing the scope of LR under an ISBA [in-scope bounding approach] as described in Section 2.1.1.
>
> Safety functions that are the basis for including an SSC in-scope are identified by reviewing the FSAR, DBDs, engineering drawings, the MR [Maintenance Rule] basis document, and other CLB and design documents.

2.1.4.1.2 Staff Evaluation

Pursuant to 10 CFR 54.4(a)(1), the applicant must consider all safety-related SSCs relied upon to remain functional following DBEs:

- the integrity of the reactor coolant pressure boundary
- the capability to shut down the reactor and maintain it in a safe-shutdown condition
- the capability to prevent or mitigate the consequences of accidents that could result in potential offsite radiological exposures comparable to those referred to in 10 CFR 50.34(a)(1), 10 CFR 50.65(b)(2), or 10 CFR 100.11, “Determination of exclusion area, low population zone, and population center distance,” as applicable

With regard to identification of DBEs, Section 2.1.3, “Review Procedures,” of the SRP-LR states, in part, the following:

> The set of [DBEs] as defined in the rule is not limited to Chapter 15 (or equivalent) of the UFSAR [updated final safety analysis report]. … 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] (as defined in 10 CFR 50.49(b)(1)) to ensure the functions described in 10 CFR 54.4(a)(1).

During the audit, the staff reviewed the applicant's basis documents, which described all design-basis conditions in the CLB and addressed all events defined in 10 CFR 50.49(b)(1) and 10 CFR 54.4(a)(1). The applicant stated that it evaluated the types of events listed in NEI 95-10 (i.e., anticipated operation occurrences, design-basis accidents (DBAs), external events, and natural phenomena) that were applicable to Comanche Peak. The staff determined that the Comanche Peak FSAR and basis documents discussed events such as internal and external flooding, tornadoes, and missiles. The staff concludes that the applicant's evaluation of DBEs was consistent with the SRP-LR.

The staff reviewed the applicant's implementing procedures governing its evaluation of safety-related SSCs and sampled the applicant's reports of the scoping results to ensure that the applicant applied the methodology in accordance with the implementing procedures. In addition, the staff discussed the methodology and results with the applicant's personnel who were responsible for these evaluations. The staff determined that the applicant performed scoping of SSCs for the 10 CFR 54.4(a)(1) criterion in accordance with its license renewal implementing procedures, which provide guidance for the preparation, review, verification, and approval of the scoping evaluations to ensure the adequacy of the results of the scoping process.

The staff reviewed the applicant's evaluation of the Rule and CLB definition pertaining to 10 CFR 54.4(a)(1). The staff determined that the Comanche Peak CLB definition of safety related met the definition of safety related specified in the Rule. The staff confirmed that the applicant had identified and used pertinent engineering and licensing information to identify the SSCs required to be within the scope of license renewal in accordance with the 10 CFR 54.4(a)(1) criteria.

2.1.4.1.3 Conclusion

On the basis of its review of the LRA, review of systems (on a sampling basis), discussions with the applicant, and review of the applicant's scoping process, the staff concludes that the applicant's methodology for identifying safety-related SSCs relied upon to remain functional during and following DBEs is consistent with the SRP-LR and 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

LRA Section 2.1.5.2, "Non-Nuclear Safety-related Affecting Nuclear Safety-related—10 CFR 54.4(a)(2)," states, in part, the following:

> In accordance with 10 CFR 54.4(a)(2), the SSCs within the scope of LR include:
>
> - *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 this section.*
>
> This scoping criterion required an assessment of non-nuclear safety-related (NNS) SSCs with respect to the following categories:

- Functional support for nuclear safety-related SSC 10 CFR 54.4(a)(1) functions
- Connected to and provide structural support for nuclear safety-related SSCs
- Potential for spatial interactions with nuclear safety-related SSCs

Each of these categories is discussed below:

Functional Support for Nuclear Safety-related SSC 10 CFR 54.4(a)(1) Functions

At CPNPP, non-structural SSCs that perform a function that supports a safety function are classified as nuclear safety-related, with few exceptions.

SSCs that are NNS and in-scope per 10 CFR 54.4(a)(2) with a function credited in the CLB include the protective (mitigative) features installed in Seismic Category I structures to protect nuclear safety-related SSCs from (external or internal) flooding, tornadoes, or pipe ruptures or excess temperatures that might occur, or in non-seismic structures to prevent/mitigate flooding of adjacent Seismic Category I structures. These mitigative features are NNS commodities and have a credited function described in the FSAR, such as:

- Tornado protection design features including tornado vents,
- Watertight doors, water stops, curbs, stop gates and sumps for flood protection,
- Missile barriers inside and outside Containment (RCB [reactor containment building]),
- High-energy line break (HELB), moderate energy line break/crack (MELB/MELC) barrier and shield and pipe whip restraints; as well as,
- Insulation on components in nuclear safety-related and engineered safety feature pump rooms credited for the heat removal capability of area room coolers during pump operation, and
- Insulation on Reactor Coolant System piping and in high temperature penetration assemblies that are implicitly credited with maintaining Containment and biological shield wall local concrete temperatures at acceptable levels.

Connected to and Provide Structural Support for Nuclear Safety-related SSCs

NNS piping and process tubing directly connected to (and providing structural support for) nuclear safety-related piping and components satisfy the 10 CFR 54.4(a)(2) criterion and are in the scope of LR up to and including the first seismic restraint, which provide restraint in each of the three orthogonal (X/Y/Z) directions beyond the nuclear safety-related/NNS interface (safety class extension), or in limited instances to equivalent anchor (such as a wall penetration, large equipment connection or a series of supports).

Potential for Spatial Interactions with Nuclear Safety-related SSCs

Spatial interactions can occur downstream of nuclear safety-related/NNS interfaces or between nuclear safety-related and NNS SSCs with the same vicinity. Spatial interactions may include physical impact, pipe whip, jet impingement, spray, flooding, or harsh environments such as caused by HELB. Spatial interactions may also include spray or leakage, such as caused by MELB/C or leakage from low energy SSCs.

Physical Impact

This category concerns potential spatial interaction of NNS SSCs falling on or otherwise physical impacting nuclear safety-related SSCs such that safety functions may not be accomplished.

Flooding, Pipe Whip, Jet Impingement, or Harsh Environments

The buildings that house high-energy lines whose failure could impact nuclear safety-related components included Auxiliary, Containment, Electrical and Control, and Safeguards Buildings. High-energy lines located outdoors in the vicinity of these buildings are also included. The high-energy lines located in the non-seismic turbine building (TB) are attached to a Seismic Category I structure and also meet the 10 CFR 54.4(a)(2) criterion. It was shown by analysis to remain undamaged by the non-seismic building, structures, and components during a seismic event, as described in FSAR Section 3.7B.2.8.

High-energy systems are fluid systems that, during normal plant conditions, are either in operation or maintained pressurized under conditions where either or both of the following are met:

1. Maximum operating temperature exceeds (>) 200°F [Fahrenheit],

2. Maximum operating pressure exceeds (>) 275 pounds per square inch gauge (psig).

Spray or Leakage

Moderate and low energy systems have the potential for spatial interactions of spray and leakage (NEI 95-10 Appendix F). NNS systems and NNS portions of nuclear safety-related systems with the potential for spray or leakage that could prevent nuclear safety-related SSCs from performing their required safety function are in the scope of LR per 10 CFR 54.4(a)(2).

Spaces Approach to Address Potential Spatial Interactions

The review for potential age-related spatial interactions utilizes a “spaces” approach for license renewal scoping of liquid or steam-filled NNS systems or NNS portions of nonsafety-related (NSR) systems with the potential for spatial interactions with NSR SSCs. This approach is consistent with other recent applicants for LR or subsequent license renewal and focuses on the interactions between NNS and NSR SSCs that are located in the same space.

A “space” is defined as a room, cubicle or area that is separated from other spaces by substantial objects (such as wall, floors, or ceilings). Areas and rooms within the same building and elevation are considered a “space” unless it is verified that configuration and mitigative features are sufficient to limit communication between areas/rooms or to lower elevations via pipe routing, cable routing, vents, etc.

2.1.4.2.2 Staff Evaluation

Pursuant to 10 CFR 54.4(a)(2), the applicant must consider all NSR SSCs whose failure could prevent the satisfactory accomplishment of any of the following functions:

- the integrity of the reactor coolant pressure boundary
- the capability to shut down the reactor and maintain it in a safe-shutdown condition
- 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

RG 1.188, Revision 2, endorses the use of NEI 95-10, Revision 6. NEI 95-10 discusses the staff’s position on the 10 CFR 54.4(a)(2) scoping criteria to include NSR SSCs that may have the potential to prevent satisfactory accomplishments of safety-related intended functions as follows: consideration of missiles, cranes, flooding, and HELBs; NSR SSCs connected to safety-related SSCs; NSR SSCs in proximity to safety-related SSCs; and mitigative and preventive options related to NSR and safety-related SSC interactions.

In addition, the staff’s position (as discussed in SRP-LR Section 2.1.3.1.2) is that applicants need not consider hypothetical failures but, rather, should base their evaluation on the plant’s CLB, engineering judgment and analyses, and relevant operating experience. NEI 95-10 further describes operating experience as all documented plant-specific and industrywide experience that can be used to determine the plausibility of a failure. The staff reviewed LRA Section 2.1.2.2, in which the applicant described the scoping methodology for NSR SSCs pursuant to 10 CFR 54.4(a)(2). In addition, the staff reviewed the applicant’s implementing document and results report, which documented the guidance and corresponding results of the applicant’s scoping review pursuant to 10 CFR 54.4(a)(2).

<u>Non-Safety-Related SSCs Required to Perform a Function that Supports a Safety-Related SSC</u>

The staff reviewed the evaluating criteria discussed in LRA Section 2.1.5.2 and the applicant’s 10 CFR 54.4(a)(2) implementing document. The staff determined that the applicant included in the license renewal scope NSR SSCs required to remain functional to support a safety-related function in accordance with 10 CFR 54.4(a)(2). The staff confirmed that the applicant reviewed the FSAR, plant drawings, the plant equipment database, and other CLB documents to identify the NSR systems and structures that function to support a safety-related system whose failure could prevent the performance of a safety-related intended function. The staff further confirmed that the applicant also considered missiles, overhead handling systems, internal and external flooding, and HELBs. Accordingly, the staff finds that the applicant implemented an acceptable method for including NSR systems that performed functions that support safety-related intended functions within the scope of license renewal, as required by 10 CFR 54.4(a)(2).

Non-Safety-Related SSCs Directly Connected to Safety-Related SSCs

The staff confirmed that the applicant has included NSR SSCs directly connected to safety-related SSCs within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The staff determined that the applicant reviewed the safety-to-NSR interfaces for each mechanical system in order to identify the NSR components located between the safety-to-NSR interface and the license renewal structural boundary.

The staff determined that in order to identify the NSR SSCs connected to safety-related SSCs that are required to be structurally sound to maintain the integrity of the safety-related SSCs, the applicant used a combination of the following items to identify the portion of NSR piping systems to include within the scope of license renewal:

- seismic anchors
- equivalent anchors, as defined in the Comanche Peak FSAR
- bounding conditions described in NEI 95-10, Revision 6, Appendix F (base-mounted component, flexible connection, inclusion to the free end of NSR piping, or inclusion of the entire piping run)

Non-Safety-Related SSCs with the Potential for Spatial Interaction with Safety-Related SSCs

The staff confirmed that the applicant has included NSR SSCs with the potential for spatial interaction with safety-related SSCs within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The staff determined that the applicant considered physical impacts (pipe whip, jet impingement), harsh environments, flooding, spray, and leakage when evaluating the potential for spatial interactions between NSR systems and safety-related SSCs. The staff further confirmed that the applicant used a preventive, spaces approach to identify the portions of NSR systems with the potential for spatial interaction with safety-related SSCs. The staff noted that the applicant's spaces approach focused on the interaction between NSR and safety-related SSCs that are located in the same space, which was defined for the purposes of the review as a structure containing active or passive safety-related SSCs.

The staff reviewed the applicant's CLB information—primarily contained in the FSAR—related to missiles, crane load drops, flooding, and HELBs. The staff noted that LRA Section 2.1.5.2 and the applicant's implementing document state that the applicant included mitigative features when considering the impact of NSR SSCs on safety-related SSCs for occurrences discussed in the CLB. The staff determined that the applicant also considered the features designed to protect safety-related SSCs from the effects of these occurrences through the use of mitigating features such as floor drains and curbs. The staff confirmed that the applicant included the mitigating features within the scope of license renewal, in accordance with 10 CFR 54.4(a)(2).

LRA Section 2.1.5.2 and the applicant's implementing document state that the applicant used a preventive approach that considered the impact of NSR SSCs contained in the same space as safety-related SSCs. The staff determined that the applicant evaluated all NSR SSCs containing liquid or steam and located in spaces containing safety-related SSCs. The applicant used a spaces approach to identify the NSR SSCs that were located within the same space as safety-related SSCs. As described in LRA Section 2.1.5.2, and for the purpose of the scoping review, a space was defined as a structure containing active or passive safety-related SSCs. In addition, the staff determined that, following the identification of the applicable mechanical systems, the applicant identified its corresponding structures for potential spatial interaction, based on a review of the CLB and plant walkdown. NSR systems and components that contain liquid or steam and are located inside structures that contain safety-related SSCs were included within the scope of license renewal, unless they were evaluated and determined not to contain safety-related SSCs. The staff also determined that, based on plant and industry operating experience, the applicant excluded the NSR SSCs containing air or gas from the scope of license renewal, with the exception of portions that are attached to safety-related SSCs and required for structural support.

Based on its review of the LRA, the results of the scoping and screening methodology audit, and the applicant's supplement to the LRA dated April 24, 2023 (ML23114A377), the staff confirmed that fluid-filled NSR SSCs in proximity to safety-related SSCs and whose failure could potentially prevent accomplishment of a safety function were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

2.1.4.2.3 Conclusion

On the basis of its review of the LRA, review of the applicant's scoping process, discussions with the applicant, and review of the information provided in the applicant's supplement to the LRA, the staff concludes that the applicant's methodology for identifying and including NSR SSCs that could affect the performance of safety-related SSCs within the scope of license renewal is consistent with the scoping criteria of 10 CFR 54.4(a)(2) and, therefore, is 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

LRA Section 2.1.5.3, "Regulated Events—10 CFR 54.4(a)(3)," states, in part, the following:

> The scope of LR includes those SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for FP [fire protection] (10 CFR 50.48), EQ [environmental qualification] (10 CFR 50.49), PTS [pressurized thermal shock] (10 CFR 50.61), ATWS [anticipated transient without scram] (10 CFR 50.62), and SBO [station blackout] (10 CFR 50.63). This section discusses the approach used to identify the systems and structures within the scope of LR based on this criterion. The systems and structures that perform intended functions in support of these regulated events are identified in the system/structure descriptions in Section 2.3, 2.4, and 2.5.
>
> **Fire Protection**
>
> Criterion 10 CFR 54.4(a)(3) requires that all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for FP (10 CFR 50.48) are included within the scope of LR.

The systems and structures required for the FP program to comply with the requirements of 10 CFR 50.48 include:

- Systems and structures required to demonstrate post-fire safe shutdown capabilities.
- Systems and structures required for fire detection and suppression.
- Systems and structures required to meet commitments made to Appendix A of Branch Technical Position (BTP) APCSB 9.5-1.

NRC guidance, including NUREG-0800 Section 9.5.1, Appendix B states that the scope of 10 CFR 50.48 goes beyond the protection of nuclear safety-related equipment, and also includes Fire Protection SSCs needed to minimize the effects of a fire and to prevent the release of radioactive material to the environment.

FSAR Section 9.5.1 references the Fire Protection Report for the description of the Fire Protection Systems and Fire Protection program. The Fire Protection program has been developed to satisfy the requirements of 10 CFR Part 50 and BTP APCSB 9.5-1, Appendix A, and to meet Sections III.G, J, L or O of 10 CFR Part 50 Appendix R.

Environmental Qualification

Criterion 10 CFR 54.4(a)(3) requires that all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for Environmental Qualification (10 CFR 50.49) be included within the scope of LR.

As described in the CPNPP Seismic and Environmental Qualification administrative procedure, equipment located in a potentially harsh environment that is Class 1E equipment, certain non-Class 1E, electrical equipment, and certain Non-1E RG 1.97 instrumentation which are required to function during or following the DBEs are subject to Environmental Qualification. The CPNPP Maximo Equipment List administrative procedure controls the maintenance of the list of EQ components contained within the MEL. Components identified as Environmental Qualification in the MEL satisfy the 10 CFR 54.4(a)(3) criterion and are included within the scope of LR.

Pressurized Thermal Shock

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

PTS is a potential PWR event or transient causing vessel failure due to severe overcooling (thermal shock) concurrent with, or followed by, significant pressure in the reactor vessel (RV). The requirements in 10 CFR 50.61 include specific operations limits for PTS pertaining to the beltline region of the RV.

The only system currently relied upon to meet the PTS regulation is the reactor coolant system, which contains the RV. There are no electrical systems or structures relied upon to meet the PTS regulation.

Structures providing support, shelter or protection to equipment meeting the criterion of 10 CFR 54.4(a)(3) based on the requirements of 10 CFR 50.61 are within the scope of LR based on 10 CFR 54.4(a)(3). Section 2.4 contains the results of the scoping review for the CPNPP structures.

Anticipated Transient Without Scram

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

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

In response to NRC requirements, CPNPP Unit 1 and Unit 2 include ATWS mitigation system actuation circuitry (AMSAC), described in Section 7.8 of the FSAR. The AMSAC System for each unit provides backup to the Reactor Trip System (RTS) and Engineered Safety Features Actuation System (ESFAS) for initiating turbine trip and auxiliary feedwater flow in the event of an anticipated transient. The AMSAC System is independent of and diverse from the RTS and the ESFAS with the exception of the analog steam generator level and turbine first stage pressure inputs, and the final actuation devices. It is a highly reliable, microprocessor-based, NSR circuitry system.

Station Blackout

Criterion 10 CFR 54.4(a)(3) requires that all SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for SBO (10 CFR 50.63) be included within the scope of LR.

A SBO event is a complete loss of alternative current (AC) electric power to the essential and nonessential switchgear buses in a nuclear power plant (i.e., loss of the offsite electric power system concurrent with generator trip and unavailability of the onside emergency AC power sources). SBO does not include the loss of available AC power to buses fed by station batteries through inverters or by alternate AC sources, nor does it assume a concurrent single failure or DBA. The objective of this requirement is to assure that nuclear power plants are capable of withstanding a SBO and maintaining adequate reactor core cooling and appropriate containment integrity for a required duration.

CPNPP capabilities, commitments and analyses that demonstrate compliance with 10 CFR 50.63 are documented in NRC SEs, SERs, and correspondence related to the SBO Rule, as well as the SBO DBD. CPNPP has developed a four-hour AC independent coping approach to address the requirements of 10 CFR 50.63; however, credit is taken for the operation of selected nuclear safety related systems which are common to Units 1 and 2.

2.1.4.3.2 Staff Evaluation

The staff reviewed the applicant's approach to identifying SSCs, in accordance with 10 CFR 54.4(a)(3), that are relied on to perform functions that demonstrate compliance with the requirements of the NRC regulations regarding fire protection, Environmental Qualification, ATWS, PTA, and SBO. As part of this review, the staff performed the following:

- discussed the applicant's methodology
- reviewed the boundary drawings
- reviewed license renewal technical reports associated with the five regulated events
- reviewed the LRA for the development and approach taken to complete the scoping process for these regulated safety systems
- evaluated SSCs (on a sampling basis) included within the scope of license renewal pursuant to 10 CFR 54.4(a)(3)

The staff confirmed that the applicant's implementing procedures were used for identifying SSCs within the scope of license renewal pursuant to 10 CFR 54.4(a)(3). The staff further confirmed that the applicant evaluated the CLB and other documents to identify SSCs that perform functions addressed in 10 CFR 54.4(a)(3) and included these SSCs within the scope of license renewal, as documented in the specific Comanche Peak regulated event license renewal technical reports. The staff determined that these technical report results appropriately reference the information used for determining the SSCs credited for compliance with the events listed in the specified regulations for the applicable license renewal regulated events.

Fire Protection. The staff reviewed the documents, including the FSAR and the Comanche Peak fire protection-related DBDs. The staff also reviewed the fire protection scoping and screening report in conjunction with the LRA and the CLB information to validate the methodology for including the appropriate SSCs within the scope of license renewal. The staff determined that the applicant's fire protection scoping document appropriately identified SSCs within the scope of license renewal required for fire protection. The applicant used CLB documents, primarily FSAR Section 9.5.1, "Fire Protection Program," to identify the SSCs within the scope of license renewal for fire protection. The staff further determined that the applicant's scoping included SSCs that perform intended functions to meet the requirements of 10 CFR 50.48, "Fire protection." Based on its review, the staff determined that the applicant's scoping methodology was adequate for including SSCs credited in performing fire protection functions within the scope of 10 CFR 54.4.

Environmental Qualification. The staff reviewed the LRA, implementing procedures, and the Environmental Qualification scoping and screening report to verify that the applicant identified SSCs within the scope of license renewal that meet Environmental Qualification requirements. The staff confirmed that the applicant's Environmental Qualification scoping and screening report required the inclusion of safety-related electrical equipment; NSR electrical equipment whose failure under postulated environmental conditions could prevent satisfactory accomplishment of the safety functions of the safety-related equipment; and certain post-accident monitoring equipment, as defined in 10 CFR 50.49(b)(1), 10 CFR 50.49(b)(2), and 10 CFR 50.49(b)(3). The staff determined that the applicant used the CLB, as described in FSAR Section 3.11, as well as its Environmental Qualification DBD to identify SSCs necessary to meet the requirements of 10 CFR 50.49, “Environmental qualification of electric equipment important to safety for nuclear power plants.” The Comanche Peak Harsh Environment Equipment List contains the Environmental Qualification identifications for specific components. The staff further determined that the applicant’s scoping methodology was adequate for identifying Environmental Qualification SSCs within the scope of 10 CFR 54.4.

<u>PTS</u>. The staff confirmed that the applicant’s PTS scoping and screening report included the applicant’s scoping methodology that used CLB information to develop the LRA to comply with 10 CFR 50.61, “Fracture toughness requirements for protection against pressurized thermal shock events,” which resulted in the reactor vessel beltline components being within the scope of license renewal pursuant to 10 CFR 54.4(a)(3). The staff determined that the methodology applied was appropriate for identifying SSCs with functions credited for complying with the PTS regulation and within the scope of license renewal. The staff finds that the scoping results included the SSCs that perform intended functions to meet the requirements of 10 CFR 50.61. The staff determined that the applicant’s scoping methodology was adequate for including SSCs credited in meeting PTS requirements within the scope of 10 CFR 54.4.

<u>ATWS</u>. The staff determined that the applicant’s ATWS scoping and screening report included the plant systems credited for ATWS mitigation based on review of the CLB and FSAR Section 7.8.3.1, “Anticipated Transient without Scram,” and Section 15.8, “Anticipated Transients Without Scram.” The staff reviewed these documents and the LRA in conjunction with the scoping results to confirm the methodology for identifying ATWS SSCs that are within the scope of license renewal. The staff determined that the scoping results included SSCs that perform intended functions meeting the requirements in 10 CFR 50.62, “Requirements for reduction of risk from anticipated transients without scram (ATWS) events for light-water-cooled nuclear power plants.” The staff further determined that the applicant’s scoping methodology was adequate for identifying SSCs with functions credited for complying with the ATWS regulation within the scope of 10 CFR 54.4.

<u>SBO</u>. The staff reviewed relevant documents and the LRA, in conjunction with the scoping results, to confirm the applicant’s SBO methodology. The staff determined that the applicant’s SBO scoping and screening report included SSCs from the CLB that the applicant identified were associated with coping and safe shutdown of the plant following an SBO event by reviewing FSAR Section 8.4, “Station Blackout,” and plant procedures. The staff finds that the scoping results included SSCs that perform intended functions meeting the requirements in 10 CFR 50.63, “Loss of all alternating current power.” The staff determined that the applicant’s scoping methodology was adequate for identifying SSCs credited in complying with the SBO regulations within the scope of 10 CFR 54.4.

2.1.4.3.3 Conclusion

On the basis of its review of the LRA, review of samples, discussions with the applicant, and review of the implementing procedures and reports, the staff concludes that the applicant’s methodology for identifying SSCs relied upon to remain functional during regulated events meets the scoping criteria pursuant to 10 CFR 54.4(a)(3) and, therefore, is acceptable.

2.1.4.4 Plant-Level Scoping of Systems and Structures

2.1.4.4.1 Summary of Technical Information in the Application

<u>System and Structure Level Scoping</u>. LRA Section 2.1.1, “Scoping and Screening Methodology, Introduction,” states, in part, the following:

> The initial step in the scoping process was to define the entire plant in terms of systems and structures. Each of these systems and structures were evaluated against the scoping criteria in 10 CFR 54.4(a)(1), (a)(2), and (a)(3) to determine if the system or structure should be considered in the scope of LR. The intended functions(s) that are the basis for including each system and structure within the scope of LR were also identified.

The application then gives a flowchart of the scoping and screening processes used for mechanical systems, structures, and EIC systems.

LRA Section 2.1.5, “Scoping Procedure,” states, in part, the following:

> The scoping process is the systematic process used to identify the CPNPP systems and structures within the scope of the LR rule. The scoping process was performed at the system and structure level, in accordance with the scoping criteria identified in 10 CFR 54.4(a). Bases for determining if a system or structure is in the scope of LR, the intended functions, were identified from a review of the pertinent CLB and design documents. System and structure scoping evaluations are documented and have been retained in the CPNPP LR technical reports.
>
> The CPNPP scoping process began with the development of a comprehensive list of plant systems and structures as described in LR technical reports. These systems and structures were grouped into the following categories to support further evaluation and the screening process:
>
> - Reactor Vessel, Internals, and Reactor Coolant System
> - Engineered Safety Features
> - Auxiliary Systems
> - Steam and Power Conversion Systems
> - Containments Structures, and Component Supports
> - Electrical, Instrumentation and Control Systems
>
> Each CPNPP system was then evaluated to determine if it fell within the scope of LR, using the criteria of 10 CFR 54.4(a).

LRA Section 2.1.5.4, “System and Structure Intended Functions,” states, in part, the following:

> For the systems and structures within the scope of LR, the intended functions that are the bases for including them within the scope are identified and documented in the scoping evaluation. The system and structure intended functions are based on the applicable CLB and other reference documents or drawings. The component-level intended functions are the passive component functions that are necessary to support the system or structure intended functions.

LRA Section 2.1.5.5, “Scoping Boundary Determination,” states, in part, the following:

> Systems and structures that are included within the scope of LR are further evaluated to determine the population of in-scope mechanical and structural components.

2.1.4.4.2 Staff Evaluation

The staff reviewed the applicant’s methodology for performing the scoping of plant SSCs to ensure that it was consistent with 10 CFR 54.4. The staff confirmed that the methodology used to determine the SSCs within the scope of license renewal was documented in implementing procedures and scoping results reports for systems. The staff further confirmed that the scoping process defined the plant in terms of systems and structures. Specifically, the implementing procedures identified the systems and structures that are subject to 10 CFR 54.4 review, described the processes for capturing the results of the review, and were used to determine whether the system or structure performed intended functions consistent with the criteria of 10 CFR 54.4(a). The process was completed for all systems and structures to ensure that the entire plant was addressed.

The staff determined that the applicant documented the results of the plant-level scoping process in accordance with the implementing documents. The systems and structures documents and reports provided the results, including the following information:

- description of the structure or system
- listing of functions performed by the system or structure
- identification of intended functions
- 10 CFR 54.4(a) scoping criteria met by the system or structure references
- basis for the classification of the system or structure intended functions

During the audit, the staff reviewed a sampling of the documents and reports and concluded that the applicant’s scoping results contained an appropriate level of detail to document the scoping process.

2.1.4.4.3 Conclusion

On the basis of its review of the LRA, site guidance documents, and a sampling of system scoping results during the audit, the staff concludes that the applicant’s methodology for identifying SSCs within the scope of license renewal, and their intended functions, is consistent with the requirements of 10 CFR 54.4 and, therefore, is acceptable.

2.1.4.5 Mechanical Scoping

2.1.4.5.1 Summary of Technical Information in the Application

LRA Section 2.1.5.5 states, in part, that for mechanical systems, mechanical components that support the system-intended functions are included within the scope of license renewal and are depicted on the applicable system flow diagrams. The applicant stated that mechanical system flow diagrams were highlighted to create license renewal boundary drawings (LRBDs) showing the in-scope components that are subject to AMR. The applicant further stated that a computer sort and download of associated system components from the CPNPP MEL confirms the scope of components in the system.

2.1.4.5.2 Staff Evaluation

The staff evaluated LRA Section 2.1.5 and the guidance in the implementing procedures and reports to perform the review of the mechanical scoping process. The staff noted that the applicant's project documents and reports contain instructions for identifying the evaluation boundaries. The staff reviewed the implementing documents and CLB documents associated with mechanical system scoping. The staff determined that this guidance and CLB source information were acceptable to identify mechanical components and support structures in mechanical systems that are within the scope of license renewal. The staff discussed the scoping process with the applicant's license renewal project personnel and reviewed relevant documentation during the scoping and screening methodology audit. The staff assessed whether the applicant applied the scoping methodology outlined in the LRA and implementing procedures and whether the scoping results were consistent with CLB requirements. The staff determined that the applicant's procedure was consistent with the description provided in LRA Section 2.1.5 and the guidance contained in SRP-LR Section 2.1 and was implemented adequately.

The staff also reviewed the implementing procedures and discussed the methodology and results with the applicant. The staff verified that the applicant identified and used pertinent engineering and licensing information to determine the mechanical component types required to be within the scope of license renewal. As part of the review process, the staff evaluated each system's intended function, the basis for inclusion of the intended function, and the process used to identify each of the system component types. The staff verified that the applicant identified and highlighted system piping and instrumentation diagrams (P&IDs) to develop the license renewal boundaries in accordance with the procedural guidance. Additionally, the staff determined that the applicant independently verified the results in accordance with the governing procedures. The staff confirmed that the applicant had license renewal personnel knowledgeable about the system, and that these personnel performed independent reviews of the marked-up drawings to ensure accurate identification of system-intended functions. The staff also confirmed that the applicant performed additional cross-discipline verification and independent reviews of the resultant highlighted drawings before final approval of the scoping effort.

2.1.4.5.3 Conclusion

On the basis of its review of the LRA, scoping implementing procedures, and a sampling of mechanical scoping results, the staff concludes that the applicant's methodology for identifying mechanical SSCs within the scope of license renewal is in accordance with the requirements of 10 CFR 54.4 and, therefore, is acceptable.

2.1.4.6 Structural Scoping

2.1.4.6.1 Summary of Technical Information in the Application

LRA Section 2.1.5.5 states, in part, that the structural components required to support the intended function(s), as described in the CLB, are included within the scope of license renewal. The applicant stated that the structural components are identified from a review of applicable information sources in LRA Section 2.1.2, which includes plant design drawings of the structure. The applicant reviewed component listings from the CPNPP MEL to determine structure-level intended functions. The applicant also evaluated components such as structural bolting required to support the structure. The applicant further evaluated structural bolting supporting the intended function of a component support, or a bulk commodity with the component support or bulk commodity. The applicant stated that a site plan layout drawing is highlighted for CPNPP to create an LRBD showing the structures within the scope of license renewal.

2.1.4.6.2 Staff Evaluation

The staff evaluated LRA Section 2.1.5 implementing procedures and guidelines and scoping and screening reports to perform the review of the structural scoping process. The staff confirmed that the license renewal procedures and guidelines contain instructions for identifying the evaluation boundaries. The staff reviewed the applicant's approach to identifying structures relied upon to perform the functions described in 10 CFR 54.4(a). As part of this review, the staff discussed the methodology with the applicant, reviewed the documentation developed to support the review, and evaluated the scoping results for a sample of structures that were identified as within the scope of license renewal. The staff determined that the applicant had identified and developed a list of plant structures and the structures' intended functions through a review of the plant equipment database, FSAR, drawings, and walkdowns. The staff determined that each structure the applicant identified was evaluated against the criteria of 10 CFR 54.4(a)(1), 10 CFR 54.4(a)(2), and 10 CFR 54.4(a)(3).

During the audit, the staff reviewed CLB information, drawings, and implementing procedures to verify the adequacy of the methodology for identifying structures meeting the scoping criteria as defined in the Rule. The staff discussed the methodology and results with the applicant. In addition, the staff reviewed, on a sampling basis, the applicant's scoping and screening reports, including information contained in the source documentation to verify that the application of the methodology would provide the results documented in the LRA.

As a result of the staff's audit for scoping and screening, the applicant submitted LRA Supplement 2, Attachment G, dated April 24, 2023 (ML23114A377). In Attachment G, the applicant identified two additional NSR buildings, the plant effluent holdup and monitor tanks, as within the scope of license renewal although they were not originally included. The buildings were added after a reevaluation of spaces because they support NNS SSCs whose failure could prevent the satisfactory accomplishment of functions identified for 10 CFR 54.4(a)(1).

2.1.4.6.3 Conclusion

On the basis of its review of information in the LRA, scoping implementation procedures, and a sample of structural scoping results, the staff concludes that the applicant's methodology for identifying the structural SSCs within the scope of license renewal is in accordance with the requirements of 10 CFR 54.4 and, therefore, is acceptable.

2.1.4.7 Electrical Component Scoping

2.1.4.7.1 Summary of Technical Information in the Application

LRA Section 2.1.5.5 states, in part, the following:

> EIC systems and components within mechanical systems, did not require further system evaluations to determine which components were required to perform or support the identified intended functions. A bounding scoping approach is used for electrical equipment. Under this approach, all electrical components were included within the scope of LR. This bounding approach is consistent with the

electrical scoping results for previous LRAs, as well as approved SLRAs [subsequent license renewal applications]. In-scope electrical components were placed into commodity groups and then evaluated as commodities during the screening process as described in Section 2.1.6.1 below.

2.1.4.7.2 Staff Evaluation

The staff evaluated LRA Section 2.1.5 and the guidance contained in the implementing procedures and reports to perform the review of the electrical scoping process. The staff reviewed the applicant's approach to identifying electrical and instrumentation and control (I&C) SSCs relied upon to perform the functions described in 10 CFR 54.4(a). The staff reviewed portions of the documentation used by the applicant to perform the electrical scoping process, including the FSAR, CLB documentation, procedures, drawings, specifications, codes and standards, and other documents.

The staff noted that, after the applicant performed scoping of electrical and I&C components, the in-scope electrical components were categorized into electrical component types. The staff confirmed that component types include similar electrical and I&C components with common characteristics. The staff further confirmed that component-level intended functions of the component types were identified (e.g., cable, connections, fuse holders, terminal blocks, connections and insulators, metal enclosed bus, switchyard bus, and connections).

As part of this review, the staff discussed the methodology with the applicant, reviewed the implementing procedures developed to support the review, and evaluated the scoping results for a sample of the SSCs that were identified as within the scope of license renewal. The staff determined that the applicant appropriately included electrical and I&C components and also electrical and I&C components contained in mechanical or structural systems within the scope of license renewal on a commodity basis.

2.1.4.7.3 Conclusion

On the basis of its review of information contained in the LRA, scoping and implementing procedures, scoping bases documents, and a sample of electrical scoping results, the staff concludes that the applicant's methodology for the scoping of electrical components within the scope of license renewal is in accordance with the requirements of 10 CFR 54.4 and, therefore, is acceptable.

2.1.4.8 Scoping Methodology Conclusion

On the basis of its review of the LRA, implementing procedures, and a sample of scoping results, the staff concludes that the applicant's scoping methodology was consistent with the guidance contained in the SRP-LR and identified those SSCs that are within the scope of license renewal in accordance with 10 CFR 54.4(a)(1), 10 CFR 54.4(a)(2), and 10 CFR 54.4(a)(3). The staff concludes that the applicant's methodology is consistent with the requirements of 10 CFR 54.4(a) and, therefore, is acceptable.

2.1.5 Screening Methodology

2.1.5.1 General Screening Methodology

2.1.5.1.1 Summary of Technical Information in the Application

LRA Section 2.1.6, "Screening Procedure," states the following:

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

LRA Section 2.1.6.1, "Identification of Structures and Components Subject to AMR," states, in part, that "Structures and components that perform an intended function without moving parts or without change in configuration or properties are defined as passive for LR. Passive SCs that are not subject to replacement based on a qualified life or specified time period are defined as long-lived for LR. The screening process is used to identify passive, long-lived structures, and components within the scope of LR that are subject to AMR…." LRA Section 2.1.6.1 further states, in part, that components or assemblies that perform their function with moving parts or a change in configuration or properties that includes a "change of state" are active and are not subject to AMR. Most passive SCs are long-lived. If a passive component is determined not to be long-lived, such a determination is documented within the screening evaluation.

2.1.5.1.2 Staff Evaluation

Pursuant to 10 CFR 54.21, each LRA must contain an IPA that identifies those SCs within the scope of license renewal that are subject to an AMR. The IPA must identify components that perform an intended function without moving parts or without a change in configuration or properties (passive), and that are not subject to replacement based on a qualified life or specified time (long-lived). In addition, the IPA must include a description and justification of the methodology used to determine the 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.

In light of the above regulations, the staff reviewed the methodology used by the applicant to identify the mechanical and structural components and electrical commodity groups within the scope of license renewal that should be subject to an AMR. The staff confirmed that the applicant implemented a process to determine which SCs were subject to an AMR in accordance with the requirements of 10 CFR 54.21. The staff noted that in LRA Section 2.1.6.1, the applicant discussed these screening activities as they relate to the component types and commodity groups within the scope of license renewal.

The staff determined that the screening process evaluated the component types and commodity groups included within the scope of license renewal to determine which ones were long-lived and passive and, therefore, subject to an AMR. The staff reviewed LRA Sections 2.3, 2.4, and 2.5, which provided the results of the process used to identify component types and commodity groups subject to an AMR. The staff also reviewed, on a sampling basis, the screening results reports for safety injection and shutdown cooling, diesel generator fuel oil storage and transfer, auxiliary feedwater, and the turbine building.

In addition, the applicant provided the staff a detailed discussion of the processes used for each discipline and provided administrative documentation that described the screening methodology. SE Sections 2.1.5.2 through 2.1.5.4 discuss the specific methodology for mechanical, structural, and electrical components. The staff finds that the applicant's methodology to identify the mechanical and structural components and electrical commodity groups within the scope of license renewal is consistent with 10 CFR 54.21.

2.1.5.1.3 Conclusion

On the basis of a review of the LRA, the implementing procedures, and a sampling of screening results, the staff concludes that the applicant's screening methodology is consistent with the guidance contained in the SRP-LR and is capable of identifying passive, long-lived SCs within the scope of license renewal that are subject to an AMR. The staff concludes that the applicant's process for determining which component types and commodity groups are subject to an AMR is consistent with the requirements of 10 CFR 54.21 and, therefore, is acceptable.

2.1.5.2 Mechanical Component Screening

2.1.5.2.1 Summary of Technical Information in the Application

LRA Section 2.1.6.1 states, in part, the following with regard to mechanical screening:

> The mechanical systems screening process began with the results from the scoping process. For in-scope mechanical systems, system FDs [flow diagrams] were highlighted to create LRBDs. These LRBDs were reviewed to identify passive, long-lived components subject to AMR. Component listings from the MEL were also reviewed to confirm that all system components were considered. Plant walkdowns were performed when required for confirmation. Finally, the identified list of passive, long-lived system components was benchmarked against previous LRAs, as well as approved SLRAs, containing similar systems.
>
> Some mechanical components, when combined, are considered a complex assembly. A complex assembly is a predominately active component where the performance of its components is closely linked to that of the intended function of the entire assembly, such that testing and monitoring of the assembly is sufficient to identify degradation of these components. Examples of complex assemblies included diesel engines, instrument air compressors, and chiller units. Complex assemblies are considered active and can be excluded from the requirements of AMR. However, to the extent that complex assemblies include piping or components that interface with external equipment, or components that cannot be adequately tested or monitored as part of the complex assembly, those components are identified and subject to AMR.

2.1.5.2.2 Staff Evaluation

The staff reviewed the mechanical screening methodology discussed and documented in LRA Section 2.1.6.1, the implementing documents, the scoping and screening reports, and the license renewal drawings. The staff determined that the mechanical system screening process began with the results from the scoping process and then the applicant reviewed each system evaluation boundary as depicted on the P&IDs to identify passive, long-lived components. Additionally, the staff determined that the applicant had identified all passive, long-lived components that perform or support an intended function within the system evaluation boundaries and determined those components to be subject to an AMR. The applicant documented the results of its review in the scoping and screening reports, which state the information sources reviewed and the component intended functions.

The staff verified that mechanical system evaluation boundaries were established for each system within the scope of license renewal and that the boundaries were determined by mapping the system-intended function boundary onto P&IDs. The staff confirmed that the applicant reviewed the components within the system-intended function boundary to determine whether the component supported the system-intended function and that those components that supported the system-intended function were reviewed to determine whether the component was passive and long-lived and, therefore, subject to an AMR.

During the scoping and screening methodology audit, the staff reviewed selected portions of the FSAR, plant equipment and other databases, CLB documentation, procedures, drawings, specifications, selected scoping and screening reports, and other documents. The staff discussed the screening process with the applicant's license renewal team and reviewed relevant documentation. The staff also performed a walkdown of portions of the selected systems with plant engineers to verify documentation. The staff assessed whether the mechanical screening methodology outlined in the LRA and procedures was appropriately implemented and whether the scoping results were consistent with CLB requirements. Based on these audit activities, the staff did not identify any discrepancies between the methodology documented and the implementation results.

2.1.5.2.3 Conclusion

On the basis of its review of the LRA, the screening implementation procedures, selected portions of the FSAR, the plant equipment database and other databases, CLB documentation, procedures, drawings, specifications, selected scoping and screening reports, and other documents and a sampling of screening results, the staff concludes that the applicant's methodology for identifying mechanical components within the scope of licensing renewal and subject to an AMR is in accordance with the requirements of 10 CFR 54.21(a)(1) and, therefore, is acceptable.

2.1.5.3 Structural Component Screening

2.1.5.3.1 Summary of Technical Information in the Application

LRA Section 2.1.6.1 states, in part, the following with regard to civil and structural screening:

> The structure screening process also began with the results from the scoping process. If only selected portions of a structure are in-scope, the in-scope portions are described in the scoping evaluation. The associated structure drawings with reviewed to identify the passive, long-lived structures, and components. Plant walkdowns were performed when required for confirmation. Finally, the identified list of passive, long-lived structures and components was benchmarked against previous LRAs, as well as approved SLRAs.

2.1.5.3.2 Staff Evaluation

The staff reviewed the structural screening methodology documented in LRA Sections 2.1.6.1 and 2.4, implementing procedures and guidelines, scoping and screening reports, and the license renewal structures drawing. The staff also reviewed the applicant's commodity group methodology for identifying structural components that are subject to an AMR, as required in 10 CFR 54.21(a)(1). The staff confirmed that the applicant reviewed the structures included within the scope of license renewal and identified the passive, long-lived components with component-level intended functions and determined those components to be subject to an AMR.

The staff reviewed selected portions of the FSAR, structural system information, and scoping and screening reports the applicant used to perform the structural scoping and screening. The staff also reviewed screening activities, on a sampling basis that documented the SCs within the scope of license renewal. The staff conducted detailed discussions with the applicant's license renewal team and reviewed documentation pertinent to the screening process to assess whether the screening methodology outlined in the LRA and implementing procedures was appropriately implemented and the scoping results were consistent with CLB requirements. Based on its review, the staff finds that the applicant's methodology for identifying structural components that are subject to an AMR is consistent with 10 CFR 54.21(a)(1).

2.1.5.3.3 Conclusion

On the basis of its review of information contained in the LRA, implementing procedures and guidelines, the plant equipment database, and a sampling of the structural screening results, the staff concludes that the applicant's methodology for identifying structural components within the scope of license renewal and subject to an AMR is in accordance with the requirements of 10 CFR 54.21(a)(1) and, therefore, is acceptable.

2.1.5.4 Electrical Component Screening

2.1.5.4.1 Summary of Technical Information in the Application

LRA Section 2.1.6.1 states the following, in part, with regard to electrical screening:

> The screening of EIC components in EIC and mechanical systems used a bounding approach as described in NEI 95-10. EIC components for in-scope systems were assigned to commodity groups consistent with Table 2.1-5 of NUREG-1800. The commodities subject to an AMR were identified by applying the "passive" screening criteria of 10 CFR 54.21(a)(1). This method provides the most efficient means for determining the electrical commodities subject to an AMR since many EIC components and commodities are active. Active components and commodities may be eliminated from AMR per 10 CFR 54.21(a)(1).
>
> The sequence of steps and special considerations for identification of electrical commodities that require an AMR is as follows:
>
> 1. EIC components and commodities in systems within the scope of LR at CPNPP were identified and listed.

2. Following the identification of the electrical commodities, the criterion of 10 CFR 54.21(a)(1)(i) was applied to identify commodities that perform their functions without moving parts or without a change in configuration or properties (referred to as "passive" components). These commodities were identified utilizing the guidance of NEI 95-10 and Table 2.1-5 of NUREG-1800.

3. The screening criterion found in 10 CFR 54.21(a)(1)(ii) excludes those commodities that are subject to replacement based on a qualified life or specific time period from the requirements of an AMR. The 10 CFR 54.21(a)(1)(ii) screening criterion was applied to those commodities that were not previously eliminated by the application of the 10 CFR 54.21(a)(1)(i) screening criterion.

4. EIC components and commodities were not evaluated to determine if they perform a LR intended function during the scope of systems. At this point in the screening process, the remaining passive electrical commodities are reviewed to determine if the commodity performs a LR intended function. If an electrical commodity does not perform a LR intended function, it is not considered further and, therefore, is not subject to an AMR.

5. Components and commodities which support or interface with electrical components and commodities (for example, cable trays, conduits, instrument racks, panels, and enclosures) are evaluated as structural components in Section 2.4.

The electrical commodities that require an AMR are the separate electrical commodities that are not a part of a larger active component. The passive commodities that are not subject to replacement based on a qualified life or specific time period are subject to an AMR. For CPNPP, the electrical commodities that require an AMR are identified in Section 2.5.

EIC components whose primary function is electrical can also have a mechanical pressure boundary function. These components include elements, resistance temperature detectors (RTDs), sensors, thermocouples, transducers, and electric heaters. According to Appendix B of NEI 96-10, the electrical portions of these components are active per 10 CFR 54.21(a)(1)(i) and are therefore not subject to AMR. Only the pressure boundary of such an in-scope component is subject to AMR, and the pressure boundary function for these EIC components is addressed in the mechanical review.

2.1.5.4.2 Staff Evaluation

The staff reviewed the applicant's methodology used for electrical component screening in LRA Sections 2.1.6.1 and 2.5, the applicant's implementing procedures, CLB documents, and electrical AMR reports. The staff confirmed that the applicant used the screening process described in these documents, along with the information in NEI 95-10, Appendix B, and the SRP-LR, to identify the electrical and I&C components subject to an AMR.

The staff determined that the applicant identified commodity groups that met the passive criteria in accordance with NEI 95-10. In addition, the staff determined that the applicant appropriately evaluated the identified passive commodities to determine whether they were subject to replacement based on a qualified life or specified time period (short lived) or not subject to replacement based on a qualified life or specified time period (long-lived). The staff confirmed that the remaining passive, long-lived components were determined to be subject to an AMR.

The staff performed a review to determine whether the screening methodology outlined in the LRA and implementing procedures was appropriately implemented and the scoping results were consistent with CLB requirements. In addition, during the scoping and screening methodology audit, the staff reviewed selected screening reports and discussed them with the applicant to verify proper implementation of the screening process. Based on these onsite review activities, the staff did not identify any discrepancies between the methodology and the implementation results.

2.1.5.4.3 Conclusion

On the basis of its review of the LRA, the screening implementing procedures, discussions with the applicant’s staff, and a sample of the screening results, the staff concludes that the applicant’s screening methodology is consistent with the guidance in the SRP-LR and identified those passive, long-lived components within the scope of 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, is acceptable.

2.1.5.5 Screening Methodology Conclusion

On the basis of its review of the LRA, the screening implementing procedures, discussions with the applicant’s staff, and a sample of the screening results, the staff concludes that the applicant’s screening methodology is consistent with the guidance in the SRP-LR and identified those passive, long-lived components within the scope of 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, is acceptable.

2.1.6 Summary of Evaluation Findings

On the basis of its review of the information presented in LRA Section 2.1, the supporting information in the scoping and screening implementing procedures and reports, the information presented during the scoping and screening methodology audit, discussions with the applicant, sample system reviews, and the applicant’s Supplement 2, dated April 24, 2023 (ML23114A377), the staff concludes 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). The staff also concludes that the applicant’s description and justification of its scoping and screening methodology are adequate to meet the requirements of 10 CFR 54.21(a)(1). From this review, the staff concludes that the applicant’s methodology for identified systems and structures within the scope of license renewal and SCs requiring an AMR is acceptable.

2.2 Plant Level Scoping Results

2.2.1 Introduction

In LRA Section 2.1, the applicant described the methodology for identifying SSCs within the scope of license renewal. In LRA Section 2.2, the applicant used the scoping methodology to determine which SSCs must be included within the scope of license renewal. The staff reviewed the plant-level scoping results to determine whether the applicant has properly identified the following:

- all SSCs relied upon to mitigate DBEs, as required by 10 CFR 54.4(a)(1)
- all NSR SSCs whose failure could prevent satisfactory accomplishment of any safety-related functions, as required by 10 CFR 54.4(a)(2)
- systems and structures relied on in safety analyses or plant evaluations to perform functions required by regulations referenced in 10 CFR 54.4(a)(3)

2.2.2 Summary of Technical Information in the Application

In LRA Tables 2.2-1 through 2.2-3, the applicant listed plant mechanical systems, electrical and I&C systems, and structures within the scope of license renewal. Based on the DBEs considered in the plant's CLB, other CLB information relating to NSR systems and structures, and certain regulated events, the applicant identified plant-level systems and structures within the scope of license renewal as defined by 10 CFR 54.4.

2.2.3 Staff Evaluation

In LRA Section 2.1, the applicant described its methodology for identifying systems and structures within the scope of license renewal and subject to an AMR. The staff reviewed the scoping and screening methodology, as discussed in SE Section 2.1. To verify that the applicant properly implemented its methodology, the staff focused its review on the implementation results shown in LRA Table 2.2-1, "Plant Level Scoping Results: Mechanical Systems," Table 2.2-2, "Plant Level Scoping Results: Electrical and I&C Systems," and Table 2.2-3, "Plant Level Scoping Results: Containments, Structures and Component Supports," to confirm that the applicant did not omit any plant-level systems and structures within the scope of license renewal.

The staff determined whether the applicant properly identified the systems and structures within the scope of license renewal in accordance with 10 CFR 54.4. The staff reviewed the applicant's implementation accordance with the guidance in SRP-LR Section 2.2, "Plant-Level Scoping Results." The staff finds that the applicant's methodology to identify the systems and structures within the scope of license renewal is consistent with 10 CFR 54.4(a).

In addition, the staff noted that, in LRA Section 2.3.3.14, "Waste Processing Systems," and Section 2.4.11, "Yard Structures," the plant effluent holdup and monitor tanks and pipe encasements were indicated as being not in scope for license renewal. By letter dated April 24, 2023 (ML23114A377), the applicant supplemented the LRA to include these two buildings as within the scope of license renewal, revising Table 2.2-3, Section 2.3.3.14, Section 2.4.11, and section 3.5.2.2.2. Based on its review, the staff finds this supplement to the LRA acceptable because the applicant specified in LRA Sections 2.3.3.14 and 2.4.11 that the plant effluent holdup and monitor tanks and pipe encasements are within the scope of license renewal.

2.2.4 Conclusion

On the basis of its review of LRA Section 2.2, the applicant's supplement to the LRA, and the FSAR supporting information, the staff concludes that the applicant has appropriately identified the systems and structures within the scope of license renewal, in accordance with 10 CFR 54.4.

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

In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant must list the passive, long-lived SCs that are within the scope of license renewal and that are subject to an AMR. To verify that the applicant properly implemented its methodology, the 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 staff performed its evaluation of mechanical systems using the methodology described in SRP-LR Section 2.3, "Scoping and Screening Results: Mechanical Systems," and considered the system function(s) as described in the FSAR. The objective was to determine whether the applicant, in accordance with 10 CFR 54.4, identified components and supporting structures for mechanical systems that met the scoping criteria for license renewal. Similarly, the staff evaluated the applicant's screening results to verify that all passive, long-lived components are subject to an AMR, as required by 10 CFR 54.21(a)(1).

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

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

2.3.1 Summary of Technical Information in the Application

LRA Section 2.3.1, “Reactor Vessel, Internals, and Reactor Coolant System,” Section 2.3.2, “Engineering Safety Features,” Section 2.3.3, “Auxiliary Systems,” and Section 2.3.4, “Steam and Power Conversion System,” identify the mechanical SCs subject to an AMR for license renewal. The applicant described the supporting SCs of the mechanical systems in the following LRA sections:

- LRA Section 2.3.1.1, “Reactor Vessel”
- LRA Section 2.3.1.2, “Reactor Vessel Internals”
- LRA Section 2.3.1.3, “Reactor Coolant System and Attached Piping”
- LRA Section 2.3.1.4, “Steam Generators”
- LRA Section 2.3.2.1, “Combustible Gas Control System”
- LRA Section 2.3.2.2, “Containment Isolation System”
- LRA Section 2.3.2.3, “Containment Spray System”
- LRA Section 2.3.2.4, “Residual Heat Removal System”
- LRA Section 2.3.2.5, “Safety Injection System”
- LRA Section 2.3.3.1, “Chemical and Volume Control System”
- LRA Section 2.3.3.2, “Component Cooling Water System”
- LRA Section 2.3.3.3, “Compressed Air and Gas Systems”
- LRA Section 2.3.3.4, “Demineralized and Reactor Makeup Water System”
- LRA Section 2.3.3.5, “Emergency Diesel Generator and Auxiliary Systems”
- LRA Section 2.3.3.6, “Equipment and Floor Drainage Systems”
- LRA Section 2.3.3.7, “Fire Protection System”
- LRA Section 2.3.3.8, “Plant Ventilation Systems”
- LRA Section 2.3.3.9, “Potable and Sanitary Water System”
- LRA Section 2.3.3.10, “Process and Effluent Radiological Monitoring and Sampling System”
- LRA Section 2.3.3.11, “Spent Fuel Pool Cooling and Cleanup System”
- LRA Section 2.3.3.12, “Station Service Water System”
- LRA Section 2.3.3.13, “Ventilation Chilled Water Systems”

- LRA Section 2.3.3.14, “Waste Processing Systems”
- LRA Section 2.3.4.1, “Auxiliary Feedwater System”
- LRA Section 2.3.4.2, “Condensate and Feedwater Systems”
- LRA Section 2.3.4.3, “Main Steam, Reheat, and Steam Dump System”
- LRA Section 2.3.4.4, “Main Turbine and Auxiliaries System”

2.3.2 Staff Evaluation

LRA Section 2.3, “Scoping and Screening Results: Mechanical Systems”				
LRA Section	**LRA Section Title**	**Documents Reviewed by Staff:**		
		LRA Tables	**FSAR**	**LRA Drawings**
LRA Section 2.3.1, “Reactor Vessel, Internals, and Reactor Coolant System”				
2.3.1.1	Reactor Vessel	Table 2.3.1-1, “Reactor Vessel Components Subject to Aging Management Review” Table 3.1.2-1, “Reactor Pressure Vessel—Summary of Aging Management Evaluation”	Sections 3.8, 3.9N, 4.3, 4.4, 5.1, 5.2, 5.3, 5.4, and 7.7	M1-0250-LR M2-0250-LR
2.3.1.2	Reactor Vessel Internals	Table 2.3.1-2, “Reactor Vessel Internals Components Subject to Aging Management Review” Table 3.1.2-2, “Reactor Vessel Internals - Summary of Aging Management Evaluation”	Sections 3.7N/B.3.14, 3.9N/B.2.3, 3.9N/B.2.4, 3.9N/B.2.5, 3.9N/B.2.6, 3.9N.5.1 to 3.9N.5.4, 4.1, 4.5, and 5.2	None
2.3.1.3	Reactor Coolant System and Attached Piping	Table 2.3.1-3, “Reactor Coolant System and Attached Piping Components Subject to Aging Management Review” Table 3.1.2-3, “Reactor Coolant System and Attached Piping—Summary of Aging Management Evaluation”	Sections 1.2.2.2.2, 3.1.2.6, 5.1, 5.2, and 5.4	M1-0250-LR M1-0251-LR M1-0253-LR M1-0253-A-LR M1-0260-LR M1-0261-LR M1-0262-LR M1-0263-LR M2-0250-LR M2-0251-LR M2-0253-LR M2-0255-LR M2-0255-001-LR M2-0260-LR M2-0261-LR M2-0263-LR M2-0263-B-LR

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
2.3.1.4	Steam Generators	Table 2.3.1-4, "Steam Generator Subcomponents Subject to Aging Management Review" Table 3.1.2-4, "Steam Generators—Summary of Aging Management Evaluation"	Sections 1.2.2.2.2, 5.4.2, and 10.4.9.1	M1-0250-LR M2-0250-LR
LRA Section 2.3.2, "Engineered Safety Features"				
2.3.2.1	Combustible Gas Control System	Table 2.3.2-1, "Combustible Gas Control Systems Components Subject to Aging Management Review " Table 3.2.2-1, "Combustible Gas Control System—Summary of Aging Management Evaluation"	Sections 1.2.2.3.5 and 6.2.5 Table 17A-1	M1-0301-LR M2-0301-LR
2.3.2.2	Containment Isolation System	Table 2.3.2-2, "Containment Isolation System Components Subject to Aging Management Review" Table 3.2.2-2, "Containment Isolation System—Summary of Aging Management Evaluation"	Sections 1.2.2.3.4, 3.1.5, 3.8.1, 3.8.2, 6.2, 6.2.4, 6.2.6, 7.1, 7.3, and 8.3.1, Tables 6.2.4-1, 6.2.4-2, 6.2.4-3, 6.2.4-4, 6.2.4-6, 9.4-2, 14.2-2, and 17A-1 Figure 3.8-22	M1-0245-LR M1-0301-A-LR M2-0245-LR M2-0245-A-LR M2-0301-A-LR
2.3.2.3	Containment Spray System	Table 2.3.2-3, "Containment Spray System Components Subject to Aging Management Review" Table 3.2.2-3, "Containment Spray System—Summary of Aging Management Evaluation"	Sections 1.2.2.3.2, 6.2.2, and 6.5.2	M1-0232-LR M1-0232-A-LR M2-0232-LR M2-0232-A-LR
2.3.2.4	Residual Heat Removal System	Table 2.3.2-4, "Residual Heat Removal System Components Subject to Aging Management Review" Table 3.2.2-4, "Residual Heat Removal System—Summary of Aging Management Evaluation"	Sections 3.1, 5.4, and 6.3	M1-0260-LR M1-0263-B-LR M2-0260-LR M2-0263-A-LR
2.3.2.5	Safety Injection System	Table 2.3.2-5, "Safety Injection System Components Subject to	Sections 6.3 and 9.2.1	M1-0261-LR M1-0262-LR M1-0263-LR M1-0263-A-LR

LRA Section 2.3, “Scoping and Screening Results: Mechanical Systems”				
		Aging Management Review” Table 3.2.2-5, “Safety Injection System—Summary of Aging Management Evaluation”		M1-0263-B-LR
LRA Section 2.3.3, “Auxiliary Systems”				
2.3.3.1	Chemical and Volume Control System	Table 2.3.3-1, “Chemical and Volume Control System Components Subject to Aging Management Review” Table 3.3.2-1, “Chemical and Volume Control System—Summary of Aging Management Review”	Section 8.3.1.1.11, “Onsite Emergency Power Sources (Diesel Generators)” Section 9.3.4, “Chemical and Volume Control System (including Born Recycle System)”	M1-0253-LR M1-0253-A-LR M1-0254-LR M2-0255-LR M1-0255-01-LR M1-0256-LR M1-0256-A-LR M2-0253-LR M2-0253-A-LR M2-0254-LR M2-0255-LR M2-0255-01-LR M2-0255-02-LR M2-0256-A-LR M2-0256-A-LR M2-0256-B-LR M1-0257-LR M1-0258-LR M1-0259-LR M1-0259-A-LR
2.3.3.2	Component Cooling Water System	Table 2.3.3-2, “CCW Components Subject to Aging Management Review” Table 3.3.2-2, “Component Cooling Water System—Summary of Aging Management Evaluation”	Section 9.2.2, “Component Cooling Water System”	M1-0229-LR M1-0229A-LR M1-0229B-LR M1-0230-LR M1-0230-A-LR M1-0230-B-LR M1-0230-C-LR M2-0229-LR M2-0229-A-LR M2-0229-B-LR M2-0230-LR M2-0230A-LR M2-0231-LR M2-0231A-LR
2.3.3.3	Compressed Air and Gas Systems	Table 2.3.3-3, “Compressed Air and Gas Systems Subject to Aging Management Review” Table 3.3.2-3, “Compressed Air and Gas Systems—Summary of Aging Management Evaluation”	Section 9.3.1, “Compressed Air Systems” Section 10.4.15, “Nitrogen and Hydrogen Supply Systems”	M1-0216-001-LR M1-0216-A-LR M1-0218-LR M1-0218-001-LR M1-0218-LR M1-0243A-LR M1-0243-002-LR M2-0216-A-LR M2-0216-B-LR M2-0218-001-LR M2-0218-002-LR M2-0243-A-LR M2-0243-002-LR M2-0243-002-LR M1-0219-LR

LRA Section 2.3, “Scoping and Screening Results: Mechanical Systems”				
2.3.3.4	Demineralized and Reactor Makeup Water System	Table 2.3.3-4, “Demineralized and Reactor Makeup Water System Components Subject to Aging Management Review” Table 3.3.2.4, “Demineralized and Reactor Makeup Water System—Summary of Aging Management Evaluation”	Section 9.2.3, “Demineralized and Reactor Makeup Water System”	M1-0241001-LR M1-0241-A-LR M1-0242-LR M1-0242-A-LR M1-0242-B-LR M2-0241-LR M2-0242-LR
2.3.3.5	Emergency Diesel Generator and Auxiliary Systems	Table 2.3.3-5, “Emergency Diesel Generator and Auxiliary Systems Subject to Aging Management Review” Table 3.3.2-5, “Auxiliary Systems—Emergency Diesel Generator and Auxiliary Systems—Summary of Aging Management Evaluation”	Section 8.3.1.1.11, “Onsite Emergency Power Sources (Diesel Generators)” Section 9.5.4, “Diesel Generator Fuel-Oil Storage and Transfer System” Section 9.5.5, “Diesel Generator Cooling Water System” Section 9.5.6, “Diesel Generator Starting System” Section 9.5.7, “Diesel Generator Lube Oil System” Section 9.5.8, “Diesel Generator Combustion Air Intake and Exhaust System”	M1-0215-F-LR M1-0215-G-LR M2-0215-F-LR M2-0215-G-LR M1-0215-H-LR M1-0215-J-LR M2-0215-H-LR M2-0215-J-LR M1-0215-D-LR M1-0215-E-LR M2-0215-D-LR M2-0215-E-LR M1-0215-B-LR M1-0215-C-LR M2-0215-B-LR M2-0215-C-LR M1-0215-LR M1-0215-A-LR M2-0215-LR M2-0215-A-LR
2.3.3.6	Equipment and Floor Drainage Systems	Table 2.3.3-6, “Equipment and Floor Drainage Systems Subject to Aging Management Review” Table 3.3.2-6, “Auxiliary Systems—Equipment and Floor Drainage Systems—Summary of Aging Management Evaluation”	Section 9.3.3.2.1, “Containment Building Floor Drains” Section 9.3.3.2.2, “Safeguards Building Floor Drains” Section 9.3.3.2.3, “Auxiliary Building Floor Drains” Section 9.3.3.2.4, “Turbine Building Floor Drains” Section 9.3.3.2.5, “Fuel Building Floor Drains”	M1-0236-LR M2-0236-LR M1-0236-A-LR M2-0236-A-LR M1-0236-B-LR M2-0236-B-LR M1-0236-01-LR M1-0236-01A-LR M1-0236-02-LR M1-0236-02A-LR M1-0236-03-LR M2-0236-03-LR M1-0236-04-LR M1-0237-LR M1-0237-01-LR M1-0238-LR M2-0238-LR M1-0238-A-LR M2-0238-A-LR
2.3.3.7	Fire Protection System	Table 2.3.3-7, “Fire Protection System Components Subject to	Sections 1.2.2.8.6, 9.5.1, and 9.5.1.4	M1-0225-LR M1-0225-01-LR M1-0225-02-LR M1-0225-02A-LR

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		Aging Management Review" Table 3.3.2-7, "Fire Protection System—Summary of Aging Management Evaluation"		M1-0225-03-LR M1-0225-03A-LR M1-0225-04-LR M1-0225-04A-LR M1-0225-05-LR M1-0225-06-LR M1-0252-01-LR M2-0225-01-LR M2-0225-03-LR M2-0225-03A-LR M2-0225-05-LR M2-0225-11-LR M2-0252-01-LR MX-0225-07-LR MX-0225-08-LR MX-0225-09-LR
2.3.3.8	Plant Ventilation Systems	Table 2.3.3-6, "Plant Ventilation Systems Subject to Aging Management Review" Table 3.3.2-6, "Auxiliary Systems—Plant Ventilation Systems—Summary of Aging Management Evaluation"	Section 6.4.2, "System Design" Section 6.5.1, "Engineered Safety Feature Filter Systems" Section 9.4.1, "Control Room Area Ventilation System" Section 9.4.2, "Spent Fuel Pool Area Ventilation System" Section 9.4.3, "Auxiliary Building and Radwaste Area Ventilation System" Section 9.4.5, "Engineered Safety Features Ventilation System" Appendix 9.4A, "Containment Ventilation Systems" Appendix 9.4B, "Service Water Intake Structure Ventilation System" Appendix 9.4C.1, "Diesel Generator Building Ventilation System" Appendix 9.4C.2, "Main Steam and Feedwater Piping Area Ventilation System" Appendix 9.4C.3, "Electrical Area (Safeguards) Ventilation System"	M1-0300-LR M2-0300-LR M1-0300-A-LR M2-0300-A-LR M1-0301-LR M2-0301-LR M1-0304-LR M1-0304-A-LR M1-0304-B-LR M1-0304-C-LR M1-0302-LR M2-0302-LR M1-0302-B-LR M2-0302-B-LR M1-0304-01-LR M1-0305-LR M1-0305-A-LR M1-0312-LR M1-0313-LR M1-0302-A-LR M2-0302-A-LR M1-0302-C-LR M2-0302-C-LR M1-0303-B-LR M1-0303-C-LR M1-0303-01-LR M1-0309-LR M1-0309-A-LR M1-0309-B-LR

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
			Appendix 9.4C.4, "Control Building Uncontrolled Access Area Heating, Ventilation, and Air-Conditioning System" Appendix 9.4C.6, "Office and Service Area HVAC System" Appendix 9.4C.8, "Uninterruptable Power Supply and Distribution Rooms Air Conditioning Systems" Appendix 9.4C.9, "Battery and Charging Rooms Air Conditioning System" Appendix 9.4C.10, "High Pressure Chemical Feed Room Ventilation System" Appendix 9.4D, "Plant Ventilation Discharge Vent"	
2.3.3.9	Potable and Sanitary Water System	Table 2.3.3.9a, "Chlorination System Components Subject to Aging Management Review" Table 2.3.3.9b, "Potable and Sanitary Water System Components Subject to Aging Management Review" Table 3.3.2-9a, "Chlorination System—Summary of Aging Management Evaluation" Table 3.3.2-9b, "Potable and Sanitary Water System—Summary of Aging Management Evaluation"	Section 9.2.4, "Potable and Sanitary Water System"	Chlorination: M1-0233-LR M2-0235-LR Potable and Sanitary Water: M1-0227-LR
2.3.3.10	Process and Effluent Radiological Monitoring and Sampling System	Table 2.3.3-10, "Process and Effluent Radiological Monitoring and Samling System Subject to Aging Management Review" Table 3.3.2-10, "Auxiliary Systems—Process and Effluent Radiological Monitoring and Samling System—Summary of	Section 1.2.2.8.2, "Sampling Systems" Section 9.3.2, "Process Sampling System" Section II.B.3, "Post-Accident Sampling" Section 11.5.1, "Design Bases"	M1-0222-LR M2-0222-LR M1-0222-A-LR M1-0222-B-LR M2-0222-001-LR M1-0228-LR M2-0228-LR M1-0228-A-LR M2-0228-A-LR M1-0228-B-LR M2-0228-B-LR

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		Aging Management Evaluation"		M1-0228-C-LR M2-0228-C-LR M1-0228-001-LR M2-0228-001-LR M1-0228-002-LR M1-0301-A-LR M2-0301-A-LR M1-0304-LR M1-0304-B-LR
2.3.3.11	Spent Fuel Pool Cooling and Cleanup System	Table 2.3.3-11, "Spent Fuel Pool Cooling and Cleanup System Components Subject to Aging Management Review" Table 3.3.2.11, "Spent Fuel Cooling and Cleanup System—Summary of Aging Management Evaluation"	Section 9.1.3, "Spent Fuel Pool Cleaning and Cleanup System" Section 9.1.4, "Fuel Handling System" Section 9.1.4.1, "Design Basis" Section 9.1.4.2, "System Description" Table 6.2.4-1, "Containment Isolation Valving Application" Table 9.1-2, "Code and Safety Class Requirements" Table 9.4-2, "Design Conditions-Indoor"	M1-0235-LR M1-0235-01-LR M1-0235-02-LR M2-0235-LR
2.3.3.12	Station Service Water System	Table 2.3.3.12, "Station Service Water System Components Subject to Aging Management Review" Table 3.3.2-12, "Station Service Water System—Summary of Aging Management Evaluation"	Section 1.2.2.8.5, "Station Service Water System" Section 9.2.1, "service Water System" Section 9.2.2, "Component Cooling Water System" Section 9.2.3, "Demineralized and Reactor Makeup Water System	M1-0233-LR M1-0233-A-LR M1-0234-LR M2-0233-LR M2-0233-A-LR M2-0234-LR
2.3.3.13	Ventilation Chilled Water Systems	Table 2.3.3-13, "Ventilation Chilled Water Systems Subject to Aging Management Review" Table 3.3.2-13, "Auxiliary Systems—Ventilation Chilled Water Systems—Summary of Aging Management Evaluation"	Appendix 9.4E, "Plant Ventilation Chilled Water System" Appendix 9.4F, "Safety Chilled Water System"	M1-0307-A-LR M1-0311-LR M1-0311-A-LR M1-0311-B-LR M2-0307-LR M2-0307-A-LR M2-0311-LR M2-0311-A-LR M2-0311-B-LR M1-0307-LR M1-0307-B-LR M1-0307-C-LR
2.3.3.14	Waste Processing Systems	Table 2.3.3.14, "Waste Processing System	Section 1.2.2.9, "Waste Processing Systems"	M1-0264-LR M2-0264-LR

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		Components Subject to Aging Management Review" Table 3.3.2-14, "Waste Processing Systems—Summary of Aging Management Evaluation"	Section 11.2, "Liquid Waste Management System" Section 11.3, "Gaseous Waste Management System" Section 11.4, "Solid Waste Management System"	M1-0266-LR M1-0266-001-LR M1-0266-A-LR M1-0267-LR M1-0268-LR M1-0268-001-LR M1-0269-LR M1-0269-001-LR M1-0269-A-LR M1-0269-B-LR M1-0270-LR M1-0270-A-LR
LRA Section 2.3.4, "Steam and Power Conversion Systems"				
2.4.3.1	Auxiliary Feedwater System	Table 2.3.4-1, "Auxiliary Feedwater System Components Subject to Aging Management Review" Table 3.4.2-1, "Auxiliary Feedwater System—Summary of Aging Management Evaluation"	Sections 10.4.9, 6.2.1.4.4, and 7.4.1.1.1	M1-0202-003-LR M1-0206-LR M1-0206-001-LR M1-0206-002-LR M2-0202-003-LR M2-0206-LR M2-0206-001-LR M2-0206-002-LR
2.4.3.2	Condensate and Feedwater Systems	Table 2.3.4-2, "Condensate and Feedwater System Components Subject to Aging Management Review" Table 3.4.2-2, "Condensate and Feedwater System—Summary of Aging Management Evaluation"	Sections 3.5.1.4, 10.1, and 10.4 Table 17A-1	M1-0203-001-LR M1-0203-001A-LR M1-024-LR M2-0203-001-LR M2-0203-001A-LR M2-0205-LR
2.4.3.3	Main Steam, Reheat, and Steam Dump System	Table 2.3.4-3, "Main Steam, Reheat, and Steam Dump System Components Subject to Aging Management Review" Table 3.4.2-3, "Main Steam, Reheat, and Steam Dump System—Summary of Aging Management Evaluation"	Sections 10.3, 10.3.1, and 10.4.8	M1-0202-LR M1-0202-002-LR M1-0202-003-LR M1-0239-LR M1-0239-001-LR M2-0202-LR M2-0202-002-LR M2-2020-003-LR M2-0239-LR M2-0239-001-LR
2.4.3.4	Main Turbine and Auxiliaries System	Tables 2.3.4-4a through 2.3.4-4f Table 3.4.2-4a through 3.4.2-4f	Section 10.3, 10.3.1, and 10.4.8	Auxiliary Steam: M1-0213-LR M1-0213-001-LR Chemical Feed and Hydrazine Injection: M1-022-LR M1-0221 -001-LR M2-0221-001-LR Condensate Polishing:

LRA Section 2.3, “Scoping and Screening Results: Mechanical Systems”				
				M1-0244-001A-LR Condenser Vacuum and Waterbox Priming: M2-0211-LR Heater Drains: M1-0207-B-LR M2-0207-B-LR Turbine Plant Cooling Water: M1-0212-B-LR M2-0212-B-LR

2.3.3 Conclusion

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

2.4 Scoping and Screening Results: Structures

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

The staff’s evaluation of the information in the LRA 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 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 the scoping evaluation, the staff reviewed the applicable LRA sections, focusing on components that were not identified as within the scope of license renewal. The staff reviewed relevant licensing basis documents, including the FSAR, for each structure to determine whether the applicant omitted from the scope of 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 LRA specified all intended functions delineated under 10 CFR 54.4(a).

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

2.4.1 Summary of Technical Information in the Application

LRA 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:

- LRA Section 2.4.1, “Containment Building”
- LRA Section 2.4.2, “Auxiliary Building”
- LRA Section 2.4.3, “Diesel Generator Buildings”
- LRA Section 2.4.4, “Electrical and Control Building”
- LRA Section 2.4.5, “Fuel Building”
- LRA Section 2.4.6, “Safeguards Buildings”
- LRA Section 2.4.7, “Safe Shutdown Impoundment and Dam”
- LRA Section 2.4.8, “Service Water Intake Structure”
- LRA Section 2.4.9, “Switchgear Buildings”
- LRA Section 2.4.10, “Turbine Buildings”
- LRA Section 2.4.11, “Yard Structures”
- LRA Section 2.4.12, “Switchyard Structures”
- LRA Section 2.4.13, “Component Support Commodity Group”
- LRA Section 2.4.14, “Crane/Hoist Commodity Group”
- LRA Section 2.4.15, “Fire Barrier Commodity Group”

LRA Tables 2.4-1 through 2.4-15 list the structures and structural component types subject to an AMR and their intended functions. LRA Tables 3.5.2-1 through 3.5.2-15 provide the results of the applicant’s AMR for structures and structural components.

2.4.2 Staff Evaluation

The staff evaluated the system functions described in the LRA and FSAR to verify that the applicant included within the scope of 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).

2.4.3 Conclusion

Based on the staff’s review of the LRA, FSARs, and LRBDs, the staff concludes that the applicant appropriately identified the structures and structural components within the scope of 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 Control Systems

This section documents the staff’s review of the applicant’s scoping and screening results for electrical and I&C systems as described in LRA Section 2.5 and its subsections. Specifically, this section discusses electrical and I&C component commodity groups as described in LRA 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 license renewal and that are subject to an AMR. To verify that the applicant properly implemented its methodology, the staff focused its review on the implementation results. This focus allowed the staff to confirm that there were no omissions of electrical and I&C components that meet the scoping criteria and that are subject to an AMR. The staff’s evaluation of the information in the LRA 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 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 the scoping evaluation, the staff reviewed the applicable LRA sections, focusing on components that had not been identified as within the scope of license renewal. The staff reviewed relevant licensing basis documents, including the FSAR, for each component to determine whether the applicant omitted from the scope of 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 LRA specified all intended functions delineated under 10 CFR 54.4(a).

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

2.5.1 Summary of Technical Information in the Application

LRA Section 2.5.1 describes the electrical and I&C system components that were evaluated and determined to be subject to an AMR. LRA Table 2.5-2, “Electrical and I&C Systems Components Subject to Aging Management Review,” lists the electrical and I&C system components subject to an AMR and their intended functions. LRA Table 3.6.2-1 provides the results of the applicant’s AMR for electrical and I&C system components.

2.5.2 Staff Evaluation

The staff evaluated the system functions described in the LRA and FSAR to verify that the applicant has included within the scope of 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 has included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). The staff performed its review using the guidance provided in the SRP-LR and NEI 95-10, Revision 6, as endorsed in RG 1.188, Revision 2.

The requirements in 10 CFR 54.4(a) identify the plant SSCs that perform specific functions that are within the scope of license renewal. The SRP-LR and NEI 95-10 provide the guidance on the scoping of electrical and I&C SSCs at the system level based on the license renewal intended functions identified in 10 CFR 54.4(a).

The applicant used a bounding approach to include within the scope of license renewal (1) all electrical and I&C systems (except meteorological instrumentation and security systems) and (2) all electrical and I&C components that are contained within mechanical systems, regardless of whether the mechanical system is included within the scope of license renewal. The applicant stated that the bounding approach eliminated the need to identify the license renewal intended functions for the electrical and I&C systems during scoping and resulted in the inclusion of all electrical and I&C components that satisfy the requirements of 10 CFR 54.4(a)(1)–(3) within the scope of license renewal. LRA Table 2.2-2, "Plant Level Scoping Results: Electrical and I&C Systems," provides the results of the plant-level scoping for electrical and I&C systems. SE section 2.2 contains the staff's evaluation of the plant-level scoping results for the electrical and I&C systems.

The SRP-LR and NEI 95-10 provide the guidance on the screening of electrical and I&C components based on the criteria in 10 CFR 54.21(a)(1) and the commodity grouping of components that have similar function, design, material of construction, environment or a combination of these. SRP-LR Table 2.1-5, "Typical Structures, Components, and Commodity Groups, and 10 CFR 54.21(a)(1)(i) Determinations for Integrated Plant Assessment," provides typical electrical and I&C components and commodity groups that are within the scope of license renewal. SRP-LR Section 2.5.2.1.1, "Components Within the Scope of SBO (10 CFR 50.63)," provides the guidance to identify components in the onsite and offsite power systems that are relied upon to meet the requirements of 10 CFR 50.63 (SBO Rule) for license renewal.

LRA Section 2.1.6.1 describes the applicant's screening methodology for the in-scope electrical and I&C systems. The applicant used a component commodity group approach, as described in the SRP-LR and NEI 95-10, to screen the electrical and I&C components subject to AMR. This screening methodology involved (1) placing the electrical and I&C components for the systems listed in LRA Table 2.2-2 in commodity groups, (2) identifying the component intended functions, which are provided in LRA Table 2.1-1, "Structure and Component Intended Functions," that support the system-intended functions, as described in 10 CFR 54.4, and (3) applying the screening criteria of 10 CFR 54.21(a)(1) to the in-scope electrical and I&C component commodity groups to identify passive, long-lived component commodity groups that perform or support an LR intended function and require an AMR.

The applicant grouped the electrical and I&C components within the in-scope electrical and I&C systems and the in-scope mechanical and structures systems in LRA Table 2.2-2 into commodity groups based on the similarity of design or functional characteristics, or both. The applicant stated that the interface of electrical and I&C components with other types of components and the evaluations of these interfacing components are provided in the appropriate mechanical or structural sections of the LRA. LRA Table 2.5-1, "Electrical and I&C Component Commodity Groups Installed at CPNPP," lists the in-scope electrical and I&C component commodity groups.

LRA Table 2.5-1 includes the commodities of switchyard bus and connections, high-voltage insulators, transmission conductors and connections, and metal enclosed bus (MEB). In the LRA, the applicant stated that these commodities perform an intended function for the restoration of offsite power following an SBO event. In LRA Section 2.1.5.3, the applicant described the in-scope electrical and I&C systems relied upon to meet the requirements in 10 CFR 50.63 in accordance with the guidance in the SRP-LR. The applicant included within the scope of license renewal those systems credited in the SBO coping analysis and systems required for restoring power following an SBO event. This includes (1) the electrical and I&C equipment required to cope with an SBO event and (2) the electrical components in the SBO recovery paths from the first set of switchyard breakers in the 138-kilovolt (kV) switchyard through the startup transformers (XST1 and alternate XST1A) to the 6.9 kV safeguard buses and from the first set of switchyard breakers in the backup 345 kV switchyard through the startup transformers (XST2 and alternate XST2) to the 6.9 kV safeguard buses. LRA Figure 2.5-1, “Restoration Power Path for Offsite Power Following a SBO Event,” shows the offsite power recovery paths following an SBO. It shows electrical equipment in the SBO recovery path from the 6.9 kV safeguard buses to the first circuit breakers connecting the offsite transmission system through the startup transformers.

The NRC staff verified that the applicant did not omit any equipment required to comply with 10 CFR 50.63 based on its review of the SBO information in the FSAR and the LRA. The staff finds that the electrical commodities provided in LRA Table 2.5-1 for the restoration of offsite power following an SBO event conform to the guidance in the SRP-LR and are, therefore, acceptable.

The applicant eliminated cable tie-wraps from the in-scope electrical and I&C commodity groups in LRA Table 2.5-1. The applicant noted that cable tie-wraps are used for training cables, assembling wires or cables into neat bundles, and general housekeeping purposes, but they are not used for cable supports or credited in the seismic qualification of cable trays. The applicant concluded that the cable tie-wraps do not perform a license renewal intended function, as defined in 10 CFR 54.4, and are therefore not subject to AMR. The staff reviewed the FSAR and confirmed that cable tie-wraps are not credited in the CPNPP design basis. Therefore, the staff finds it acceptable to eliminate cable tie-wraps from the commodity groups since they do not perform a license renewal intended function, as described in 10 CFR 54.4.

The staff reviewed the electrical and I&C commodity groups that the applicant identified as within the scope of license renewal in LRA Table 2.5-1 and finds that these commodities are part of the in-scope electrical and I&C systems identified in LRA Table 2.2-1, which satisfy the requirements of 10 CFR 54.4(a), and are consistent with the electrical and I&C commodities listed in SRP-LR Table 2.1-5. Therefore, the staff concludes that there is reasonable assurance that the applicant has identified the components within the scope of license renewal for the electrical and I&C systems.

The applicant applied the screening criterion of 10 CFR 54.21(a)(1)(i) to the commodity groups in LRA Table 2.5-1 to identify those that perform their functions without moving parts or without a change in configuration or properties (i.e., passive). LRA Section 2.5.1.2, “Application of Screening Criterion 10 CFR 54.21 (a)(1)(i) to the Electrical and I&C Components and Commodities,” provides the passive electrical and I&C commodity groups.

The applicant eliminated fuse holders (metallic clamps) from the passive cables and connections commodity group. The applicant stated that an equipment database evaluation was performed, and it was determined that the fuses supporting a system-intended function are part of active equipment such as switchgear, power supplies, power inverters, battery chargers, load centers, and circuit boards. LRA Section 3.6.2.3, “AMR Results Not Consistent With or Not Addressed in the GALL Report,” discusses the database evaluation. The applicant concluded that fuses, including metallic clamps of the fuse holders, are parts of a larger active assembly and are therefore not subject to AMR. The staff verified fuse locations reported in the FSAR and finds that the fuses described in the FSAR are included in active equipment. Based on its review of the information provided for CPNPP fuses in the LRA and FSAR, the staff finds it acceptable to eliminate fuse holders from the passive component commodity groups since they are part of active equipment.

The applicant also identified the in-scope electrical and I&C components that are electrical active components but have a mechanical pressure boundary function, following the guidance of the SRP-LR and NEI 95-10. These components include elements, resistance temperature detectors, sensors, thermocouples, transducers, and electric heaters. In LRA Section 2.1.6.1, the applicant stated that the mechanical review addressed the pressure boundary function for these components. SE Section 2.3 contains the staff's evaluation of the pressure boundary function for these in-scope electrical and I&C components.

The applicant applied the screening criterion of 10 CFR 54.21(a)(1)(ii) to the remaining passive electrical and I&C components and commodity groups to determine those that are long-lived (i.e., not subject to replacement based on a qualified life or specified time period). This screening also involved excluding from an AMR those components that are included in a passive, long-lived commodity group but do not support a license renewal system-intended function.

The applicant excluded from the AMR all the insulated cables and connections commodities and the electrical and I&C penetration assemblies commodities that are included in the CPNPP Environmental Qualification Program because they are subject to replacement based on a qualified life. The staff finds it acceptable to eliminate the cables and connections commodities and the electrical and I&C penetration assemblies commodities that are within the Environmental Qualification Program from the passive, long-lived commodity groups because this practice is consistent with the requirements of 10 CFR 54.21(a)(1)(ii).

The applicant excluded from AMR isolated phase buses in the MEB commodity group. In LRA Section 2.5.1.4, "Application of Screening Criteria 10 CFR 54.21(a)(1)(ii) to Electrical and I&C Commodity Groups," the applicant stated that of the two categories of MEB used at CPNPP, which are the isolated phase bus and the nonsegregated phase bus, the isolated phase bus category does not perform a license renewal intended function. According to CPNPP FSAR Chapter 8, "Electric Power," 22 kV isolated phase buses connect each unit's main generator to its respective main step-up transformer bank. The staff reviewed FSAR Chapter 8 and finds that the 22 kV isolated phase buses do not perform a license renewal intended function in accordance with 10 CFR 54.4(a) since they are NSR components whose failure will not prevent satisfactory accomplishment of the functions identified in 10 CFR 54.4(a)(1), and they are not relied upon to cope with or recover from an SBO. Therefore, the staff finds the exclusion of the isolated phases in the MEB commodity group from license renewal acceptable.

The applicant subjected to AMR all remaining passive and long-lived electrical and I&C commodities that perform license renewal intended functions. LRA Table 2.5-2 lists the following electrical and I&C commodities that required an AMR and their associated component intended functions:

- non-Environmental Qualification insulated cables and connections—electrical continuity
- metal enclosed bus (for SBO recovery)
  - bus and conductors—electrical continuity

  - electrical insulation and internal insulators—insulate (electrical)
- high-voltage insulators (for SBO recovery)—insulate (electrical)
- switchyard bus and connections (for SBO recovery)—electrical continuity
- transmission conductors and connections (for SBO recovery)—electrical continuity
- uninsulated ground conductors and connections—electrical continuity

The staff reviewed the electrical and I&C commodities subject to AMR in LRA Table 2.5-2 to verify that the applicant did not omit any passive and long-lived components that meet the screening criteria of 10 CFR 54.21(a)(1). The staff finds that the CPNPP electrical and I&C commodities subject to an AMR identified in LRA Table 2.5-2 are consistent with SRP-LR Table 2.1-5 and meet the criteria in 10 CFR 54.21(a)(1)(i) and 10 CFR 54.21(a)(1)(ii). Therefore, the staff concludes that there is reasonable assurance that the applicant has identified the electrical and I&C components subject to an AMR in accordance with 10 CFR 54.21(a)(1).

2.5.3 Conclusion

Based on the staff's evaluation in SE Section 2.5.2 and on a review of the LRA and FSAR, the staff concludes that the applicant appropriately identified the electrical and I&C system components within the scope of 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 staff reviewed the information in LRA Section 2. The staff determined that the applicant's scoping and screening methodology is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

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

SECTION 3 AGING MANAGEMENT REVIEW RESULTS

This section of the safety evaluation (SE) contains the U.S. Nuclear Regulatory Commission (NRC) staff's evaluation of the Vistra Operations Company LLC (the applicant) aging management reviews (AMRs) and aging management programs (AMPs) for Comanche Peak Nuclear Power Plant, Units 1 and 2 (CPNPP).

The applicant described these AMRs and AMPs in its license renewal application (LRA) for CPNPP. LRA Section 3 provides the results of the applicant's AMRs for those structures and components (SCs) identified in LRA Section 2 as within the scope of license renewal and subject to an AMR. LRA Appendix B lists the 43 AMPs that the applicant will rely on to manage or monitor the aging of passive, long-lived SCs.

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

(1) reactor vessel, internals, and reactor coolant system (Safety Evaluation [SE] Section 3.1)
(2) engineered safety features (SE Section 3.2)
(3) auxiliary systems (SE Section 3.3)
(4) steam and power conversion systems (SE Section 3.4)
(5) containments, structures, and component supports (SE Section 3.5)
(6) electrical and instrumentation and controls (SE Section 3.6)

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

In preparing the LRA, the applicant credited NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report" (GALL-LR Report), dated December 2010 (ML103490041), for AMPs and AMR items. The NRC may issue a renewed license in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 54.29(a)(1) if the Commission finds that the applicant has or will take actions to manage the effects of aging during the period of extended operation on the functionality of structures and components that the staff has identified as requiring review under 10 CFR 54.21(a)(1). The GALL-LR Report summarizes generic AMPs that the staff has determined would be adequate to manage the effects of aging on related SCs subject to an AMR.

The GALL-LR Report identifies the following related to AMPs:

- structures, systems, and components
- 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 License Renewal Application

The applicant submitted an application based on the guidance in NUREG-1800, Revision 2, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants” (SRP-LR), issued December 2010 (ML103490036), and the guidance provided by Nuclear Energy Institute (NEI) 95-10, Revision 6, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54—The License Renewal Rule,” issued June 2005 (ML051860406). The NRC endorsed the latter as acceptable for use in performing AMRs and drafting LRAs in Regulatory Guide (RG) 1.188, Revision 2, “Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses,” issued April 2020 (ML20017A265).

The organization of LRA Section 3 follows the recommendations in NEI 95-10 and parallels the section structure of SRP-LR, Section 3. LRA Section 3 presents the results of the applicant’s AMRs in the following two table types:

(1) Table 1’s: Table 3.x.1, where “3” indicates the LRA section number, “x” indicates the subsection number from the GALL-LR Report, and “1” indicates that this is the first table type in LRA Section 3.
(2) Table 2’s: Table 3.x.2-y, where “3” indicates the LRA section number, “x” indicates the subsection number from the GALL-LR Report, “2” indicates that this is the second table type in LRA Section 3, and “y” indicates the table number for a specific system.

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

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

3.0.2 Staff’s Review Process

The staff conducted three types of evaluations of CPNPP’s AMR items and the AMPs listed in LRA Section 3 and Appendix B that are credited for managing the effects of aging:

(1) For items that the applicant stated are consistent with the GALL-LR Report, the staff conducted either an audit or a technical review to determine consistency. GALL-LR Report AMPs and AMR analyses are one acceptable method for managing the effects of aging; thus, the staff did not reevaluate those AMPs and AMRs that were determined to be consistent with the GALL-LR Report.
(2) For items that the applicant stated were consistent with the GALL-LR Report with exceptions, enhancements, or both, the staff conducted either an audit or a technical review of the item to determine consistency. Additionally, the staff conducted either an audit or a technical review of the applicant’s technical justifications for the exceptions or the adequacy of the enhancements.

The SRP-LR states that an applicant may take one or more exceptions to specific GALL-LR Report AMP elements; however, any exception to the GALL-LR Report AMP should be described and justified. Therefore, the staff considers exceptions as being portions of the GALL-LR 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-LR 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 LRA review, the staff conducted a regulatory audit from December 12, 2022, to May 18, 2023, in accordance with the audit plan dated November 23, 2022 (ML22304A191), as supplemented by letter dated January 4, 2023 (ML22355A043), and as detailed in the Audit Report dated August 9, 2023 (ML23172A136).

These audits and technical reviews were conducted to determine if the Commission can make the findings of 10 CFR 54.29(a)(1) such that there is reasonable assurance that activities authorized by the 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 structures and components 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-LR Report AMPs, the staff conducted either an audit or a technical review to confirm that the applicant's AMPs are consistent with the GALL-LR Report. 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-LR Report, the staff performed a full review to determine their adequacy. The staff evaluated the AMPs against the following 10 program elements identified in Table A.1-1 of the SRP-LR:

(1) "scope of program"—should include the specific SCs subject to an AMR for license renewal (LR)
(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); 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"—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 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" (OE)—should add the OE applicable to the AMP, including past corrective actions resulting in program enhancements or additional programs, to provide objective evidence to support the conclusion that the effects of aging will be adequately managed so that the SC-intended function(s) will be maintained during the period of extended operation.

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

Details of the staff's audit evaluation of program elements 1 through 7 and 10 are documented in the Audit Report and summarized in SE Section 3.0.3.

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

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

3.0.2.2 Review of AMR Results

Each LRA Table 2 contains information concerning whether the AMRs identified by the applicant align with the GALL-LR Report AMRs. For a given AMR in a Table 2, the staff reviewed the intended function, material, environment, aging effect requiring management (AERM), and AMP combination for a particular system component type. Item numbers in column seven, "NUREG-1801 Item," of each LRA Table 2 correlate to an AMR combination identified in the GALL-LR Report. The staff also conducted a technical review of combinations not consistent with the GALL-LR Report. Column eight, "Table 1 Item," refers to a number indicating the correlating row in Table 1.

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

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

Note A indicates that the AMR item is consistent with the GALL-LR Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL-LR Report AMP. The staff audited these items to verify consistency with the GALL-LR 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-LR Report AMP.

Note B indicates that the AMR item is consistent with the GALL-LR Report for component, material, environment, and aging effect. Because the AMP takes one or more exceptions to the

GALL-LR Report AMP, the staff audited these items to verify consistency with the GALL-LR 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-LR Report AMPs.

Note C indicates that the component for the AMR item is different than that in the GALL-LR Report but that the item is otherwise consistent with the GALL-LR Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL-LR Report AMP. This note indicates that the applicant was unable to find an AMR item associated with the component in the GALL-LR Report but found a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these items to verify consistency with the GALL-LR 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-LR Report AMP.

Note D indicates that the component for the AMR item is different than that in the GALL-LR Report but that the item is otherwise consistent with the GALL-LR Report for material, environment, and aging effect. In addition, the AMP takes one or more exceptions to the GALL-LR 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-LR Report but found a different component with the same material, environment, aging effect, and AMP as the component under review. Note D is used to indicate that the applicant has taken one or more exceptions to the GALL-LR Report AMP. The staff audited these items to verify consistency with the GALL-LR 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-LR Report AMPs.

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

3.0.2.3 Updated Final Safety Analysis Report Supplement

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

3.0.2.4 Documentation and Documents Reviewed

In performing the review, the staff used the LRA, LRA supplements, SRP-LR, GALL-LR Report, and the applicant's responses to requests for additional information (RAIs) and requests for confirmation of information (RCIs). Additionally, although the LRA is for an initial LR, the staff considered the GALL-SLR Report for subsequent license renewal in some cases. As stated in the GALL-SLR Report, applicants for initial LR (40–60 years) may use aging management guidance from SLR (60–80 years) in their applications. Accordingly, as discussed in this SE, the staff also used the GALL-SLR Report, SRP-SLR, and other SLR guidance in performing its review.

During the regulatory audit, the staff examined the applicant's justifications, as documented in the Audit Report, to verify that the applicant's activities and programs are adequate to manage the effects of aging on SCs. The staff also conducted detailed discussions and interviews with the applicant's LR 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 LRA Appendix B, "Aging Management Programs." The table also indicates (1) whether the AMP is an existing or new program, (2) the staff's final disposition of the AMP, (3) the GALL-LR Report program to which the applicant's AMP was compared, and (4) the SE Section that documents the staff's evaluation of the program.

Table 3.0-1 Comanche Peak Aging Management Programs

Comanche Peak Aging Management Program	LRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-1801 GALL-LR Report	Corresponding Aging Management Program in the GALL-LR Report	Corresponding Section in this Safety Evaluation
Fatigue Monitoring	A.2.1.1 B.2.2.1	Existing	Consistent with enhancements	X.M1 Fatigue Monitoring	3.0.3.2.1
Environmental Qualification of Electric Components	A.2.1.2 B.2.2.2	Existing	Consistent with enhancement	X.E1 Environmental Qualification of Electric Components	3.0.3.2.2
ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	A.2.2.1 B.2.3.1	Existing	Consistent	XI.M1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	3.0.3.1.1
Water Chemistry	A.2.2.2 B.2.3.2	Existing	Consistent with exception and enhancement	XI.M2 Water Chemistry	3.0.3.2.3
Reactor Head Closure Stud Bolting	A.2.2.3 B.2.3.3	Existing	Consistent with exception and enhancements	XI.M3 Reactor Head Closure Stud Bolting	3.0.3.2.4
Boric Acid Corrosion	A.2.2.4 B.2.3.4	Existing	Consistent	XI.M10 Boric Acid Corrosion	3.0.3.1.2
Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components	A.2.2.5 B.2.3.5	Existing	Consistent	XI.M11B Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components	3.0.3.1.3

Comanche Peak Aging Management Program	LRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-1801 GALL-LR Report	Corresponding Aging Management Program in the GALL-LR Report	Corresponding Section in this Safety Evaluation
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel	A.2.2.6 B.2.3.6	New	Consistent	XI.M12 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel	3.0.3.1.4
PWR Vessel Internals	A.2.2.7 B.2.3.7	New	Consistent	XI.M16A PWR Vessel Internals	3.0.3.1.5
Flow-Accelerated Corrosion	A.2.2.8 B.2.3.8	Existing	Consistent with exception and enhancements	XI.M17 Flow-Accelerated Corrosion	3.0.3.2.5
Bolting Integrity	A.2.2.9 B.2.3.9	Existing	Consistent with enhancements	XI.M18 Bolting Integrity	3.0.3.2.6
Steam Generators	A.2.2.10 B.2.3.10	Existing	Consistent with exceptions	XI.M19 Steam Generators	3.0.3.2.7
Open-Cycle Cooling Water System	A.2.2.11 B.2.3.11	Existing	Consistent with enhancements	XI.M20 Open-Cycle Cooling Water System	3.0.3.2.8
Closed Treated Water Systems	A.2.2.12 B.2.3.12	Existing	Consistent with exception and enhancement	XI.M21A Closed Treated Water Systems	3.0.3.2.9
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	A.2.2.13 B.2.3.13	Existing	Consistent with enhancements	XI.M23 Boraflex Monitoring	3.0.3.2.10
Compressed Air Monitoring	A.2.2.14 B.2.3.14	Existing	Consistent with enhancements	XI.M24 Compressed Air Monitoring	3.0.3.2.11
Fire Protection	A.2.2.15 B.2.3.15	Existing	Consistent with enhancements	XI.M26 Fire Protection	3.0.3.2.12
Fire Water System	A.2.2.16 B.2.3.16	Existing	Consistent with exceptions and enhancements	XI.M27 Fire Water System	3.0.3.2.13
Fuel Oil Chemistry	A.2.2.17 B.2.3.17	Existing	Consistent with exceptions and enhancements	XI.M30 Fuel Oil Chemistry	3.0.3.2.14
Reactor Vessel Surveillance	A.2.2.18 B.2.3.18	Existing	Consistent with enhancements	XI.M31 Reactor Vessel Surveillance	3.0.3.2.15
One-Time Inspection	A.2.2.19 B.2.3.19	New	Consistent	XI.M32 One-Time Inspection	3.0.3.1.6
Selective Leaching	A.2.2.20 B.2.3.20	New	Consistent	XI.M33 Selective Leaching	3.0.3.1.7
One-Time Inspection of ASME Code Class 1 Small-Bore Piping	A.2.2.21 B.2.3.21	New	Consistent	XI.M35 One-Time Inspection of ASME Code Class 1 Small-Bore Piping	3.0.3.1.8

Comanche Peak Aging Management Program	LRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-1801 GALL-LR Report	Corresponding Aging Management Program in the GALL-LR Report	Corresponding Section in this Safety Evaluation
External Surfaces Monitoring of Mechanical Components	A.2.2.22 B.2.3.22	Existing	Consistent with enhancements	XI.M36 External Surfaces Monitoring of Mechanical Components	3.0.3.2.16
Flux Thimble Tube Inspection	A.2.2.23 B.2.3.23	Existing	Consistent	XI.M37 Flux Thimble Tube Inspection	3.0.3.1.9
Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	A.2.2.24 B.2.3.24	New	Consistent	XI.M38 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	3.0.3.1.10
Lubricating Oil Analysis	A.2.2.25 B.2.3.25	Existing	Consistent with enhancement	XI.M39 Lubricating Oil Analysis	3.0.3.2.17
Monitoring of Neutron-Absorbing Materials Other than Boraflex	A.2.2.26 B.2.3.26	Existing	Consistent with enhancement	XI.M40 Monitoring of Neutron-Absorbing Materials Other than Boraflex	3.0.3.2.18
Buried and Underground Piping and Tanks	A.2.2.27 B.2.3.27	Existing	Consistent with exception and enhancements	XI.M41 Buried and Underground Piping and Tanks	3.0.3.2.19
Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	A.2.2.28 B.2.3.28	Existing	Consistent with exceptions and enhancements	XI.M42 Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	3.0.3.2.20
ASME Section XI, Subsection IWE	A.2.2.29 B.2.3.29	Existing	Consistent with enhancements	XI.S1 ASME Section XI, Subsection IWE	3.0.3.2.21
ASME Section XI, Subsection IWL	A.2.2.30 B.2.3.30	Existing	Consistent with enhancements	XI.S2 ASME Section XI, Subsection IWL	3.0.3.2.22
ASME Section XI, Subsection IWF	A.2.2.31 B.2.3.31	Existing	Consistent with exception and enhancements	XI.S3 ASME Section XI, Subsection IWF	3.0.3.2.23
10 CFR Part 50, Appendix J	A.2.2.32 B.2.3.32	Existing	Consistent	XI.S4 10 CFR Part 50, Appendix J	3.0.3.1.11
Masonry Walls	A.2.2.33 B.2.3.33	Existing	Consistent with enhancements	XI.S5 Masonry Walls	3.0.3.2.24
Structures Monitoring	A.2.2.34 B.2.3.34	Existing	Consistent with enhancements	XI.S6 Structures Monitoring	3.0.3.2.25
RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	A.2.2.35 B.2.3.35	Existing	Consistent with enhancements	XI.S7 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	3.0.3.2.26

Comanche Peak Aging Management Program	LRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-1801 GALL-LR Report	Corresponding Aging Management Program in the GALL-LR Report	Corresponding Section in this Safety Evaluation
Protective Coating Monitoring and Maintenance Program	A.2.2.36 B.2.3.36	Existing	Consistent with enhancement	XI.S8 Protective Coating Monitoring and Maintenance Program	3.0.3.2.27
Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	A.2.2.37 B.2.3.37	New	Consistent	XI.E1 Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.1.12
Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	A.2.2.38 B.2.3.38	New	Consistent	XI.E2 Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	3.0.3.1.13
Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	A.2.2.39 B.2.3.39	New	Consistent	XI.E3 Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.1.14
Metal Enclosed Bus	A.2.2.40 B.2.3.40	New	Consistent	XI.E4 Metal Enclosed Bus	3.0.3.1.15
Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	A.2.2.41 B.2.3.41	New	Consistent	XI.E6 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.1.16

3.0.3.1 AMPs Consistent with the GALL-LR Report

In LRA Appendix B, the applicant identified the following AMPs as consistent with the GALL-LR Report:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- Boric Acid Corrosion
- Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components

- Thermal Aging Embrittlement of Cast Austenitic Stainless Steel
- PWR Vessel Internals
- One-Time Inspection
- Selective Leaching
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping
- Flux Thimble Tube Inspection
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components
- 10 CFR Part 50, Appendix J
- Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits
- Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- Metal Enclosed Bus
- Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

In the following sections, the staff discusses the results of the evaluation of these AMPs, listing any amendments to the programs during the review, a summary of the staff's determination of consistency, any RAIs and applicant responses, OE, and a review of the applicant's final safety analysis report (FSAR) supplement summary of the program.

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

LRA Section B.2.3.1 states that the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP is consistent with the program described in the GALL-LR Report AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, & IWD."

<u>Staff Evaluation</u>. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M1.

Based on a review of LRA Section B.2.3.1, 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 are consistent with the corresponding program elements of GALL-LR Report AMP XI.M1.

<u>Operating Experience</u>. LRA Section B.2.3.1 summarizes OE related to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMP to manage the effects of aging during the period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program.

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

FSAR Supplement. LRA Section A.2.2.1 provides the FSAR supplement for ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff finds that the information in the FSAR 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 staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.2 Boric Acid Corrosion

LRA Section B.2.3.4 describes the Boric Acid Corrosion program as an existing condition monitoring program that is consistent with the program elements in the GALL-LR Report AMP XI.M10, "Boric Acid Corrosion."

Staff Evaluation. As documented in the audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 described in the associated program basis document to the corresponding program elements of GALL-LR Report AMP XI.M10. Based on its audit and review of the LRA, the staff finds that all of the noted program elements are consistent with the corresponding program elements of GALL-LR Report AMP XI.M10.

Operating Experience. LRA Section B.2.3.4 summarizes OE related to the Boric Acid Corrosion program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff reviewed the plant OE information: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database and (b) to 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 period of extended operation. The staff did not identify any OE indicating that the applicant should modify its existing program.

Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Boric Acid Corrosion program was evaluated.

FSAR Supplement. LRA Section A.2.2.4 provides the FSAR supplement for the Boric Acid Corrosion program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed, in LRA Table A-3, to continue the existing Boric Acid Corrosion program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Boric Acid Corrosion program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. The staff also 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

LRA Section B.2.3.5, as amended by LRA Supplement 1, dated April 6, 2023 (ML23096A302), describes the existing Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components program consistent with GALL-LR 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 (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M11B.

Based on a review of the LRA, 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-LR Report AMP XI.M11B.

Operating Experience. LRA Section B.2.3.5 summarizes OE related to the cracking of nickel-alloy components and loss of material due to boric acid-induced corrosion in reactor coolant pressure boundary components. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation.

The staff verified that the applicant has reviewed the following industry guidance and NRC-issued generic communications for applicability and incorporation into its inservice inspection (ISI) program:

- Electric Power Research Institute (EPRI) Technical Report (TR) 3002017288, "Materials Reliability Program: Guideline for Nondestructive Examination of Reactor Vessel Upper Head Penetrations, Revision 1 (MRP-384)," as an industry initiative under NEI 03-08, "Guideline for the Management of Materials Issues," dated December 11, 2019

- Regulatory Issue Summary (RIS) 2018-06, "Clarification of the Requirements for Reactor Pressure Vessel Upper Head Bare Metal Visual Examinations," dated December 10, 2018 (ML18178A137)

- RIS 2015-10, "Applicability of ASME Code Case N-770-1 as Conditioned in 10 CFR 50.55a, 'Codes and Standards,' to Branch Connection Butt Welds," dated July 16, 2015 (ML15168A131)

The staff did not identify any OE 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 OE 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 program was evaluated.

FSAR Supplement. LRA Section A.2.2.5 provides the FSAR supplement for the cracking of nickel-alloy components and loss of material due to boric acid-induced corrosion in reactor coolant pressure boundary components. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. 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 program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the FSAR 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 program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.4 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel

LRA Section B.2.3.6 describes the new Thermal Aging Embrittlement of Cast Austenitic Stainless Steel program as consistent with GALL-LR Report AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel."

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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-LR Report AMP XI.M12.

Based on a review of the LRA, 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-LR Report AMP XI.M12. The staff finds that the AMP is adequate to manage the applicable aging effects.

For the “detection of aging effects” program element, the staff reviewed the applicant’s screening results, which identified three reactor coolant loop components that are susceptible to thermal aging embrittlement. The staff also reviewed the applicant’s flaw tolerance evaluation for the three susceptible components for the period of extended operation. The staff finds that the applicant’s plant-specific flaw tolerance evaluation is acceptable because: (a) the fracture toughness values for the thermally embrittled cast austenitic stainless steel (CASS) were estimated in accordance with NUREG/CR-4513, Revision 2, “Estimation of Fracture Toughness of Cast Stainless Steels during Thermal Aging in LWR Systems,” issued May 2016, (b) the evaluation was performed in accordance with guidance in the GALL-LR Report, and (c) results of the bounding flaw tolerance evaluation successfully demonstrated that the subject materials have adequate fracture toughness to address thermal aging embrittlement for the period of extended operation. The staff further noted that the applicant has demonstrated that the susceptible CASS components at CPNPP, Units 1 and 2, have tolerance for flaws, such that even if a component had an undetected flaw that would grow in time, the final flaw size in the proposed 60-year plant life would be significantly less than the critical flaw size. Therefore, the flaw tolerance analysis demonstrates that the thermally embrittled CASS components would not affect the structural integrity of the piping during the period of extended operation.

Operating Experience. LRA Section B.2.3.6 summarizes OE related to the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information: (a) to identify examples of age-related degradation, as documented in the applicant’s corrective action program database and (b) to 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 period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel program was evaluated.

FSAR Supplement. LRA Section 2.2.6 in Appendix A provides the FSAR supplement for the AMP B2.3.6, “Thermal Aging Embrittlement of Cast Austenitic Stainless Steel.” The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff noted that the applicant committed to ongoing implementation of the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its review of the applicant’s Thermal Aging Embrittlement of Cast Austenitic Stainless Steel program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.5 PWR Vessel Internals

LRA Section B.2.3.7, "PWR Vessel Internals," states that the pressurized water reactor (PWR) Vessel Internals program is a new AMP that will be consistent with the program elements in AMP XI.M16A, "PWR Vessel Internals," of the GALL-LR Report, as modified in Interim Staff Guidance (ISG) SLR-ISG-2021-01-PWRVI, "Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized-Water Reactors," issued January 2021.

The applicant stated that the PWR Vessel Internals AMP, in accordance with NEI 03-08, will implement MRP-227, Revision 1-A (ML19339G350), or the latest NRC-approved revision of MRP-227, which will be applied through the use of MRP-228, Revision 3), or the latest NRC-approved revision of MRP-228. The applicant stated that MRP-227, Revision 1-A, was written for an operating period of 60 years; therefore, a gap analysis to identify program enhancements that are needed to address an 80-year operating period are not relevant to CPNPP.

The applicant further stated that LRA Section B.2.3.7 takes no exception to the GALL-LR Report and has no enhancements.

The applicant amended this LRA section by letter dated April 6, 2023 (ML23096A302) as discussed further in this SE.

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA B.2.3.7 to the corresponding program elements of GALL-LR Report, Revision 2, AMP XI.M16A, as updated in SLR-ISG-2021-01-PWRVI. As discussed in the GALL-SLR Report, applicants for initial LR (40–60 years) may use aging management guidance from SLR (60–80 years) in their applications. In its review, the staff used the acceptance criteria in MRP-227, Revision 1-A, including inspection and evaluation methodology criteria as discussed in SLR-ISG-2021-01-PWRVI. The staff also used review procedures given in SRP-LR Sections 3.1.3.2.9 and 3.1.3.2.10, as updated in SLR-ISG-2021-01 PWRVI.

The staff noted that its SE dated April 25, 2019 (ML19081A001) for MRP-227, Revision 1, specified an LR applicant action item, A/LAI 1, that applicants or licensees that find degradation of baffle-former bolts (BFBs) comply with the following:

> If the table in MRP 2017-009 dated March 15, 2017 (ML17087A106) indicates that the subsequent inspection interval is not to exceed 6 years (e.g., downflow plants with ≥ 3 percent BFBs with indications or clustering, or upflow plants with ≥ 5 percent of BFBs with indications or clustering), the plant-specific evaluation to determine a subsequent inspection interval shall be submitted to the NRC for information within one year following the outage in which the degradation was found. Any evaluation to lengthen the determined inspection interval or to exceed the maximum inspection interval recommended in MRP 2017-009 shall be submitted to the NRC for information at least one year prior to the end of the current applicable interval for BFB subsequent examination.

For the above action item, LRA Section B.2.3.7 further states that Westinghouse guidance uses a four-tiered approach to categorize the relative risk of BFB failure. Tier 1 plants have the highest risk of BFB failure because the coolant in the reactor vessel (RV) is in the downflow direction. Tier 4 plants have the lowest risk because the coolant in the RV is in the upflow direction. The applicant stated that CPNPP is considered a Tier 4 plant and therefore has the lowest risk of BFB failure. The applicant further stated that plants in the Tier 4 category must perform a baseline inspection no later than 35 effective full-power years (EFPYs). The applicant stated that CPNPP has not yet completed baseline volumetric examinations of the BFBs; however, it will perform baseline inspections of BFBs prior to 35 EFPYs for Units 1 and 2. The staff noted that LRA Section B.2.3.7 states that the PWR Vessel Internals AMP will be consistent with MRP-227, Revision 1-A, which includes the staff's SE (ML19081A001). As stated in A/LAI 1 above, in order to credit MRP-227, Revision 1, for its PWR Vessel Internals AMP, the applicant needs to follow the guidance in MRP 2017-009 in the inspection of the BFBs. The applicant did not take exception to the A/LAI 1 action item in the staff's SE for MRP-227, Revision 1-A. As such, the applicant will follow A/LAI 1 action item. Therefore, the staff finds that the applicant has adequately addressed the A/LAI 1 action item.

Based on the review of the LRA 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-LR Report AMP XI.M16A, as updated in SLR-ISG-2021-01-PWRVI.

<u>Operating Experience</u>. LRA Section B.2.3.7 summarizes OE related to the PWR Vessel Internals program. The staff reviewed OE in LRA Section 2.3.7 and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation.

The staff's audit review of the PWR Vessel Internals program is documented in Section B.2.3.7 of the Audit Report. The scope of the staff's review included the review of any generic or plant-specific OE that could potentially impact the inspection and evaluation criteria for evaluated reactor vessel internal (RVI) components in the AMP from what is described and defined for the components in MRP-227, Revision 1-A. The staff's Audit Report input for LRA Section B.2.3.7 summarizes OE that the staff confirmed to be bound by the GALL-LR Report or SRP-LR guidance during its audit of the AMP. However, during the staff's audit, the applicant identified a discrepancy in the scheduled date for the baseline inspection at Unit 2 as discussed below.

LRA Section B.2.3.7 discusses that the modified baseline inspection schedule for guide tubes and associated guide cards at CPNPP, Units 1 and 2, is no later than 29 EFPY. The LRA states that the Unit 2 inspection will occur prior to reaching 29 EFPY during the outage occurring in spring 2023. During the audit, the applicant stated that the spring 2023 baseline inspection schedule was incorrect. By supplement dated April 6, 2023 (ML23096A302), the applicant corrected the baseline inspection schedule for Unit 2 to the fall 2024 outage. The staff finds the change to the baseline inspection schedule acceptable because the fall 2024 inspection is before the applicant's commitment to implement AMP B2.3.7 in August 2032, as specified in LRA Section A.4, "License Renewal Commitments List," Table A.3, "Commitment List." The staff did not identify any additional OE indicating that the applicant should modify its proposed program.

Based on its evaluation, the staff concludes that the “scope of program,” “parameters monitored,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program element criteria for the components are acceptable for implementation. Additionally, based on the staff’s audit and review of the LRA, the staff finds that the conditions and OE at CPNPP are bounded by those for which the PWR Vessel Internals program was evaluated and are acceptable.

FSAR Supplement. LRA Section A.2.2.7 provides the FSAR supplement for the PWR Vessel Internals program. The staff reviewed the FSAR supplement description in LRA Section A.2.2.7 related to the PWR Vessel Internals program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. As shown in LRA Section A.4, Table A.3, No. 9, the staff noted that the applicant has committed to implementing the new PWR Vessel Internals AMP for managing the effects of aging for applicable components no later than six months prior to the period of extended operation, or no later than the last refueling outage prior to the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the PWR Vessel Internals program.

Conclusion. Based on its review, the staff concludes that LRA Section B.2.3.7 is consistent with AMP XI.M16A of the GALL-LR Report, Revision 2, as updated in SLR-ISG-2021-01-PWRVI. 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.6 One-Time Inspection

LRA Section B.2.3.19 describes the new One-Time Inspection program as consistent with GALL-LR Report AMP XI.M32, “One-Time Inspection.” The applicant amended this LRA section by letters dated April 6 and 24, 2023 (ML23096A302 and ML23114A377, respectively).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant’s claim of consistency with the GALL-LR 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 the GALL-LR Report AMP XI.M32, “One-Time Inspection.”

Based on a review of the LRA and 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 are consistent with the corresponding program elements of the GALL-LR Report AMP XI.M32.

Operating Experience. LRA Section B.2.3.19 summarizes OE related to the One-Time Inspection program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff reviewed search results of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database and (b) provide a basis for the staff’s conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the One-Time Inspection program was evaluated.

FSAR Supplement. LRA Section A.2.2.19 provides the FSAR supplement for the One-Time Inspection program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to implementing the new One-Time Inspection program no later than six months prior to the period of extended operation, or no later than the last refueling outage prior to the period of extended operation, for managing the effects of aging for applicable components. The applicant also committed to perform the pre-period of extended operation inspections within the 10-year period prior to the period of extended operation. The staff finds that the information in the FSAR supplement, as amended by letter dated April 24, 2023 (ML23114A377), is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's One-Time Inspection program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.7 Selective Leaching

LRA Section B.2.3.20 describes the new Selective Leaching program as consistent with GALL-LR Report AMP XI.M33, "Selective Leaching," as amended by LR-ISG-2011-03, "Changes to the GALL-LR Report Revision 2 AMP XI.M41, 'Buried and Underground Piping and Tanks,'" dated August 2, 2012 (ML12138A296), and LR-ISG-2015-01, "Changes to Buried and Underground Piping and Tank Recommendations," dated February 4, 2016 (ML15308A018). The applicant amended this LRA section by letter dated April 24, 2023 (ML23114A377).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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-LR Report AMP XI.M33, as amended by LR-ISG-2011-03 and LR-ISG-2015-01.

For the "detection of aging effect" program element, the staff noted that the inspection sample size for buried components is less than the sample size specified in GALL-LR Report AMP XI.M33. During the audit, and as confirmed by the applicant through RCI B.2.3.20-1, dated June 13, 2023 (ML23164A223), the staff noted that at a minimum, the following one-time inspections will be performed within the five year period prior to entering the period of extended operation: (a) the external surface of one buried gray cast iron valve body or one buried gray cast iron fire hydrant and (b) the external surfaces of a 10-foot section of buried cement-lined ductile iron piping. The staff finds this reduced inspection sample size acceptable for the following reasons: (1) the staff observed the applicant's search of its OE database using the keyword "graphiti" (to capture "graphitic corrosion" or "graphitization") during its audit, which did not return any results, (2) the staff's review of plant-specific OE provided by the applicant did not identify any instances of selective leaching for components exposed to a soil environment, (3) as amended by letter dated April 24, 2023 (ML23114A377), LRA Section B.2.3.20 was revised to clarify that the subject buried components are externally coated, (4) as noted in the OE discussion in SE Section 3.0.3.2.19, "Buried and Underground Piping and Tanks," the staff found that buried piping coating damage identified during an opportunistic inspection by the applicant in April 2015 was not representative of the condition of buried piping in-scope for LR, (5) GALL-LR Report AMP XI.M33 allows for reduction or elimination of buried component inspections based on the condition of external surface coatings, and (6) the focus of NRC IN-20-04, "Operating Experience Regarding Failure of Buried Fire Protection Main Yard Piping," dated December 17, 2020 (ML20223A333), is gray cast iron piping, whereas CPNPP has less susceptible ductile iron piping.

Based on a review of the LRA (as amended) and the applicant's response to RCI B.2.3.20-1, 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 are consistent with the corresponding program elements of GALL-LR Report AMP XI.M33.

<u>Operating Experience</u>. LRA Section B.2.3.20 summarizes OE related to the Selective Leaching program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff reviewed plant OE information provided by the applicant to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation.

The staff did not identify any OE 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 OE at the plant are bounded by those for which the Selective Leaching program was evaluated.

<u>FSAR Supplement</u>. LRA Section A.2.2.20 provides the FSAR supplement for the Selective Leaching program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to implementing the new Selective Leaching program no later than 6 months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

<u>Conclusion</u>. Based on its review of the applicant's Selective Leaching program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.8 One-Time Inspection of ASME Code Class 1 Small-Bore Piping

LRA Section B.2.3.21 states that the One-Time Inspection of ASME Code Class 1 Small-Bore Piping is a new program that will be consistent with the program elements in the GALL-LR Report AMP XI.M35, "ASME Code Class 1 Small-Bore Piping."

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M35.

Based on a review of the LRA, 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-LR Report AMP XI.M35.

Operating Experience. LRA Section B.2.3.21 summarizes OE related to the ASME Code Class 1 Small-Bore Piping program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMP to manage the effects of aging during the period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program.

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

FSAR Supplement. LRA Section A.2.2.21 provides the FSAR supplement for ASME Code Class 1 Small-Bore Piping program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LRA Table 3.0-1. The staff also noted that the applicant committed to implementing the new ASME Code Class 1 Small-Bore Piping program within 6 years prior to the start of the period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's ASME Code Class 1 Small-Bore Piping program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.9 Flux Thimble Tube Inspection

LRA Section B.2.3.23, as amended by letter dated April 6, 2023 (ML23096A302), describes the existing Flux Thimble Tube Inspection program as consistent with GALL-LR Report AMP XI.M37, "Flux Thimble Tube Inspection."

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 the GALL-LR Report AMP XI.M37.

Based on the review of the LRA 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 the GALL-LR Report AMP XI.M37. The "detection of aging effects" program element, as modified by Supplement 1, is acceptable because (1) it aligns the description of the AMP with the description in the program basis document,(2) it provides sufficient indication of wall thinning occurring in the flux thimble tubes, and (3) it is consistent with the corresponding program element of the GALL-LR Report AMP XI.M37.

Operating Experience. LRA Section B.2.3.23 summarizes OE related to the Flux Thimble Tube Inspection program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program.

Based on its audit and review, the staff finds that the conditions and OE at the plant are bounded by those for which the Flux Thimble Tube Inspection program was evaluated.

FSAR Supplement. LRA Section A.2.2.23 provides the FSAR supplement for the Flux Thimble Tube Inspection program. The staff reviewed this FSAR Supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Flux Thimble Tube Inspection program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.10 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

LRA Section B.2.3.24 describes the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program as consistent with GALL-LR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," as modified by LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation," dated November 22, 2013 (ML13227A361). The applicant amended this LRA section by letter dated April 24, 2023 (ML23114A377).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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-LR Report AMP XI.M38, as modified by LR-ISG-2012-02. Based on a review of the LRA (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 are consistent with the corresponding program elements of GALL-LR Report AMP XI.M38.

Operating Experience. LRA Section B.2.3.24 summarizes OE related to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff reviewed plant OE information provided by the applicant to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation.

The staff did not identify any OE 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 OE at the plant are bounded by those for which the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program was evaluated.

FSAR Supplement. LRA Section A.2.2.24 provides the FSAR supplement for the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to implementing the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program no later than 6 months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the FSAR supplement 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 program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.11 10 CFR Part 50, Appendix J

LRA Section B.2.3.32 describes the existing 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities,” Appendix J, “Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors,” program as consistent with GALL-LR Report AMP XI.S4, “10 CFR Part 50, Appendix J.”

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant’s claim of consistency with the GALL-LR 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-LR Report AMP XI.S4.

Based on a review of the LRA, 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-LR Report AMP XI.S4.

Operating Experience. LRA Section B.2.3.32 summarizes OE related to the 10 CFR Part 50, Appendix J program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the period of extended operation.

The staff did not identify any OE 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 OE at the plant are bounded by those for which the 10 CFR Part 50, Appendix J program was evaluated.

FSAR Supplement. LRA Section A.2.2.32 provides the FSAR supplement for the 10 CFR Part 50, Appendix J program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that in LRA Table A-3, the applicant committed to ongoing implementation of the existing 10 CFR Part 50, Appendix J program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

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

3.0.3.1.12 Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

LRA Section B.2.3.37 describes the new Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program as consistent with GALL-LR Report XI.E1, “Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.”

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant’s claim of consistency with the GALL-LR 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-LR Report AMP XI.E1.

Based on a review of the LRA, 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-LR Report AMP XI.E1.

Operating Experience. LRA Section B.2.3.37 summarizes OE related to the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program was evaluated.

FSAR Supplement. LRA Section A.2.2.37 provides the FSAR supplement for Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to implementing the new Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program no later than 6 months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.13 Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits

LRA Section B.2.3.38 describes the new Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program as consistent with GALL-LR Report AMP XI.E2, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits."

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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-LR Report AMP XI.E2.

Based on a review of the LRA, 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-LR Report AMP XI.E2.

Operating Experience. LRA Section B.2.3.38 summarizes OE related to the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program was evaluated.

FSAR Supplement. LRA Section A.2.2.38 provides the FSAR supplement for the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to implementing the new Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program no later than six months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.14 Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

LRA Section B.2.3.39 describes the new Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements as consistent with GALL-LR Report AMP XI.E3, "Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding elements of the GALL-LR Report AMP XI.E3.

Based on a review of the LRA, the staff finds that the "scope of the 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-LR Report AMP XI.E3.

Operating Experience. LRA Section B.2.3.39 summarizes OE related to the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualifications Requirements program was evaluated.

FSAR Supplement. LRA Section A.2.2.39 provides the FSAR supplement for the Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to implementing the new Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program no later than six months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.15 Metal Enclosed Bus

LRA Section B.2.3.40 describes the new Metal Enclosed Bus program as consistent with GALL-LR Report AMP XI.E4, "Metal Enclosed Bus."

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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-LR Report AMP XI.E4.

Based on a review of the LRA, 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 the GALL-LR Report AMP XI.E4.

Operating Experience. LRA Section B.2.3.40 summarizes OE related to the Metal Enclosed Bus program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the Metal Enclosed Bus program was evaluated.

FSAR Supplement. LRA Section A.2.2.40 provides the FSAR supplement for the Metal Enclosed Bus program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to implementing the new Metal Enclosed Bus program no later than six months before the period of extended operation or no later than the last refueling outage before the period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Metal Enclosed Bus program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by

10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

LRA Section B.2.3.41 describes the new Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program as consistent with GALL-LR Report AMP XI.E6, “Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.”

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant’s claim of consistency with the GALL-LR 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-LR Report AMP XI.E6.

Based on a review of the LRA, 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 the GALL-LR Report AMP XI.E6.

Operating Experience. LRA Section B.2.3.41 summarizes OE related to the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program was evaluated.

FSAR Supplement. LRA Section A.2.2.41 provides the FSAR supplement for the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. 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 program no later than six months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the FSAR 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 program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

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

- Fatigue Monitoring
- Environmental Qualification of Electric Components
- Water Chemistry
- Reactor Head Closure Stud Bolting
- Flow-Accelerated Corrosion
- Bolting Integrity
- Steam Generators
- Open-Cycle Cooling Water System
- Closed Treated Water Systems
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems
- Compressed Air Monitoring
- Fire Protection
- Fire Water System
- Fuel Oil Chemistry
- Reactor Vessel Surveillance
- External Surfaces Monitoring of Mechanical Components
- Lubricating Oil Analysis
- Monitoring of Neutron-Absorbing Materials Other than Boraflex
- 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
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants
- Protective Coating Monitoring and Maintenance Program

For AMPs that the applicant claimed are consistent with the GALL-LR Report with exception(s) enhancement(s), or both, the 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-LR Report are indeed consistent. The staff reviewed the exceptions to the GALL-LR 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-LR Report AMP to which it is compared. Because the LRA groups the enhancements by program element and does not individually number each enhancement, the numbering of each enhancement evaluation reflects the order in which the enhancements are listed in the application. The results of the staff's audits and reviews are documented in the following sections.

3.0.3.2.1 Fatigue Monitoring

LRA 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 GALL-LR Report AMP X.M1, "Fatigue Monitoring." The applicant amended this LRA section by letters dated April 6, 2023, and July 12, 2023 (ML23096A302 and ML23193A846, respectively).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP X.M1. For the portions of the program elements not associated with the program enhancements, the staff found that these program elements of the LRA are consistent with the corresponding program elements of GALL-LR Report AMP X.M1.

The staff also reviewed the portions of the "scope of program," "preventive actions," "parameters monitored or inspected," and "corrective actions" program elements associated with the program 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. LRA Section B.2.2.1 includes an enhancement to the "scope of program" and "preventive actions" program elements. The enhancement relates to modifying the program to calculate the environmentally adjusted cumulative usage factor (CUF_{en}) values for the locations that are determined to be sentinel (limiting) locations in the environmentally assisted fatigue (EAF) screening evaluation, in addition to the locations listed in NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components," issued February 1995 (ML031480219). LRA Table 4.3.4-1 describes these additional sentinel locations, and SE Section 4.3.4 presents the staff's evaluation of the EAF analysis.

The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP X.M1. The staff finds the enhancement acceptable because, when implemented, it will ensure that (1) the scope of the program includes the calculations of the 60-year CUF_{en} values for the additional sentinel locations that may be more limiting than those listed in NUREG/CR-6260 and (2) these CUF_{en} values are monitored in the program to prevent the limiting CUF_{en} values from exceeding the design limit of 1.0 for the period of extended operation, consistent with GALL-LR Report AMP X.M1. The monitoring of the CUF_{en} values is further discussed in the evaluation of Enhancement 2 below in relation to the "preventive actions" program element.

Enhancement 2. LRA Section B.2.2.1, as supplemented by letter dated April 6, 2023 (ML23096A302), includes an enhancement to the "preventive actions" program element. The enhancement relates to modifying the program to monitor the CUF_{en} at the sentinel locations, consistent with the EAF analyses described in LRA Section 4.3.4.

The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP X.M1. The staff finds the enhancement acceptable because, when implemented, it will ensure that (1) the fatigue monitoring includes the CUF_{en} values as well as the cumulative usage factor (CUF) values and (2) the program monitors the effects of the reactor coolant water environment on metal fatigue to meet the CUF_{en} limit of 1.0, consistent with the GALL-LR Report AMP X.M1.

Enhancement 3. LRA Section B.2.2.1, as supplemented by letter dated April 6, 2023 (ML23096A302), includes an enhancement to the "preventive actions" program element. The enhancement relates to modifying the program to monitor the dissolved oxygen of the reactor coolant through the Water Chemistry AMP (LRA Section 2.3.2) to ensure that the dissolved oxygen will remain consistent with that assumed in the EAF analyses (LRA Section 4.3.4).

The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP X.M1 and finds it acceptable because, when implemented, it will ensure that the dissolved oxygen assumed in the CUF_{en} calculations is consistent with the actual dissolved oxygen that is monitored in the Water Chemistry AMP. SE Section 3.0.3.2.3 presents the staff's safety evaluation of the Water Chemistry AMP.

Enhancement 4. LRA Section B.2.2.1, as supplemented by letter dated April 6, 2023 (ML23096A302), includes an enhancement to the "parameters monitored or inspected" program element. The enhancement relates to modifying the program to account for and monitor critical thermal and pressure transients for components that have been identified in the EAF TLAA. The applicant also explained that a transient may not be counted in the fatigue monitoring if the transient results in stresses below the fatigue endurance limit or occurs with an already counted transient.

The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP X.M1. The staff finds the enhancement acceptable because, when it is implemented, it will ensure that (1) the program includes the transients that contribute to the CUF_{en} values and (2) these transients are monitored in the program to confirm that the CUF_{en} values meet the fatigue design limit (i.e., 1.0), consistent with GALL-LR Report AMP X.M1.

Enhancement 5. LRA Section B.2.2.1, as supplemented by letter dated April 6, 2023 (ML23096A302), includes an enhancement to the "acceptance criteria" program element. The enhancement relates to modifying the program to include acceptance criteria based on the 60-year cycle projections used in the EAF analyses to ensure that the CUF_{en} values do not exceed 1.0.

The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP X.M1. The staff finds the enhancement acceptable because, when it is implemented, it will ensure that (1) the program identifies specific acceptance criteria for the transient cycles based on the cycles that are assumed in the CUF_{en} calculation for the period of extended operation and (2) these acceptance criteria associated with the EAF analyses are used to confirm that the CUF_{en} values do not exceed the fatigue design limit, consistent with GALL-LR Report AMP X.M1.

Enhancement 6. LRA Section B.2.2.1, as supplemented by letter dated April 6, 2023 (ML23096A302), includes an enhancement to the "corrective actions" program element. The enhancement relates to modifying the program to clarify when to initiate corrective actions. In this enhancement, the program procedure will be revised to ensure timely corrective actions as actual cycle numbers encroach the acceptance criteria for the initiation of corrective actions. Examples of the clarification of when to initiate corrective actions include the following: (1) the transient count exceeds a prescribed limit (90 percent cycle limit), (2) if the transient count is projected to exceed a design cycle number prior to the next scheduled engineering report for cycle counting (within 2 years), or (3) the transient count is within one of the design cycle number.

The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP X.M1. The staff finds that the clarification of when to initiate corrective actions is acceptable because, when it is implemented, the applicant's approach will ensure that corrective actions are performed in a timely manner before the CUF and CUF_{en} values exceed the fatigue design limit, consistent with GALL-LR Report AMP X.M1.

The applicant further explained that the corrective actions will also consider the impact of transient cycles on high-energy line break (HELB) analysis and ASME Section III, Class 2 and 3 allowable stress analyses (LRA Sections 4.3.6 and 4.3.3, respectively). In its response to RAI B.2.2.1-1, the applicant also explained that the corrective actions address the impact on the HELB location postulation for both Class 1 and non-Class 1 piping locations (ML23193A846).

The staff finds the RAI response acceptable because (1) the applicant confirmed that the corrective actions address the potential impact of transient cycles on the HELB analysis for non-Class-1 piping locations, as well as Class 1 piping locations (e.g., potential need for identification of additional locations and related evaluation) and (2) the applicant revised LRA Section B.2.2.1 and Table A-3, consistent with the RAI response, to clarify that the corrective actions address the potential impact of transient cycles to ensure the validity of the HELB analysis for both Class 1 and non-Class-1 piping locations. SE Sections 4.3.6 and 4.3.3, respectively, document the staff's SEs for the HELB analysis and ASME Section III, Class 2 and 3, allowable stress analyses.

The staff finds that the enhancement to the "corrective actions" program element regarding the fatigue analyses discussed above is acceptable because the applicant's approach will ensure that the HELB analysis, including the break location postulation, and ASME Section III, Class 2 and 3, allowable stress analyses continue to be valid during the period of extended operation by monitoring the design transient cycles and performing adequate corrective actions as needed (e.g., refinement of CUF and CUF_{en} calculations, repair or replacement of components and ASME Code Section XI, Appendix L, flaw tolerance analysis).

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-LR Report. Based on a review of the LRA supplement and the applicant's response to RAI B.2.2.1-1, 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-LR Report, are consistent with the corresponding program elements of GALL-LR Report AMP X.M1. In addition, the staff reviewed the enhancements associated with the "scope of program," "preventive actions," "parameters monitored or inspected," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.2.1 summarizes OE related to the Fatigue Monitoring AMP. The staff also reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff reviewed the plant OE information the applicant provided for this program to (a) identify examples of age-related degradation 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 period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program.

FSAR Supplement. LRA Section A.2.1.1 provides the FSAR supplement of the Fatigue Monitoring AMP. The staff also noted that the applicant committed to implementing the program enhancements no later than 6 months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation, as described in LRA Section A.4. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Fatigue Monitoring AMP, the staff concludes that those program elements, for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.2 Environmental Qualification of Electric Components

LRA Section B.2.2.2 states that the Environmental Qualification of Electric Components is an existing program with an enhancement that will be consistent with the program elements in GALL-LR Report AMP X.E1, "Environmental Qualification of Electric Components."

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding elements of the GALL-LR Report AMP X.E1.

The staff also reviewed the portions of the "scope of program" 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 the enhancement is as follows.

Enhancement. LRA Section B.2.2.2 includes an enhancement to the "scope of program" program element, which relates to implementation of RG 1.89, Revision 1, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants," issued June 1984 (ML003740271), which provides additional guidance for the application of the Institute of Electrical and Electronics Engineers (IEEE) Standard 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations," which was not available in the original issuance of RG 1.89 that the licensee currently follows. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP X.E1 and finds it acceptable because, when 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.

Based on a review of the LRA, 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-LR Report are consistent with the corresponding program elements of the GALL-LR Report AMP X.E1. In addition, the staff reviewed the enhancement associated with the "scope of program" program element and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.2.2 summarizes OE related to the Environmental Qualification of Electric Components program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the Environmental Qualification of Electric Components program was evaluated.

FSAR Supplement. LRA Section A.2.1.2 provides the FSAR supplement for the Environmental Qualification of Electric Components program. The staff noted that the applicant committed to ongoing implementation of the existing Environmental Qualification of Electric Components AMP. This includes an enhancement to implement Revision 1 of RG 1.89, which provides additional guidance for the application of IEEE Standard 323-1974, which was not available when RG 1.89 was originally issued. The applicant will make this enhancement no later than six months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation, for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Environmental Qualification of Electric Components program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. The staff also reviewed the enhancement and finds that, when the enhancement is 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.3 Water Chemistry

LRA Section B.2.3.2 states that the Water Chemistry program is an existing program with enhancements that will be consistent with the program elements in the GALL-LR Report AMP XI.M2, "Water Chemistry," with an exception identified in the LRA.

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M2.

The staff also reviewed the portions of the "scope of program" 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 this one exception and one enhancement follows.

Exception. LRA Section B.2.3.2 includes an exception to the "scope of program" program element related to referencing Revision 7 of the EPRI primary water chemistry guidelines and Revision 8 of the EPRI secondary water chemistry guidelines, which are the most recent revisions of these guidelines. The GALL-LR Report references Revisions 6 and 7, respectively, of the EPRI primary and secondary water chemistry guidelines. The staff finds the exception acceptable because GALL-SLR Report XI.M2 was amended by SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance," issued February 2021 (ML20181A434), to reference the most recent versions of the EPRI primary and secondary water chemistry guidelines. As discussed in the GALL-SLR Report, applicants for initial LR (40–60 years) may use aging management guidance from SLR (60–80 years) in their applications. Therefore, the exception makes the applicant's program consistent with the staff's current guidance for LR and the current EPRI water chemistry guidelines.

Enhancement. LRA Section B.2.3.2 includes an enhancement to the "corrective actions" program element, which relates to including evidence of aging effects as items to be evaluated, the cause identified, and the condition corrected. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M2 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report.

Based on a review of the LRA, 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-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M2. The staff also reviewed the exception 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 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. LRA Section B.2.3.2 summarizes OE related to the Water Chemistry program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the Water Chemistry program was evaluated.

FSAR Supplement. LRA Section A.2.2.2 provides the FSAR supplement for the Water Chemistry program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to implementing the enhancement no later than six months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Water Chemistry program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. The staff also reviewed the exception and the enhancement and finds that, when the exception and the enhancement 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.4 Reactor Head Closure Stud Bolting

The LRA states that AMP B.2.3.3, "Reactor Head Closure Stud Bolting," is an existing program with enhancements that will be consistent with the program elements in the GALL-LR Report AMP XI.M3, "Reactor Head Closure Stud Bolting," not including the exceptions identified in the LRA. The applicant amended and supplemented this LRA section by letter dated July 12, 2023 (ML23193A846).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M3.

The staff also reviewed the portions of the "preventive actions" 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 the one exception and two enhancements is as follows.

Exception. LRA Section B.2.3.3 includes an exception to the "preventive actions" and "corrective actions" program elements related to limits on yield strength of the reactor head closure studs. GALL-LR Report AMP XI.M3 places limits on the yield strength values of the reactor head closure studs as a preventive measure to reduce the potential for stress corrosion cracking (SCC) or intergranular stress corrosion cracking (IGSCC) in the studs. This measure reduces susceptibility of the studs to SCC or IGSCC since susceptibility of the studs to SCC or IGSCC increases as material strength increases. The applicant stated in LRA Section B.2.3.3 that NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," issued July 2017 (ML17187A031 and ML17187A204), allows for existing material to have a maximum tensile strength of 170 kilopound per square inch (ksi) and new material to have a yield strength of less than 150 ksi. The applicant stated that all existing reactor head closure stud bolting material meets the recommended 170 ksi tensile strength limit. LRA Section B.2.3.3 also stated that site documentation indicates that some reactor head closure stud nuts and washers have actual measured yield strength that is greater than 150 ksi, and that the AMR identified the stud material as "High strength low allow steel bolting with yield strength of 150 ksi or greater." The applicant is therefore taking exception to the recommendation in the GALL-LR Report AMP XI.M3 that specifies an upper limit value on the measured yield strength of the reactor head closure studs. The staff reviewed the exception against the corresponding program element in GALL-LR Report AMP XI.M3 and finds it acceptable for the following reasons: (1) there were no relevant indications identified by ISI program examinations of the reactor head closure stud bolting components, (2) the closure studs are volumetrically examined per ASME Code, Section XI, Table IWB-2500-1, Examination Category B-G-1, which is an effective examination for detecting degradation due to SCC or IGSCC, (3) other preventive measures in the GALL-LR Report AMP XI.M3 regarding not using metal-plated studs and using acceptable stud surface treatments are met, and (4) two enhancements (evaluated in the next paragraph) to reduce the potential for SCC or IGSCC are implemented. One enhancement will ensure that replacement bolts will have the yield strength necessary to be consistent with the recommendations in GALL-LR Report AMP XI.M3, and the other enhancement will ensure that lubricants not meeting RG 1.65, “Materials and Inspections for Reactor Vessel Closure Studs,” are not used.

Enhancements. LRA Section B.2.3.3, as amended by letter dated July 12, 2023, includes enhancements to the “preventive actions” and “corrective actions” program elements. The applicant’s response to RAI B.2.3.3-4 (ML23193A846) clarified that the enhancement regarding the revision of the procurement requirements to ensure the proper yield strength for replacement materials should be associated with only the “preventive actions” and “corrective actions” program elements. The other enhancement, applicable to the “preventive actions” program element, is to revise maintenance documents for the installation of the RV head to explicitly prohibit the use of lubricants not meeting RG 1.65. The staff reviewed the enhancements against the corresponding program elements in GALL-LR Report AMP XI.M3 and finds them acceptable because, when implemented, they will be consistent with the GALL-LR Report AMP XI.M3 guidance.

Based on a review of the LRA, the staff finds that the “scope of program,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “corrective actions,” and “acceptance criteria” program elements for which the applicant claimed consistency with the GALL-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M3. The staff also reviewed the exceptions 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 enhancements associated with the “preventive actions” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.3.3 summarizes OE related to the Reactor Head Closure Stud Bolting AMP. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the applicant made a presentation on the process it used to identify and evaluate pertinent OE. The applicant searched the plant OE to identify examples of age-related degradation, as documented in the applicant’s corrective action program database to (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the period of extended operation. In LRA Section B.2.3.3, the applicant identified OE related to thread damage in the stud and threads-in-flange (i.e., the stud holes) that had occurred over time and that the applicant had evaluated in 2014. In the responses to RAIs B.2.3.3-1 to B.2.3.3-3 (ML23193A846), the applicant provided additional information on how the thread damage is being managed and will be managed during the period of extended operation. The staff reviewed the applicant’s responses and determined that the applicant has been adequately managing and will adequately manage thread damage during the period of extended operation because (1) no further thread damage has occurred since 2014, (2) the thread damage was not due to an aging effect, and instead was due to galling of threads that can be induced by improper lubrication, and (3) the subject AMP's corrective action program includes means of adequately managing thread damage, such as proper use of lubricants, reworking affected thread locations, adhering to hydraulic tensioning limits of the studs, and stud replacement. The staff did not identify any other relevant OE beyond that identified in LRA Section B.2.3.3, as supplemented.

Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Reactor Head Closure Stud Bolting AMP was evaluated.

FSAR Supplement. LRA Section A.2.2.3 provides the FSAR supplement for the Reactor Head Closure Stud Bolting AMP. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to ongoing implementation of the existing Reactor Head Closure Stud Bolting AMP with enhancement for managing the effects of aging for applicable components during the period of operation. The staff finds that the information in the FSAR 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 staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. The staff also reviewed the exceptions and enhancements, and finds that, with the exceptions and the implemented 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.5 Flow-Accelerated Corrosion

LRA Section B.2.3.8 states that the Flow-Accelerated Corrosion program is an existing condition monitoring program with enhancements that will be consistent with the program elements in the GALL-LR Report AMP XI.M17, "Flow-Accelerated Corrosion," as modified by LR-ISG-2012-01, "Wall Thinning Due to Erosion Mechanisms," dated April 25, 2013 (ML12352A057), with an exception identified in the LRA. The applicant amended this section in LRA Supplement 1 (ML23096A302).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 described in the associated program basis document to the corresponding program elements of GALL-LR Report AMP XI.M17, as amended by LR-ISG-2012-01.

The staff reviewed the portion of the "scope of program" 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 is as follows.

Exception. LRA Section B.2.3.8 includes an exception to the “scope of program” program element related to the use of EPRI NSAC-202L, Revision 4, “Recommendations for an Effective Flow-Accelerated Corrosion Program,” dated November 26, 2013, instead of the earlier revisions of this industry guidance for a flow-accelerated corrosion program that are provided in the GALL-LR Report AMP XI.M17, as amended by LR-ISG-2012-01. The staff finds the exception acceptable because GALL-SLR Report XI.M17 references the most recent versions of the EPRI guidelines. As discussed in the GALL-SLR Report, applicants for initial LR (40–60 years) may use aging management guidance from SLR (60–80 years) in their applications. Therefore, the exception makes the applicant’s program consistent with the staff’s current guidance for LR and the current EPRI guidelines.

The staff also reviewed the portions of the “scope of program,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “corrective actions” program element 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 the enhancements are as follows.

Enhancement 1. As amended in LRA Supplement 1, Section B.2.3.8 includes an enhancement to the “scope of program” program element relating to the inclusion of erosion mechanisms in various environments through the Flow-Accelerated Corrosion AMP. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M17, as amended by LR-ISG-2012-01, and finds it acceptable. When implemented, the applicant’s enhanced program will also manage various erosion mechanisms in different water and steam environments, consistent with the “scope of program” guidance in LR-ISG-2012-01.

Enhancement 2. LRA Section B.2.3.8 includes an enhancement to the “parameters monitored or inspected” program element regarding the inclusion of wall thickness measurements for components susceptible to wall thinning due to erosion mechanisms. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M17, as amended by LR-ISG-2012-01, and finds it acceptable. When implemented, the applicant’s enhanced program will also measure wall thicknesses of components susceptible to erosion mechanisms, consistent with the guidance for the “parameters monitored/inspected” program element provided in LR-ISG-2012-01.

Enhancement 3. LRA Section B.2.3.8 includes an enhancement to the “detection of aging effects” program element regarding the identification of locations susceptible to erosion based on plant-specific and industry OE and various industry guidance documents. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M17, as amended by LR-ISG-2012-01, and finds it acceptable. When implemented, the applicant’s enhanced program will consider locations using the approach and industry guidance for various erosion mechanisms provided in the “detection of aging effects” program element of LR-ISG-2012-01.

Enhancement 4. LRA Section B.2.3.8 includes an enhancement to the “monitoring and trending” program element related to trending wall thickness measurement for locations susceptible to erosion mechanisms and adjusting the inspection frequencies and repair or replacement determinations based on the component’s predicted remaining service life. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M17, as amended by LR-ISG-2012-01, and finds it acceptable. When implemented, the applicant’s enhanced program will consider locations using the approach and industry guidance for various erosion mechanisms provided in the "detection of aging effects" program element of LR-ISG-2012-01.

Enhancement 5. LRA Section B.2.3.8 includes an enhancement to the "monitoring and trending" program element related to controlling and independently reviewing updates to the predictive models used by this program. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M17, as amended by LR-ISG-2012-01, and finds it acceptable. When implemented, the applicant's enhanced program will ensure that changes to the predictive models receive appropriate independent oversight and controls consistent with the recommendations in Revision 4 of NSAC-202L and will address industry OE discussed in NRC Information Notice (IN) 2019-08, "Flow-Accelerated Corrosion Events," dated October 8, 2019 (ML19065A123).

Enhancement 6. LRA Section B.2.3.8 includes an enhancement to the "corrective actions" program element relating to the effectiveness verification of actions taken to eliminate the cause of erosion mechanisms and the continuation of periodic monitoring for components replaced with alternate materials. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M17, as amended by LR-ISG-2012-01, and finds it acceptable. When implemented, the applicant's enhanced program will be consistent with the guidance in LR-ISG-2012-01 by verifying the effectiveness of erosion elimination actions and by continuing to monitor components that have been replaced with alternate materials.

Based on its audit and review of the LRA 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-LR Report, excluding the acceptable exception noted above, are consistent with the corresponding program elements of GALL-LR Report AMP XI.M17. The staff also reviewed the exception 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 "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "corrective actions" program elements and finds that, after implementation, the AMP will be able to adequately manage the applicable aging effects.

Operating Experience. LRA Section B.2.3.8 summarizes OE related to the Flow-Accelerated Corrosion program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff reviewed search results of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation.

The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on its audit and reviews of the application and supplement, the staff finds that the conditions and OE at the plant are bounded by those for which the Flow-Accelerated Corrosion program was evaluated.

FSAR Supplement. LRA Section A.2.2.8 provides the FSAR supplement for the Flow-Accelerated Corrosion program. The staff reviewed this FSAR description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted in LRA Table A-3, as modified in LRA Supplement 1, that the applicant committed to continuing the existing Flow-Accelerated Corrosion program and to enhance the program by implementing the enhancements discussed above, six months prior to the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Flow-Accelerated Corrosion program, the staff concludes that the program elements, for which the applicant claimed consistency with the GALL-LR Report, are consistent. The staff also reviewed the exception and enhancements and finds that, with the exception and 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.6 Bolting Integrity

LRA Section B.2.3.9 states that the Bolting Integrity program is an existing program with enhancements that will be consistent with the program elements in the GALL-LR Report AMP XI.M18, "Bolting Integrity." The applicant amended this LRA section in Supplement 1, dated April 6, 2023 (ML23096A302).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M18.

The staff also reviewed the portions of the "preventive actions," "parameters monitored or inspected," "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 evaluation of these seven enhancements are as follows.

Enhancement 1. LRA Section B.2.3.9 includes an enhancement to the "preventive actions," "detection of aging effects," and "corrective actions" program elements, which relate to incorporating the applicable guidance from EPRI NP-5769, "Degradation and Failure of Bolting in Nuclear Power Plants: Volume 1," dated April 1, 1988; NUREG-1339, "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants," issued June 1990 (ML031430208); and EPRI TR-104213, "Bolted Joint Maintenance & Applications Guide," dated December 1995. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-LR 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. LRA Section B.2.3.9 includes an enhancement to the "preventive actions" program element, which relates to explicitly prohibiting the use of molybdenum disulfide (MoS_2) as a lubricant for use on pressure-retaining bolts. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-LR Report recommendations to ensure that lubricants known to be potential contributors to SCC are not used.

Enhancement 3. LRA Section B.2.3.9 includes an enhancement to the “preventive actions” program element, which relates to minimizing any future use of bolting material with an actual yield strength greater than or equal to 150 ksi in portions of systems within the scope of the Bolting Integrity program. If bolting with an actual yield strength greater than or equal to 150 ksi is used, bolting will be monitored for cracking, with volumetric examinations performed in accordance with ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-LR Report recommendations to include preventive measures and examinations for high-strength closure bolting (actual yield strength greater than or equal to 150 ksi) known to be more susceptible to SCC.

Enhancement 4. LRA Section B.2.3.9 includes an enhancement to the “parameters monitored or inspected” element, which relates to ensuring that closure bolting will be inspected opportunistically for loss of preload during excavations. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-LR Report recommendations to ensure that the effects of aging on the intended function of closure bolting will be inspected for loss of preload.

Enhancement 5. LRA Section B.2.3.9 includes an enhancement to the “parameters monitored or inspected” and “detection of aging effects” program elements, which relates to enhancing procedures or developing new procedures to ensure that submerged closure bolting is visually inspected for loss of material during maintenance activities, perform alternative means of testing and inspection for closure bolting where leakage is difficult to detect, and provide specific guidance on closure bolting inspections for nonsafety-related bolted connections. Required inspections will be performed on a representative sample of the population of bolt heads and threads (i.e., 20 percent of the population, up to a maximum of 19 per unit) over each 10-year period of extended operation. The staff noted that LRA Section B.2.3.9 describes the similarities between the two units in terms of the bolt exposure environment (indoor air, outdoor air, raw water, and soil) and the OE credited for the use of a reduced number of 19 inspections at a unit in lieu of 25. The staff reviewed this enhancement, as modified by Supplement 1 (ML23096A302), against the corresponding program elements in GALL-LR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-LR Report recommendations to ensure that (1) submerged closure bolting or bolting in piping systems containing air or gas for which leakage is difficult to detect will be inspected visually or using alternative means to detect degradations as described in GALL-LR Report AMP XI.M18, (2) the selected representative example is sufficient, because of the similarity between CPNPP’s units, to provide adequate representative inspection results, and (3) nonsafety-related bolting will be inspected under clear guidance.

Enhancement 6. LRA Section B.2.3.9 includes an enhancement to the “detection of aging effects” and “monitoring and trending” program elements, which relates to ensuring that periodic system walkdowns to inspect closure bolting occur at least once per refueling cycle for the portions of systems that are within the scope of LR. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-LR Report recommendation to ensure that age-related degradation of closure bolting is detected and corrected before component leakage becomes excessive.

Enhancement 7. LRA Section B.2.3.9 includes an enhancement to the “monitoring and trending” program element, which relates to enhancing the procedures to consider more frequent bolting inspections if identified leak rates are increasing. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-LR Report recommendation to ensure that identified leaking bolted connections will be monitored at an increased frequency in accordance with the corrective action process.

Based on a review of the LRA and 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-LR Report are consistent, or consistent with enhancements, with the corresponding program elements of GALL-LR 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,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.3.9 summarizes OE related to the Bolting Integrity program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (2) 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 period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the Bolting Integrity program was evaluated.

FSAR Supplement. LRA Section A.2.2.9 provides the FSAR supplement for the Bolting Integrity program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that in LRA Table A-3, the applicant committed to ongoing implementation of the existing Bolting Integrity program for managing the effects of aging for applicable components during the period of extended operation. The staff also noted that the applicant committed to implementing the enhancements no later than six months, or during the last refueling outage, prior to the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s Bolting Integrity program, as amended, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. The staff has 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.7 Steam Generators

LRA Section B.2.3.10 states that the Steam Generators program is an existing program that will be consistent with the program elements in the GALL-LR Report AMP XI.M19, "Steam Generators," as modified by LR-ISG-2016-01, "Changes to Aging Management Guidance for Various Steam Generator Components," dated December 7, 2016, apart from the exceptions identified in the LRA. The applicant amended this LRA section by letter dated April 6, 2023 (ML23096A302).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M19.

The staff also reviewed the portions of the "scope of program," "parameters monitored or inspected," and "acceptance criteria," program elements associated with the exceptions to GALL-LR Report AMP XI.M19 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 exceptions follows.

Exception 1. LRA Section B.2.3.10 includes an exception to the "scope of program" program element to identify the Unit 2 steam generator (SG) tube-to-tubesheet welds as exempt from inspection and monitoring because the welds no longer serve a pressure boundary function. 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 has an approved permanent H* alternate repair criteria (ARC) amendment for both the hot leg and cold leg. The ARC credits the hydraulically expanded portion of the tube, from the top of the tubesheet to 14.01 inches below the top of the tubesheet, with providing structural and leakage integrity. Accordingly, the portion of the tube more than 14.01 inches below the top of the tubesheet, including the tube-to-tubesheet weld, is not credited with providing structural or leakage integrity. The staff reviewed the exception against the corresponding program element in GALL-LR Report AMP XI.M19, as modified by LR-ISG-2016-01, and finds it acceptable for Unit 2 because the tube-to-tubesheet weld is no longer part of the reactor coolant pressure boundary, consistent with item 2 in SRP-LR Section 3.1.2.2.11, as modified by LR-ISG-2016-01. The staff also notes that Section B.2.3.10 of the LRA, as supplemented by the letter dated April 6, 2023 (ML23096A302), states that the SG channel head interior surfaces, including tube-to-tubesheet welds, will be visually inspected at least every 54 effective full-power months (EFPMs) (see Exception 3 below for additional detail).

Exception 2. LRA Section B.2.3.10 includes an exception to the "parameters monitored or inspected" program element related to referencing EPRI Report 3002018267, Revision 5, of the EPRI primary-to-secondary leakage guidelines. This is an exception because GALL-LR Report AMP XI.M19, as modified by LR-ISG-2016-01, references Revision 4 of the guidelines. As stated in AMP XI.M19, the Steam Generator program at every PWR is modeled after NEI 97-06, "Steam Generator Program Guidelines," dated January 2011 (ML111370708). The NEI 97-06 framework requires licensees to implement the latest version of the referenced EPRI guidelines. Revision 5 of the primary-to-secondary leakage guidelines was issued in December 2020, and the staff noted during the audit that Revision 5 has been incorporated into the applicant's plant procedures. The staff finds the exception acceptable because referencing Revision 5 of the primary-to-secondary leakage guidelines in the Steam Generators program is consistent with the current programmatic guidelines in NEI 97-06.

Exception 3. As amended by letter dated April 6, 2023 (ML23096A302), LRA Section B.2.3.10 includes an exception to the "parameters monitored or inspected" program element related to the frequency of visual inspections of the SG head interior surfaces. The SG head interior surfaces are defined in the LRA AMP description as the divider plates, channel heads, tubesheets, and tube-to-tubesheet welds, which is consistent with the description in GALL-LR Report AMP XI.M19, as modified by LR-ISG-2016-01. The inspection intervals proposed in the LRA are at least every 96 EFPM for Unit 1 and at least every 54 EFPM for Unit 2. This is an exception for Unit 1 because in GALL-LR Report AMP XI.M19, as modified by LR-ISG-2016-01, the inspection interval is at least every 72 EFPM or every third refueling outage (whichever results in more frequent inspections). The staff finds the exception acceptable because the proposed intervals are consistent with the applicant's current technical specifications as revised by NRC letter dated February 24, 2022 (ML21321A349). These intervals are based on Technical Specifications Task Force Traveler 577 (TSTF-577) and incorporated into Revision 5 of the Standard Technical Specifications for Westinghouse plants.

Exception 4. LRA Section B.2.3.10 includes an exception to the "acceptance criteria" program element related to referencing the EPRI in situ pressure testing guidelines from EPRI Report 3002007856, Revision 5. This is an exception because GALL-LR Report AMP XI.M19, as modified by LR-ISG-2016-01, references Revision 4 of the guidelines. As stated in AMP XI.M19, the Steam Generator program at every PWR is modeled after NEI 97-06. The NEI 97-06 framework requires licensees to implement the latest version of the referenced EPRI guidelines. Revision 5 of the in situ pressure testing guidelines was issued in November 2016, and the staff noted during the audit that Revision 5 had been incorporated into the applicant's plant procedures. The staff finds the exception acceptable because referencing Revision 5 of the in situ pressure testing guidelines in the Steam Generators program is consistent with the current programmatic guidelines in NEI 97-06.

Based on a review of the LRA, the staff finds that the "preventive actions," "detection of aging effects," "monitoring and trending," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M19. The staff also reviewed the exceptions associated with the "scope of program," "parameters monitored or inspected," and "acceptance criteria" program elements and their justifications and finds that the AMP, with the exceptions, is adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.3.10 summarizes OE related to the Steam Generators program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMP to manage the effects of aging in the period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the Steam Generators program was evaluated.

FSAR Supplement. LRA Section A.2.2.10 provides the FSAR supplement for the Steam Generators program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to ongoing implementation of the existing Steam Generators program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. The staff also reviewed the exceptions and finds that, when the exceptions 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.8 Open-Cycle Cooling Water System

LRA Section B.2.3.11 states that the Open-Cycle Cooling Water System is an existing program with enhancements that will be consistent with the program elements in the GALL-LR Report AMP XI.M20, "Open-Cycle Cooling Water System," as modified by LR-ISG-2013-01, "Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," (ML14225A059) dated November 14, 2014, and LR-ISG-2012-02.

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M20.

The staff also reviewed the portions of the "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 evaluation of these three enhancements is as follows.

Enhancement 1. LRA Section B.2.3.11 includes an enhancement of the "monitoring and trending" program element that relates to enhancing the implementing documents to ensure that if corrosion buildup or fouling is noted, the system is evaluated for the impact on heat transfer capability. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M20 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report AMP XI.M20.

Enhancement 2. LRA Section B.2.3.11 includes an enhancement to the "monitoring and trending" program element that relates to enhancing the implementing documents to ensure that evidence of corrosion is evaluated for its potential impact on the integrity of the piping, and inspections or nondestructive testing are used to determine the extent of biofouling, the condition of the surface coating, the magnitude of localized pitting, and the amount of microbiologically influenced corrosion (MIC), if applicable. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M20 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report AMP XI.M20.

Enhancement 3. LRA Section B.2.3.11 includes an enhancement to the "corrective actions" program element that relates to enhancing the implementing documents to ensure evaluations are performed for test or inspection results that do not satisfy established acceptance criteria, and a condition report is initiated to document the concern in accordance with plant administrative procedures. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M20 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report AMP XI.M20.

Based on a review of the LRA, 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-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M20. In addition, the staff reviewed the enhancements associated with the "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.

Operating Experience. LRA Section B.2.3.11 summarizes OE related to the Open-Cycle Cooling Water System. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff reviewed search results of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the Open-Cycle Cooling Water System program was evaluated.

FSAR Supplement. LRA Section A.2.2.11 provides the FSAR supplement for the Open-Cycle Cooling Water System. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to an implementation schedule starting no later than six months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Open-Cycle Cooling Water System, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.9 Closed Treated Water Systems

LRA Section B.2.3.12 states that the Closed Treated Water Systems is an existing program with enhancements that will be consistent with the program elements in the GALL-LR Report AMP XI.M21A, “Closed Treated Water Systems,” as modified by LR-ISG-2012-02, excluding the exception identified in the LRA. The applicant amended this LRA section by letter dated April 6, 2023 (ML23096A302).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant’s claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M21A, as modified by LR-ISG-2012-02.

The staff also reviewed the portions of the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” 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 the exception and two enhancements follows.

Exception 1. LRA Section B.2.3.12 includes an exception to the “parameters monitored or inspected” program element. The GALL-LR Report recommends that the specific water chemistry parameters monitored and the acceptable ranges of values for these parameters be maintained in accordance with EPRI Report 1007820, “Closed Cooling Water Chemistry Guidelines,” dated April 23, 2004. However, the applicant uses a newer revision of that report (EPRI Report 3002000590), dated December 9, 2013. The staff finds the exception acceptable because the GALL-SLR Report AMP XI.M21A references the most recent versions of the EPRI guidelines. Therefore, the exception makes the applicant’s program consistent with the staff’s current guidance for LR and the current EPRI guidelines.

Enhancement 1. LRA Section B.2.3.12 includes an enhancement to the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria,” program elements, which relates to performing visual inspections for age-related degradation whenever a closed treated water system boundary is opened. The enhancement includes inspections of a minimum sample size in each 10-year period during the period of extended operation. The staff notes that the specified sample size is consistent with the sample size guidance from GALL-LR Report AMP XI.M21A. The staff reviewed this enhancement and finds it acceptable because performing inspections whenever a system boundary is opened and ensuring that a minimum sample size is periodically inspected during the period of extended operation are consistent with the guidance in the GALL-LR Report and will ensure that the effects of aging will be adequately managed.

Enhancement 2. LRA Section B.2.3.12 includes an enhancement to the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria,” program elements, which relates to performing volumetric inspections of a sample of welds in the turbine plant cooling water system during each 10-year period of the period of extended operation. As discussed in LRA Section 3.4.2.2.6, as amended by letter dated April 24, 2023 (ML23114A337), this enhancement addresses through-wall leaks due to undersized welds that met the criteria for recurring internal corrosion. The amended section clarified that these targeted inspections of the turbine plant cooling water system welds are in addition to the enhancement (discussed above) for opportunistic inspections of closed treated water system components. The staff reviewed this enhancement and finds it acceptable because these increased inspections meet the intent of the augmented inspection guidance for recurring internal corrosion, as discussed in SE Section 3.4.2.2.6.

Based on its audit and review of the LRA and 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-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M21A. The staff also reviewed the exception associated with the "parameters monitored or 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 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. LRA Section B.2.3.12 summarizes OE related to the Closed Treated Water Systems program. The staff reviewed OE information in the application during the audit. As discussed in the Audit Report (ML23172A136), the staff also reviewed plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation. Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Closed Treated Water Systems program was evaluated.

FSAR Supplement. LRA Section A.2.2.12 provides the FSAR supplement for the Closed Treated Water Systems program. The staff reviewed the summary description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that in Table A-3, the applicant committed to implementing the existing Closed Treated Water System AMP, including enhancements, no later than 6 months, or no later than the last refueling outage, prior to the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Closed Treated Water Systems program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

LRA Section B.2.3.13 states that the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems is an existing program with enhancements that will be consistent with the program elements in the GALL-LR Report AMP XI.M23, “Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems.”

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant’s claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M23.

The staff also reviewed the portions of the “parameters monitored or inspected” 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 is as follows:

Enhancement 1. LRA Section B.2.3.13 includes an enhancement to the “parameters monitored or inspected,” program element, which relates to inspecting for visual indications of loss of material due to corrosion and wear and ensuring that any visual indication of loss of material due to corrosion or wear or any visual signs of loss of bolting preload will be evaluated in accordance with ASME/American National Standards Institute (ANSI) B30.2 or ASME B30.16. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M23 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendation associated with implementation of the ASME B30.2 or ASME B30.16 standards.

Enhancement 2. LRA Section B.2.3.13 includes an enhancement to the “acceptance criteria,” program element, which relates to evaluating any visual indication of loss of material due to corrosion or wear and any visual signs of loss of bolting preload in accordance with ASME/ANSI B30.2 or ASME B30.16. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M23 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendation associated with implementation of the ASME/ANSI B30.2 or ASME B30.16 standards.

Based on a review of the LRA, the staff finds that the “scope of program,” “preventive actions,” “detection of aging effects,” “monitoring and trending,” and “corrective actions” program elements are consistent with the corresponding program elements of GALL-LR Report AMP XI.M23. In addition, the staff reviewed the enhancements associated with the “parameters monitored or inspected” and “acceptance criteria” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.3.13 summarizes OE related to the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP was evaluated.

FSAR Supplement. LRA Appendix A, Section A.2.2.13, provides the FSAR supplement for the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to ongoing implementation of the existing Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.11 Compressed Air Monitoring

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

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M24.

The 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 evaluation of these enhancements is as follows.

Enhancement 1. LRA Section B.2.3.14 includes an enhancement to the "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements, which relates to enhancing procedures for periodic internal inspections and trending and evaluating any signs of corrosion. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M24 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-LR Report.

Enhancement 2. LRA Section B.2.3.14 includes an enhancement to the "monitoring and trending" program element, which relates to the review of analysis results and comparison with previous results for procedures that perform air quality analysis. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M24 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-LR Report.

Enhancement 3. LRA Section B.2.3.14 includes an enhancement to the “monitoring and trending” program element, which relates to trending dewpoint temperature readings. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M24 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-LR Report.

Enhancement 4. LRA Section B.2.3.14 includes an enhancement to the “corrective actions” program element, which relates to taking corrective actions if air samples are unsatisfactory. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M24 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-LR Report.

Based on its audit and review of the LRA, 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 CPNPP claimed consistency with the GALL-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M24. 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. LRA Section B.2.3.14 summarizes OE related to the Compressed Air Monitoring program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff reviewed search results of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the period of extended operation.

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

FSAR Supplement. LRA Appendix A, Section A.2.2.14, provides the FSAR supplement for the Compressed Air Monitoring program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that CPNPP committed to ongoing implementation of the existing Compressed Air Monitoring program, including the enhancements discussed above, for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the CPNPP’s Compressed Air Monitoring program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 CPNPP 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.12 Fire Protection

LRA Section B.2.3.15 states that the Fire Protection program is an existing program with enhancements that will be consistent with the program elements in GALL-LR Report AMP XI.M26, “Fire Protection.” The applicant amended the LRA section by letters dated April 24, 2023 (ML23114A377), July 27, 2023 (ML23208A193), and October 4, 2023 (ML23277A176).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant’s claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M26.

For the “scope of the program,” “parameters monitored or inspected,” and “monitoring and trending” program elements, the staff needed additional information regarding the AMPs credited for managing the aging effects of masonry walls that perform a fire barrier intended function, the AMPs credited for managing the aging effects of concrete curbs and berms/dikes, aging effects for ceramic fiber/blanket and gypsum, visual inspection of fire damper surfaces, visual inspection of stainless steel straps that secure radiant energy shields to raceways, and trending inspection results. The staff’s requests and the applicant’s responses are documented in RAIs B.2.3.15-1 and B.2.3.15-2 (ML23208A193); RAI B.2.3.15-3 (ML23277A176); and RCIs B.2.3.15-1, B.2.3.15-2, and B.2.3.15-3 (ML23171B072).

In its response to RAI B.2.3.15-1 (ML23208A193), the applicant revised the discussion for AMR item 3.5-1, 070, in LRA Table 3.5-1 to state that both the Fire Protection and Masonry Walls programs will manage cracking of the concrete block (removable) for opening fire barrier. Consequently, the applicant added the Fire Protection program to LRA Table 3.5.2-15, item 3.5-1, 070, as a credited AMP, in addition to the already cited Masonry Walls program (see SE Section 3.5.2.1.7 for additional information). The staff finds the response acceptable because the changes reflect that both of the applicant’s programs are used to inspect masonry walls that perform a fire barrier intended function.

In its response to RAI B.2.3.15-2 (ML23208A193), the applicant (1) revised LRA Section 2.4.15 to clarify that reinforced concrete curbs are part of the reinforced concrete floor and where the floor is a fire barrier, the concrete curb is fire rated equal to or greater than the fire barrier floor, (2) moved the fire barrier intended function for concrete curbs in LRA Tables 2.4-3 and 2.4-4 to LRA Table 2.4-15, (3) revised the discussion for AMR items 3.5-1, 054, 066, and 067, in LRA Table 3.5-1 to state that both the Fire Protection and Structures Monitoring programs will manage aging of the concrete curbs that serve as a fire barrier, (4) removed the fire barrier intended function for the concrete curbs in LRA Tables 3.5.2-3 and 3.5.2-4 (aging associated with the direct flow intended function managed by the Structures Monitoring program remained), and (5) added AMR items 3.5-1, 054, 066, and 067, crediting the Fire Protection program to LRA Table 3.5.2-15 (see SE Sections 3.5.2.1.3, 3.5.2.1.5, and 3.5.2.1.6 for additional information).

In its response to RAI B.2.3.15-2, the applicant also (1) revised LRA Section 2.4.11 to state that the reinforced concrete berm/dike is addressed in LRA Section 2.4.15, which was revised to clarify that the function of the reinforced concrete berm/dike associated with the auxiliary boiler fuel oil storage tank is to contain fuel oil spills and prevent the spread of fire, and that the reinforced concrete berm/dike does not provide structural support or protection and therefore is not included in the Structures Monitoring program, (2) moved the reinforced concrete berm/dike from LRA Table 2.4-11 to LRA Table 2.4-15, (3) revised the discussion for AMR items 3.3-1, 061 and 062, in LRA Section 3.3-1 to clarify the function of the reinforced concrete berm/dike, (4) removed AMR items 3.3-1, 061 and 062, associated with the reinforced concrete berm/dike from LRA Table 3.5.2-11, and (5) added AMR items 3.3-1, 061 and 062, for the reinforced concrete berm/dike crediting the Fire Protection program (see SE Section 3.3.2.1.7 for additional information). Finally, the applicant revised LRA Table A-3 and LRA Section B.2.3.15 to add an enhancement to the Fire Protection program related to visual inspection of the reinforced concrete berm/dike associated with the auxiliary boiler fuel oil storage tank (see the discussion of Enhancement 4 below).

The staff finds the applicant's response acceptable because aging for the reinforced concrete curbs will be managed by both the Fire Protection and Structures Monitoring programs, which is consistent with GALL-LR Report AMP XI.M26, and the reinforced concrete berm/dike that only has a fire barrier intended function will be managed by the Fire Protection program, which is capable of identifying cracking and loss of material through its visual inspections.

In its response to RAI B.2.3.15-3 (ML23277A176), the applicant (1) revised LRA Table 3.5.2-15 to add the aging effects of change in material properties, cracking, delamination, and separation for ceramic fiber/blanket insulation and wrap exposed to indoor uncontrolled air, (2) added the aging effects of change in material properties, delamination, and separation for gypsum walls, floors, and ceilings exposed to indoor uncontrolled air, (3) removed the aging effect of loss of bond for gypsum walls, floors, and ceilings, (4) revised plant-specific notes 2 and 4 to reflect the aging effects changes for the ceramic fiber/blanket insulation and wrap and gypsum walls, floors, and ceilings, and (5) revised LRA Table A-3 and LRA Section B.2.3.15 to add an enhancement to the Fire Protection program related to revising the Fire Rated Assembly Visual Inspection procedure to include the aging effects of change in material properties, cracking, delamination, loss of material, and separation (see the discussion of Enhancement 5 below). The staff finds the applicant's response acceptable because the aging effects for these component, material, and environment combinations are consistent with GALL-LR Report AMP XI.M26, as modified by SLR-ISG-2021-02-MECHANICAL, and the applicant appropriately enhanced the AMP to address these additional aging effects.

In its response to RCI B.2.3.15-1 (ML23171B072), the applicant confirmed that visual inspection of fire damper surfaces for changes or degradation will be performed during the period of extended operation. While GALL-LR Report AMP XI.M26 does not specify visual inspection of fire damper surfaces, the staff finds the applicant's response acceptable because it reflects the visual inspections of the fire damper surfaces being performed under the applicant's Fire Protection program.

In its response to RCI B.2.3.15-2 (ML23171B072), the applicant confirmed that the stainless steel straps that secure radiant energy shields to raceways are part of the radiant energy shield assembly and will be inspected as part of the assembly during the period of extended operation. The staff finds the applicant's response acceptable because, consistent with Section 6.1 of EPRI 3002013084, "Long-Term Operations: Subsequent License Renewal Aging Effects for

Structures and Structural Components (Structural Tools)," issued November 2018, the stainless steel straps are considered part of the fire barrier assembly and are being inspected as part of the fire barrier assembly.

In its response to RCI B.2.3.15-3 (ML23171B072), the applicant confirmed that inspection and test results for penetration seals, fire barriers, doors, and the halon system will be trended during the period of extended operation. The applicant documents deficient conditions in the corrective action database for tracking and trending. The staff finds the applicant's response acceptable because the inspection and test results for penetration seals, fire barriers, doors, and the halon system will be trended, which is consistent with GALL-LR Report AMP XI.M26.

The staff also reviewed the portions of the "detection of aging effects" program element associated with the enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. Because the program's enhancements are grouped according to program element in the LRA, the enhancement numbering below reflects their appearance in the associated enhancement table in the letter dated October 4, 2023 (ML23277A176).

Enhancement 1. LRA Section B.2.3.15 includes an enhancement to the "detection of aging effects" program element that relates to expanding the inspection sample size for penetration seals if any sign of degradation is found. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, it will address expanding the inspection scope for penetration seals consistent with GALL-LR Report AMP XI.M26.

Enhancement 2. LRA Section B.2.3.15 includes an enhancement to the "detection of aging effects" program element that relates to requiring qualified fire protection personnel to perform Fire Protection program inspections. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, it will address personnel qualifications consistent with GALL-LR Report AMP XI.M26.

Enhancement 3. As amended by letter dated April 24, 2023 (ML23114A377), LRA Section B.2.3.15 includes an enhancement to the "detection of aging effects" program element that relates to revising procedures to require inspection of not less than 10 percent of each type of penetration seal at a frequency in accordance with the plant's NRC-approved Fire Protection program or at least once every refueling outage. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, it will address penetration seal inspections consistent with GALL-LR Report AMP XI.M26.

Enhancement 4. As amended by letter dated July 27, 2023 (ML23208A193), LRA Section B.2.3.15 includes an enhancement to the "detection of aging effects" program element that relates to revising the fire rated assembly visual inspection procedure to include inspection of the reinforced concrete berm/dike associated with the auxiliary boiler fuel oil storage tank. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, it will require visual inspection of the reinforced concrete berm/dike associated with the auxiliary boiler fuel oil storage tank. The Fire Protection program is capable of identifying cracking and loss of material through its visual inspections prior to a loss of intended function.

Enhancement 5. As amended by letter dated October 4, 2023 (ML23277A176), LRA Section B.2.3.15 includes an enhancement to the “detection of aging effects” program element that relates to revising the procedure for visual inspection of fire rated assemblies to include the aging effects of change in material properties, cracking, delamination, loss of material, and separation. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, it will address aging effects consistent with GALL-LR Report AMP XI.M26, as modified by SLR-ISG-2021-02-MECHANICAL.

Based on a review of the LRA, amendments, and the applicant’s responses to RAIs B.2.3.15-1, B.2.3.15-2, and B.2.3.15-3 and RCIs B.2.3.15-1, B.2.3.15-2, and B.2.3.15-3, 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 GALL-LR Report AMP XI.M26 are consistent with the corresponding program elements of GALL-LR Report AMP XI.M26. The staff also 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. LRA Section B.2.3.15 summarizes operating experience related to the Fire Protection program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff reviewed search results of the plant operating experience information to (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (2) 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 period of extended operation. The 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 program was evaluated.

FSAR Supplement. As amended by letter dated April 24, 2023 (ML23114A377), LRA Section A.2.2.15 provides the FSAR supplement for the Fire Protection program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-LR Report Table 3.0-1. The staff also noted in LRA Table A-3 that the applicant committed to enhance the Fire Protection program by implementing the enhancements discussed above six months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s Fire Protection program, the staff concludes that those program elements for which the applicant claimed consistency with GALL-LR Report AMP XI.M26 are consistent. The staff also reviewed the enhancements and concluded that their implementation prior to the 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.13 Fire Water System

LRA Section B.2.3.16 states that the Fire Water System program is an existing program with enhancements that will be consistent with the program elements in GALL-LR Report AMP XI.M27, "Fire Water System," as modified by LR-ISG-2012-02 and LR-ISG-2013-01, except for the exceptions identified in the LRA. The applicant amended this LRA section by letters dated April 6, 2023 (ML23096A302), April 24, 2023 (ML23114A377), July 27, 2023 (ML23208A193), and October 4, 2023 (ML23277A176).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M27.

For the "scope of program," "parameters monitored or inspected," "detection of aging effects," and "monitoring and trending" program elements, the staff had questions regarding inspection of the diesel engine fire pump heat exchangers, fire water storage tank (FWST) caulking/sealant, corrective actions for FWST internal coatings/linings, and operational tests of water spray fixed systems. The staff's requests and the applicant's responses are documented in RAIs B.2.3.16-1, B.2.3.16-2, B.2.3.16-3, and B.2.3.16-4 (ML23208A193), and RAI B.2.3.16-4a (ML23277A176).

In its response to RAI B.2.3.16-1, the applicant revised LRA Table 3.4-1 for AMR items 3.4-1, 015, 016, and 018, to state that the Fire Water System program manages the loss of material and reduction of heat transfer for steel and copper alloy heat exchanger components and tubes exposed to treated water in the fire protection system. The applicant also revised LRA Sections A.2.2.16 and B.2.3.16 to: a) address cleaning and inspecting the diesel fire pump heat exchanger whenever the heat exchanger is opened for maintenance, and b) visually inspect it at least once every 10 years. Finally, the applicant revised LRA Table A-3 and LRA Section B.2.3.16 to add an enhancement related to aging management activities for the fire pump diesel engine heat exchanger tubesheet and channel head (see the discussion of Enhancement 10 below). The staff notes that the heat exchanger tubes are already cleaned and visually inspected under an existing maintenance procedure. The staff finds the response acceptable because the effects of aging (loss of material and reduction of heat transfer) will be managed by the Fire Water System program through periodically cleaning and visually inspecting the components.

In its response to RAI B.2.3.16-2, the applicant revised LRA Table A-3 and LRA Section B.2.3.16 to update the enhancement related to the caulking or sealant that will be installed at the interface between the FWST and the concrete foundation ring (see the discussion of Enhancement 6 below). The staff finds the applicant's response acceptable because, consistent with LR-ISG-2012-02, the visual inspection of the caulking or sealant will be supplemented by physical manipulation, and degradation will be evaluated in the corrective action program.

In its response to RAI B.2.3.16-3, the applicant revised LRA Section A.2.2.16 to add corrective actions when FWST internal coated/lined surfaces do not meet acceptance criteria. The staff finds the response acceptable because, consistent with LR-ISG-2013-01, the FSAR supplement includes corrective action recommendations from AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks."

In its responses to RAI B.2.3.16-4 and B.2.3.16-4a, the applicant revised the table in LRA Section B.2.3.16 that provides additional detail on the required enhancements based on Table 4a in Appendix L to LR-ISG-2012-02 (i.e., operational tests, National Fire Protection Association (NFPA) 25, "Inspection, Testing and Maintenance of Water-Based Fire Protection Systems," section 10.3.4.3) to (1) clarify which deluge system operational tests are performed with water, which are tested with air instead of water, and which are not tested but addressed in the exception to the program, and (2) add a new enhancement related to NFPA 25 Section 10.3.4.3, regarding monitoring and trending the results of the deluge system operational tests performed with water (i.e., pump performance, run and discharge time, pressure, deposits or sediment). In addition, the applicant revised LRA Table A-3 to reference the table in LRA Section B.2.3.16 that provides additional detail on the required enhancements based on Table 4a in Appendix L to LR-ISG-2012-02 (see the discussion of Enhancement 4 below). The staff finds the applicant's responses acceptable because (1) the revised table clarified the current compliance discussion relating to operational testing and included an additional enhancement for monitoring and trending operational tests consistent with GALL-LR Report AMP XI.M27, as modified by LR-ISG-2012-02, and (2) the revised commitment table provides clear information relating to all the required enhancements to the program.

The 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 exceptions and enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. Because the program's enhancements are not numbered in the LRA, the enhancement numbering below reflects their appearance in the associated enhancement tables in the letter dated July 27, 2023 (ML23208A193).

<u>*Exception 1*</u>. LRA Section B.2.3.16 includes an exception to the "detection of aging effects" program element related to the deluge valves for the containment pre-access filtration system charcoal filter units and primary plant ventilation engineered safety feature (ESF) filter units that cannot be tested with water or air. The staff reviewed this exception against the corresponding program element in GALL-LR Report AMP XI.M27, as modified by LR-ISG-2012-02, and finds it acceptable because (1) the deluge header inside the filter plenum and the accessible portions of the spray spargers will receive an external visual inspection every refueling cycle, (2) one of the two pre-access filtration charcoal filter deluge systems will be visually inspected internally every 5 years, (3) 2 of the 18 ESF filter deluge systems will be visually inspected internally every 5 years, (4) if degradation is identified, then all pre-access filtration charcoal filter deluge systems will be visually inspected internally every 5 years, and (5) if degradation is identified, then the inspection population of the ESF filter deluge systems will be expanded.

<u>*Exception 2*</u>. LRA Section B.2.3.16 includes an exception to the "corrective actions" program element related to lightly tapping the coating/lining surrounding a blister as an alternative to adhesion testing in order to determine whether the remaining coating/lining is tightly bonded to the base metal. The staff reviewed this exception and finds it acceptable because as noted in GALL-LR Report AMP XI.M42, as added by LR-ISG-2013-01, lightly tapping the coating/lining is an acceptable alternative when adhesion testing is not possible due to physical constraints. SE Section 3.0.3.2.20 contains additional discussion.

<u>*Enhancement 1*</u>. LRA Section B.2.3.16 includes an enhancement to the "scope of program," "parameters monitored or inspected," "detection of aging effects," "acceptance criteria," and "corrective actions" program elements related to FWST internal lining inspections. The staff reviewed this enhancement against the corresponding program elements in the associated AMP

and finds it acceptable because, when it is implemented, internal lining inspections of the FWST will address aging effects, personnel training and qualification, acceptance criteria, and corrective actions, with the exception of the adhesion test (see the discussion of Exception 2 above), consistent with GALL-LR Report AMP XI.M27, as modified by LR-ISG-2013-01.

Enhancement 2. LRA Section B.2.3.16 includes an enhancement to the “parameters monitored or inspected” and “detection of aging effects” program elements related to visual inspections for loss of material and follow-up volumetric wall thickness examinations when surface irregularities are detected. The staff reviewed this enhancement against the corresponding program elements in the associated AMP and finds it acceptable because, when it is implemented, the visual inspection technique used to detect loss of material will be consistent with GALL-LR Report AMP XI.M27, as modified by LR-ISG-2012-02.

Enhancement 3. LRA Section B.2.3.16 includes an enhancement to the “parameters monitored or inspected” and “detection of aging effects” program elements related to augmented tests and inspections on portions of the water-based fire protection system components that are wetted but are normally dry. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, the augmented tests and inspections on portions of the water-based fire protection system components that are wetted but are normally dry will be consistent with the recommendations in GALL-LR Report AMP XI.M27, as modified by LR-ISG-2012-02.

Enhancement 4. As amended by letter dated October 4, 2023 (ML23277A176), LRA Section B.2.3.16 includes an enhancement to the “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements related to updating and developing procedures to incorporate surveillance requirements from the corresponding program element and Table 4a in Appendix L to LR-ISG-2012-02. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, testing and visual inspections will be performed in accordance with the surveillance recommendations in GALL-LR Report AMP XI.M27, as modified by LR-ISG-2012-02. The discussion of RAI B.2.3.16-4a above contains more information.

Enhancement 5. LRA Section B.2.3.16 includes an enhancement to the “acceptance criteria” program element related to maintaining the minimum design wall thickness. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, it will address maintaining the minimum wall thickness of fire water system components consistent with GALL-LR AMP XI.M27, as modified by LR-ISG-2012-02.

Enhancement 6. As amended by letters dated April 6, 2023 (ML23096A302), and July 27, 2023 (ML23208A193), LRA Section B.2.3.16 includes an enhancement to the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “acceptance criteria,” and “corrective actions” program elements related to caulking or sealant installed at the interface between the steel FWST and the concrete foundation ring. The staff reviewed this enhancement against the corresponding program elements in the associated AMP and finds it acceptable because, when it is implemented, (1) caulking or sealant will be installed at the interface between the FWST and the concrete foundation ring, (2) the caulking or sealant will be visually inspected and physically manipulated each refueling outage, (3) the acceptance criteria will include no drying, cracking, or missing caulking or sealant, and (4) flaws in the caulking or sealant will be evaluated in the corrective action program consistent with GALL-LR Report

AMP XI.M27, as modified by LR-ISG-2012-02. The discussion of RAI B.2.3.16-2 above contains additional information.

Enhancement 7. As amended by letter dated April 6, 2023 (ML23096A302), LRA Section B.2.316 includes an enhancement to the “parameters monitored or inspected,” “detection of aging effects,” “acceptance criteria,” and “corrective actions” program elements related to measuring the bottom thickness of each FWST using ultrasonic testing during the first 10 years of the period of extended operation, evaluating the bottom thickness measurements against the design thickness and corrosion allowance, and evaluating in the corrective action program bottom thickness measurements not meeting acceptance criteria. The staff reviewed this enhancement against the corresponding program elements in the associated AMP and finds it acceptable because, when it is implemented, bottom thicknesses will be measured for each FWST consistent with GALL-LR Report AMP XI.M27, as modified by LR-ISG-2012-02.

Enhancement 8. As amended by letter dated April 6, 2023 (ML23096A302), LRA Section B.2.316 includes an enhancement to the “parameters monitored or inspected,” “detection of aging effects,” “acceptance criteria,” and “corrective actions” program elements related to inspecting and clearing debris or obstructions for the electric-motor-driven vertical centrifugal fire pump suction strainer/screen following any activation of the pump. The staff reviewed this enhancement against the corresponding program elements in the associated AMP and finds it acceptable because, when it is implemented, the electric-motor-driven vertical centrifugal fire pump suction strainer/screen will be inspected consistent with GALL-LR Report AMP XI.M27, as modified by LR-ISG-2012-02.

Enhancement 9. As amended by letter dated April 24, 2023 (ML23114A377), LRA Section B.2.3.16 includes an enhancement to the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements related to how recurring internal corrosion will be managed during the period of extended operation. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, consistent with the GALL-LR Report AMP XI.M27, as modified by LR-ISG-2012-02, when it is implemented, recurring internal corrosion will be managed for the fire water system. Specifically, recurring internal corrosion will be adequately managed by (1) performing volumetric examinations on a refueling outage interval on five carbon steel aboveground locations susceptible to recurring internal corrosion, (2) continuing to perform volumetric examinations until recurring internal corrosion occurrences are arrested, and (3) performing volumetric examinations on additional locations if significant degradation is identified through volumetric examinations or operating experience (four additional tests for through-wall leaks and loss of material greater than 50 percent, and two additional tests for 30 to 50 percent loss of material and the remaining life is calculated to be less than 2 years).

Enhancement 10. As amended by letter dated July 27, 2023 (ML23208A193), LRA Section B.2.3.16 includes an enhancement to the “scope of program,” “detection of aging effects,” “acceptance criteria,” and “corrective actions” program elements related to cleaning and inspecting the diesel-driven fire pump heat exchanger tubesheet and channel head. The staff reviewed this enhancement against the corresponding program elements in the associated AMP and finds it acceptable because, when it is implemented, loss of material and reduction of heat transfer of the diesel-driven fire pump heat exchanger tubesheet and channel head will be adequately managed by the Fire Water System program through cleaning and visual inspection for any indication of fouling or corrosion at least once every 10 years, and inspection results not meeting the acceptance criteria will be entered in the corrective action program. The discussion of RAI B.2.3.16-1 above contains additional information.

Based on a review of the LRA, supplements, and the applicant's response to RAIs B.2.3.16-1, B.2.3.16-2, B.2.3.16-3, B.2.3.16-4, and B.2.3.16-4a, 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 GALL-LR Report AMP XI.M27 are consistent with the corresponding program elements of GALL-LR Report AMP XI.M27, as modified by LR-ISG-2012-02 and LR-ISG-2013-01. The staff also reviewed the exceptions associated with the "detection of aging effects" and "corrective actions" 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," "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. LRA Section B.2.3.16 summarizes operating experience related to the Fire Water System program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff reviewed search results of the plant operating experience information to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging during the period of extended operation. The 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 program was evaluated.

FSAR Supplement. LRA Section A.2.2.16, as amended by letters dated April 6, 2023 (ML23096A302), and July 27, 2023 (ML23208A193), provides the FSAR supplement for the Fire Water System program. The staff reviewed this FSAR supplement description of the program, as amended, and noted that it is consistent with the recommended description in Table 3.0-1 of LR-ISG-2012-02, as provided in LR-ISG-2013-01. The staff also noted that in LRA Table A-3, the applicant committed to enhance the Fire Water System program by implementing the enhancements discussed above, 6 months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation, and to perform the inspections needed before the period of extended operation within the 5-year period prior to period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Fire Water System program, the staff concludes that those program elements for which the applicant claimed consistency with GALL-LR Report AMP XI.M27 are consistent. The staff also reviewed the exceptions and enhancements and finds that, with the exceptions and the enhancements when implemented prior to the 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.14 Fuel Oil Chemistry

LRA Section B.2.3.17 states that the Fuel Oil Chemistry program is an existing program with enhancements that will be consistent with the program elements in the GALL-LR Report AMP XI.M30, “Fuel Oil Chemistry,” except for exceptions identified in the LRA. The applicant supplemented this LRA section with a letter dated April 6, 2023 (ML23096A302).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant’s claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M30.

The staff also reviewed the portions of the “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. LRA Section B.2.3.17 includes an exception to the “detection of aging effects” program element, which is related to the emergency diesel generator (EDG) diesel fuel oil storage tanks (DFOST) that are drained, cleaned, visually inspected, and ultrasonically inspected on a 20-year frequency per preventive maintenances (PMs). Accordingly, CPNPP will take an exception to the guidance in Element 4 of NUREG-2191, XI.M30, which recommends draining, cleaning, and visually inspecting each diesel fuel tank at least once during the 10-year period prior to the period of extended operation, and on a 10-year frequency during the period of extended operation. The applicant provided supplemental information regarding the external surface of the tank, the sampling location in the tank sump, and the typical storage conditions for the tank. The applicant proposed these changes in LRA Revision 1, Supplement 1, by letter dated April 6, 2023 (ML23096A302). The staff reviewed this exception against the corresponding program element in GALL-LR Report AMP XI.M30 and finds it acceptable because, as an alternative to the GALL-LR Report Element 4 requirements, CPNPP will drain and clean the EDG DFOSTs tanks and maintain between approximately 85 percent and 97 percent full, with very little of the interior surface area exposed to air. The exteriors of the tanks are coated with two coats of 0.15 to 0.18 mil bitumastic and properly backfilled. The tank foundations are located above the ground water elevation, and the site cathodic protection system is regularly surveyed and maintained. Additionally, each tank is sampled (from the lowest point of the tank, the sample is taken six inches from the bottom of the tank sump, which is representative of the tank bottom) monthly for accumulated water and sediment, with any accumulated water removed in a timely manner and recent sampling within free water concentration acceptance criteria.

Exception 2. LRA Section B.2.3.17 includes an exception to the “detection of aging effects” program element, which is related to the sampling location. CPNPP will take an exception to the periodic multilevel sampling to ensure that fuel oil contaminants are below unacceptable levels. If tank design features do not allow for multilevel sampling, a sampling methodology that includes a representative sample from the lowest point in the tank is allowed in Element 4 of NUREG-2191, XI.M30. The staff reviewed this exception against the corresponding program element in GALL-LR Report AMP XI.M30 and finds it acceptable because as an alternative to the GALL-LR Element 4 requirements, CPNPP will use a sampling methodology that includes a representative sample from the lowest point in the DFOST tanks. The single, lower level samples are taken from a sump located at the bottom of the tank (the sump is 2 feet 6 inches deep and the sample is taken six inches from the bottom of the sump; therefore, the sample is taken two feet below the bottom of the tank and representative of the tank bottom). A review of recent water sampling results confirmed that there is no water accumulation in the tanks.

Enhancement 1. LRA Section B.2.3.17 includes an enhancement to the “preventive actions” and “detection of aging effects” program elements, which incorporates the following activities: drain, clean, and visually inspect the internal surfaces of the EDG day tanks and the diesel driven fire pump (DDFP) fuel oil storage tanks; volumetrically inspect the tanks if evidence of degradation is observed during visual inspection or if visual inspection is not possible; and perform the maintenance activities and the inspections at least once during the 10-year period prior to the period of extended operation, then periodically on a 10-year frequency during the period of extended operation. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-LR Report.

Enhancement 2. LRA Section B.2.3.17 includes an enhancement to the “parameters monitored and inspected” program element, which relates to revising procedure(s) to test for microbiological organisms in new fuel prior to acceptance for use. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-LR Report.

Enhancement 3. LRA Section B2.3.17 includes an enhancement to the “parameters monitored and inspected” and “monitoring and trending” program elements, which revises sampling procedures to specifically monitor and trend the following parameters quarterly: water content, sediment content, biological activity, and total particulate concentration for the EDG DFOSTs, day tanks, and DDFP fuel oil storage tanks. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-LR Report.

Enhancement 4. LRA Section B.2.3.17 includes an enhancement to the “parameters monitored or inspected,” “detection of aging effects” and “acceptance criteria” program elements, which provide acceptance criteria, consistent with industry standards, for the testing requirement and approach used to detect microbiological activity in diesel fuel used in the EDG DFOSTs, day tanks, and DDFP fuel oil storage tanks. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-LR Report.

Based on a review of the LRA and 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 CPNPP claimed consistency with the GALL-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M30. The staff also reviewed the exceptions associated with the “detection of aging effects” program element and the 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,” and “acceptance criteria” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.3.17 summarizes OE related to the Fuel Oil Chemistry program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff reviewed search results of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the period of extended operation.

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

FSAR Supplement. LRA Appendix A, Section A.2.2.17, provides the FSAR supplement for the Fuel Oil Chemistry program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that CPNPP committed to ongoing implementation of the existing Fuel Oil Chemistry program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the CPNPP’s Fuel Oil Chemistry program, the staff concludes that those program elements for which CPNPP claimed consistency with the GALL-LR Report are consistent. The staff also reviewed the enhancements and exceptions and finds that, when the enhancements and exceptions are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that CPNPP 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.15 Reactor Vessel Surveillance

LRA Section B.2.3.18 states that the Reactor Vessel Surveillance program is an existing program with enhancements that will be consistent with the program elements in the GALL-LR Report AMP XI.M31, “Reactor Vessel Material Surveillance.” The applicant supplemented this LRA section with a letter dated April 6, 2023 (ML23096A302).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant’s claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M31.

The staff also reviewed the portions of the “detection of aging effects,” “monitoring and trending,” and “corrective actions” program elements, as supplemented by letter dated

April 6, 2023 (ML23096A302), and associated 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. LRA Section B.2.3.18, as supplemented by letter dated April 6, 2023 (ML23096A302), includes an enhancement to the "detection of aging effects" program element, which relates to providing an updated capsule withdrawal schedule for Unit 1 and Unit 2 for the period of extended operation.

The enhancement, as supplemented by letter dated April 6, 2023 (ML23096A302), specifies an explicit capsule withdrawal schedule for each unit, which includes three available surveillance capsules, and the associated withdrawal time, which will be evaluated in detail below.

LRA Section B.2.3.18 states that six specimen capsules were installed in each unit before plant commercial operation. Furthermore, all six capsules were withdrawn, and three specimen capsules from each unit were tested in accordance with American Society for Testing and Materials (ASTM) E185-82. The remaining three untested specimen capsules from each reactor pressure vessel are currently stored in the spent fuel pool.

For Unit 1, Capsule X was the latest capsule withdrawn and was exposed to a neutron fluence value of 3.18×10^{19} neutrons per square centimeters (n/cm^2) (E > 1.0 mega electron volts (MeV)), which is equivalent to a peak projected RV fluence after 50 EFPY of operation. The staff noted that this capsule fulfilled the surveillance requirement for the initial 40 years of operation but did not achieve the neutron fluence projected to be experienced after 60 years of operation (i.e., projected neutron fluence of 3.59×10^{19} n/cm^2 (E > 1.0 MeV) after 56 EFPY of operation). The applicant stated that Capsule Z will be reinserted before 36 EFPY to be exposed to at least a vessel equivalent fluence of 80 EFPY (5.23×10^{19} n/cm^2) and be removed and tested at the outage nearest to but following an additional 9 EFPY of operation. The applicant also stated that if Capsule Z is unavailable for reinsertion, Capsule W or V can be reinserted for an additional 13 EFPY of operation. During its audit, the staff confirmed that reinsertion of Capsule W or V, in lieu of Capsule Z, into the Unit 1 RV for an additional 13 EFPY of operation would be capable of achieving at least an RV equivalent neutron fluence of 80 EFPY (5.23×10^{19} n/cm^2). Based on its review, the staff finds that the proposed withdrawal schedule of Capsule Z, W, or V in Unit 1 will achieve at least the projected 60-year neutron fluence exposure of 3.59×10^{19} n/cm^2 (E > 1.0 MeV) in advance of the end of the period of extended operation to support managing the effects of irradiation embrittlement of the RV.

For Unit 2, Capsule W was the latest capsule withdrawn and was exposed to a neutron fluence value of 3.30×10^{19} n/cm^2 (E > 1.0 MeV), which is equivalent to a peak projected RV fluence after 55 EFPY of operation. The staff noted that this capsule fulfilled the surveillance requirement for the initial 40 years of operation but did not achieve the neutron fluence projected to be experienced after 60 years of operation (i.e., projected neutron fluence of 3.37×10^{19} n/cm^2 (E > 1.0 MeV) after 56 EFPY of operation). The applicant stated that Capsule Z will be reinserted before 36 EFPY to be exposed to at least a vessel equivalent fluence of 80 EFPY (4.83×10^{19} n/cm^2) and be removed and tested at the outage nearest to but following an additional 8 EFPY of operation. The applicant also stated that if Capsule Z is unavailable for reinsertion, Capsule Y or V can be reinserted for an additional 14 EFPY of operation. During its audit, the staff confirmed that reinsertion of Capsule Y or V, in lieu of Capsule Z, into the Unit 2 RV for an additional 14 EFPY of operation would be capable of achieving at least an RV equivalent neutron fluence of 80 EFPY (4.83×10^{19} n/cm^2). Based on its review, the staff finds that the proposed withdrawal schedule of Capsule Z, Y, or V in Unit 2 will achieve at least the projected 60-year neutron fluence exposure of 3.37 x 10^{19} n/cm^2 (E > 1.0 MeV) in advance of the end of the period of extended operation to support managing the effects of irradiation embrittlement of the RV.

Additionally, the staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M31 and finds the enhancement acceptable because, when implemented, it will be consistent with the "detection of aging effects" program element of GALL-LR AMP XI.M31, such that the applicant withdraws one capsule (i.e., Capsule Z, W, or V for Unit 1, and Capsule Z, Y, or V for Unit 2) that receives a neutron fluence of between one and two times the projected 60-year peak RV wall neutron fluence prior to the end of the period of extended operation.

Enhancement 2. LRA Section B.2.3.18 includes an enhancement to the "detection of aging effects" and "monitoring and trending" program elements, which relates to establishing operating restrictions to ensure that the plant is operated such that the cold-leg temperature during normal operation will be limited to between 525 degrees Fahrenheit (°F) (minimum) and 590°F (maximum).

The "monitoring and trending" program element of GALL-LR AMP XI.M31 states that a program that determines embrittlement by following RG 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," issued May 1988 (ML003740284), uses the applicable limitations in Regulatory Position 1.3 of that RG. Specifically, the staff noted that Regulatory Position 1.3 states, in part, that procedures are valid for a nominal irradiation temperature of 550°F and that irradiation below 525°F should be considered to produce greater embrittlement, and irradiation above 590°F may be considered to produce less embrittlement.

The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M31 and finds it acceptable because, when it is implemented, there will be operating restrictions such that the cold-leg temperature during normal operation will be limited to a range that is consistent with guidance in RG 1.99, Revision 2, and GALL-LR AMP XI.M31. This ensures that the capsule surveillance data obtained by the applicant can be assessed against the embrittlement trend curve in RG 1.99, Revision 2.

Enhancement 3. LRA Section B.2.3.18, as supplemented by letter dated April 6, 2023 (ML23096A302), includes an enhancement to the "monitoring and trending" program element, which relates to modifying program documents to require an update to the pressure-temperature limit report (PTLR) that is consistent with the surveillance test results. This enhancement was included as a result of plant-specific OE after the staff's review of the LRA. This enhancement is consistent with the "monitoring and trending" program element of GALL-LR AMP XI.M31 because, when implemented, it will ensure that the RV material fracture toughness data from the testing of surveillance capsules will be assessed to determine the impact, if any, to the applicant's PTLR. Additionally, the staff finds this enhancement consistent with the reporting requirements in Appendix H, "Reactor Vessel Material Surveillance Program Requirements," to 10 CFR Part 50. This regulation requires that changes to technical specifications, either in the pressure-temperature limits or in the operating procedures required to meet the limits, be identified.

The staff reviewed this enhancement against the corresponding program elements in GALL-LR AMP XI.M31 and finds it acceptable because, when implemented, it will be consistent with GALL-LR AMP XI.M31 and meet the requirements of 10 CFR Part 50, Appendix H.

Enhancement 4. LRA Section B.2.3.18 includes an enhancement to the "detection of aging effects" and "corrective actions" program elements, which relates to documenting the capsule withdrawal schedule in the PTLR. The staff noted that the applicant fulfilled its RV material surveillance requirements for the original 40-year operating license with its withdrawal and testing of Capsules X and W from Units 1 and 2, respectively. Thus, a capsule withdrawal schedule was no longer required and necessary to be contained in the applicant's PTLR for the original 40-year operating license. The staff noted that this enhancement ensures that the applicant's PTLR will include the applicant's capsule withdraw schedule for the period of extended operation, as described above in Enhancement 1, and require that any changes to the proposed withdrawal schedule for the period of extended operation be approved by the NRC before implementation, consistent with Section III of Appendix H to 10 CFR Part 50.

The staff reviewed this enhancement against the corresponding program elements in GALL-LR AMP XI.M31 and finds it acceptable because, when implemented, it will ensure that changes to the applicant's capsule withdrawal schedule are approved by the NRC before implementation, consistent with the "detection of aging effects" program element of GALL-LR AMP XI.M31 and Appendix H to 10 CFR Part 50.

Based on a review of the LRA and the applicant's 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-LR Report are consistent with the corresponding program elements of GALL-LR AMP XI.M31. In addition, the staff reviewed the enhancements associated with "detection of aging effects," "monitoring and trending," and "corrective actions" program elements and finds that, when implemented, they ensure that the applicant's AMP will be adequate to manage reduction of fracture toughness of RV beltline materials due to neutron irradiation embrittlement and to monitor RV operating conditions during the period of extended operation.

Operating Experience. LRA Section B.2.3.18 summarizes OE related to the Reactor Vessel Surveillance program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation. As a result of plant-specific OE identified after the staff's review of the LRA, the LRA AMP was supplemented, by letter dated April 6, 2023 (ML23096A302), to include Enhancement 3, which the staff evaluated above.

Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Reactor Vessel Surveillance program was evaluated.

FSAR Supplement. LRA Section A.2.2.18 provides the FSAR supplement for the Reactor Vessel Surveillance program. The staff reviewed this FSAR supplement description of the program against the recommended description for this type of program as given in SRP-LR Table 3.0-1 and noted that it was not consistent with the staff guidance, and based on plant-specific OE, the CLB should include additional detail. However, when modified by Supplement 1, the FSAR supplement for the Reactor Vessel Surveillance program is consistent with the corresponding program description in SRP-LR Table 3.0-1 and includes appropriate details associated with plant-specific OE.

The staff also noted that the applicant committed to ongoing implementation of the existing Reactor Vessel Surveillance program for managing the effects of aging for applicable components during the period of extended operation with the enhancements listed below no later than six months, or the last refueling outage, prior to the period of extended operation:

- The applicant stated that, for Unit 1, Capsule Z will be reinserted and then withdrawn and tested at the outage nearest to but following an additional 9 EFPY of operation. If Capsule Z is not available for reinsertion, Capsule W or V can be reinserted for an additional 13 EFPY. For Unit 2, Capsule Z will be reinserted and then withdrawn and tested at the outage nearest to but following an additional 8 EFPY of operation. If Capsule Z is not available for reinsertion, Capsule Y or V can be reinserted for an additional 14 EFPY of operation.
- The applicant stated that the capsule withdrawal schedule will be documented in the PTLR and notes that changes require NRC approval as stated in 10 CFR Part 50, Appendix H.
- The applicant stated that the program documents will be modified to require that all pulled and tested specimens will be retained unless the NRC has approved the discard of the pulled and tested samples.
- The applicant stated that the program documents will be modified to establish operating restrictions to ensure that the plant is operated within the material aging OE (i.e., the cold-leg temperature during normal operation will be limited to between 525°F (minimum) and 590°F (maximum)).
- The applicant stated that the program documents will be modified to require an update to the PTLR to be consistent with the surveillance test results after the applicant submits to the NRC the surveillance test results in accordance with 10 CFR Part 50, Appendix H.

The staff finds that the information in the FSAR supplement, as supplemented by the applicant’s letter dated April 6, 2023 (ML23096A302), is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s Reactor Vessel Surveillance program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. The staff also reviewed the enhancements and finds that, with the supplement, 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.16 External Surfaces Monitoring of Mechanical Components

LRA Section B.2.3.22 states that the External Surfaces Monitoring of Mechanical Components program is an existing program with enhancements that will be consistent with the program elements in the GALL-LR Report AMP XI.M36, “External Surfaces Monitoring of Mechanical Components,” as modified by LR-ISG-2012-02 (ML13227A361). The applicant amended this LRA section by letter dated April 6, 2023 (ML23096A302).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant’s claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M36, “External Surfaces Monitoring of Mechanical Components.”

The staff also reviewed the portions of the “scope of program,” “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 four enhancements follows.

Enhancement 1. LRA Section B.2.3.22 includes an enhancement to the “scope of program” program element, which relates to the following:

- including elastomeric and polymeric components
- including outdoor insulated components and indoor insulated components exposed to condensation, to monitor for degraded conditions under insulation
- clarifying that this program manages below-grade components that are accessible during normal operations or refueling outages for which access is not restricted
- allowing external examinations to be credited to manage the aging effects of the internal surfaces of components when external conditions are representative of internal conditions

The staff reviewed this enhancement and finds it acceptable because, when the enhancement is implemented, the “scope of program” program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M36.

Enhancement 2. LRA Section B.2.3.22 includes an enhancement to the “parameters monitored or inspected” program element, which relates to the following:

- monitoring for discoloration, surface cracking, crazing, scuffing, dimensional change, and hardening for polymeric and elastomeric components, as well as exposure of internal reinforcement for reinforced elastomers
- monitoring metallic components for loss of material due to material wastage; leakage; worn, flaking, or oxide-coated surfaces; corrective coating degradation; and corrosion stains on thermal insulation
- including examples of components inspected, such as piping, piping components, ducting, polymeric components, and insulation jacketing
- inspecting the heat transfer surfaces of unit coolers that are exposed to external condensation and are credited with a heat transfer function

The staff reviewed this enhancement and finds it acceptable because, when the enhancement is implemented, the “parameters monitored or inspected” program element will be consistent with GALL-LR Report AMP XI.M36.

Enhancement 3. LRA Section B.2.3.22 includes an enhancement to the “detection of aging effects” program element which relates to the following:

- Ensuring that inspections of readily visible surfaces during plant operations and refueling outages are performed once per refueling cycle. Surfaces not readily visible are inspected when they are made accessible and at intervals that ensure the components’ intended functions are maintained.
- Ensuring that inspections follow site procedures that include inspection parameters for items, such as lighting, distance, offset, surface coverage, and presence of protective coatings, when non-ASME Code inspections and tests are required.

- Inspecting elastomeric and polymeric components through a combination of visual inspection and manual or physical manipulation of the material. Visual inspections will cover 100 percent of accessible component surfaces. Manipulation sample size is at least 10 percent of available surface area. The inspection parameters for elastomers and polymers shall include surface cracking, crazing, scuffing, dimensional change, loss of thickness, discoloration, exposure of internal reinforcement for reinforced elastomers, and hardening.
- Inspecting insulated components in an outdoor environment, or in an indoor environment that may be exposed to condensation, once every 10 years during the period of extended operation. The population and sample size used is determined by material type and environment. A minimum of 20 percent of the in-scope piping length, or 20 percent of the surface area for components whose configuration does not conform to a 1-foot axial length determination (e.g., valve, accumulator, tank), will be inspected after the insulation is removed. Alternatively, any combination of a minimum of 25 1-foot axial length sections and components from each material type is inspected, with a maximum of 25 inspections required for each material-environment in each population.
- Including the following alternatives to removing insulation after the initial inspection:
    - Examination of the exterior surface of the insulation with sufficient acuity to detect indications of damage to the jacketing or protective outer layer (if the protective outer layer is waterproof) when the initial inspection results showed both of the following:
        - no loss of material due to general, pitting, or crevice corrosion beyond that which could have been present during initial construction
        - no evidence of SCC

      If (a) the external visual inspections of the insulation reveal damage to the exterior surface of the insulation or jacketing, (b) there is evidence of water intrusion through the insulation (e.g., water seepage through insulation seams or joints), or (c) the protective outer layer (where jacketing is not installed) is not waterproof, then periodic inspections under the insulation should continue as conducted for the initial inspection.

    - Removal of tightly adhering insulation that is impermeable to moisture is not required unless there is evidence of damage to the moisture barrier. Tightly adhering insulation is a separate population from the remaining insulation installed on in-scope components. The entire population of in-scope piping that has tightly adhering insulation is visually inspected for damage to the moisture barrier with the same frequency as for other types of insulation inspections. These inspections are not credited towards the inspection quantities for other types of insulation.
- Selection of bounding or lead components most susceptible to corrosion under insulation in an outdoor environment or in an indoor environment that may be exposed to condensation. This could be due to time in service, severity of operating conditions, and lowest design margin for inspection under insulation.

The staff reviewed this enhancement and finds it acceptable because, when the enhancement is implemented, the “detection of aging effects” program element will be consistent with GALL-LR Report AMP XI.M36, as modified by LR-ISG-2012-02.

<u>*Enhancement 4*</u>. LRA Section B.2.3.22 includes an enhancement to the “acceptance criteria” program element adding the following acceptance criteria:

- For metallic surfaces, any indications of degradation are evaluated.
- For stainless steel surfaces, a clean, shiny surface is expected, and any deviation is evaluated.
- For flexible polymers, a uniform surface texture and uniform color with no dimension change are expected, and any deviation is evaluated.
- For flexible materials, changes in physical properties (e.g., the hardness, flexibility, physical dimensions, and color of the material are unchanged from when the material was new) are evaluated.
- For rigid polymers, surface changes affecting performance, such as erosion, cracking, crazing, and chalking, are evaluated.

The staff reviewed this enhancement and finds it acceptable because, when the enhancement is implemented, the “acceptance criteria” program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M36, as modified by LR-ISG-2012-02.

Based on a review of the LRA and 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-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M36, as modified by LR-ISG-2012-02. In addition, the staff reviewed the enhancements associated with the “scope of program,” “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>. LRA Section B.2.3.22 summarizes OE related to the External Surfaces Monitoring of Mechanical Components program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the External Surfaces Monitoring of Mechanical Components program was evaluated.

<u>FSAR Supplement</u>. LRA Section A.2.2.22 provides the FSAR supplement for the External Surfaces Monitoring of Mechanical Components program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that in LRA Table A-3, the applicant committed to implementing the existing External Surfaces Monitoring of Mechanical Components AMP, including enhancements, no later than six months prior to the period of extended operation. The staff finds that the information in the FSAR supplement, as amended by letter dated April 4, 2023, is an adequate summary description of the program.

<u>Conclusion</u>. Based on its review of the applicant’s External Surfaces Monitoring of Mechanical Components program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.17 Lubricating Oil Analysis

LRA Section B.2.3.25 describes the existing Lubricating Oil Analysis program which, with enhancement, will be consistent with GALL-LR Report AMP XI.M39, "Lubricating Oil Analysis."

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M39.

The staff also reviewed the portions of the "acceptance criteria" 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 is as follows.

Enhancement. LRA Section B.2.3.25 includes an enhancement to the "acceptance criteria" program element to revise procedure(s) and/or PM(s) to clarify that phase-separated water in any amount is not acceptable for any component within the scope of LR. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M39 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-LR Report.

Based on a review of the amended LRA, 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 CPNPP claimed consistency with the GALL-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M39. In addition, the staff reviewed the enhancement associated with the "acceptance criteria" program element and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.3.25 summarizes OE related to the Lubricating Oil Analysis program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff reviewed search results of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE indicating that CPNPP should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Lubricating Oil Analysis program was evaluated.

FSAR Supplement. LRA Appendix A, Section A.2.2.25, provides the FSAR supplement for the Lubricating Oil Analysis program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-LR Report

Table XI.M39. The staff also noted that CPNPP committed to ongoing implementation of the existing Lubricating Oil Analysis program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of CPNPP's Lubricating Oil Analysis program, the staff concludes that those program elements for which CPNPP claimed consistency with the GALL-LR Report are consistent. Also, the staff reviewed the enhancement and concluded that its implementation prior to the period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that CPNPP 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.18 Monitoring of Neutron-Absorbing Materials Other than Boraflex

The LRA states that AMP B.2.3.26, "Monitoring of Neutron-Absorbing Materials Other than Boraflex," is an existing program that, with enhancement, will be consistent with the program elements in GALL-LR Report AMP XI.M40, "Monitoring of Neutron-Absorbing Materials Other than Boraflex."

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M40.

The staff also reviewed the portions of the "corrective actions" 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 one enhancement follows.

Enhancement. LRA Section B.2.3.26 includes an enhancement to the "corrective actions" program element, which relates to updating procedures to ensure corrective actions for failed acceptance criteria include a comparison of current and future predicted parameters to the assumptions of the spent fuel pool criticality analysis. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M40 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report.

Operating Experience. LRA Section B.2.3.26 summarizes OE related to the Monitoring of Neutron-Absorbing Materials Other than Boraflex program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the Monitoring of Neutron-Absorbing Materials Other than Boraflex program was evaluated.

<u>FSAR Supplement</u>. LRA Section A.2.2.26 provides the FSAR supplement for the Monitoring of Neutron-Absorbing Materials Other than Boraflex program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to implementing the enhancement no later than six months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

<u>Conclusion</u>. Based on its review of the applicant's Monitoring of Neutron-Absorbing Materials Other than Boraflex program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. The staff also reviewed the enhancement 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.19 Buried and Underground Piping and Tanks

LRA Section B.2.3.27 states that the Buried and Underground Piping and Tanks program is an existing program with enhancements that will be consistent with the program elements in GALL-LR Report AMP XI.M41, "Buried and Underground Piping and Tanks," as amended by LR-ISG-2015-01, not including the exception identified in the LRA. The applicant amended this LRA section by letters dated April 6, 2023 (ML23096A302); April 24, 2023 (ML23114A377); and July 27, 2023 (ML23208A193).

<u>Staff Evaluation</u>. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M41, as amended by LR-ISG-2015-01.

The 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 this exception and 16 enhancements follows.

<u>*Exception 1*</u>. As amended by letters dated April 6, 2023 (ML23096A302), and April 24, 2023, LRA Section B.2.3.27 includes an exception to the "detection of aging effects" program element related to inspecting the diesel generator fuel oil storage tanks every 20 years through visual inspection and ultrasonic thickness measurements (in lieu of the 10-year frequency specified in the GALL-LR Report). The staff reviewed this exception against the corresponding program element in GALL-LR Report AMP XI.M41 and finds it acceptable for the following reasons: (1) the subject tanks are provided with cathodic protection and are coated with 30–36 mils of bitumastic coating, minimizing the potential for external corrosion of the subject tanks, and

(2) based on the measured corrosion rates (i.e., time to reach minimum wall thickness, projected during the last inspection using a 42-point gridded inspection, would be over 60 years, excluding one location where the projected time to reach minimum wall thickness would be 36.8 years), a 20-year inspection frequency provides the staff reasonable assurance that loss of material will be effectively managed prior to a loss of intended function.

Enhancement 1. LRA Section B.2.3.27 includes an enhancement to the “scope of program” program element, which relates to revising procedures to manage loss of material due to corrosion of piping system bolting within the scope of this program. The staff reviewed this enhancement and finds it acceptable because, when the enhancement is implemented, the “scope of program” program element will be consistent with GALL-LR Report AMP XI.M41.

Enhancement 2. LRA Section B.2.3.27 includes an enhancement to the “preventive actions” program element, which relates to revising cathodic protection procedures to implement the guidance of NACE SP0169-2007, “Control of External Corrosion on Underground or Submerged Metallic Piping Systems,” or NACE RP0285-2002, “Standard Recommended Practice Corrosion Control of Underground Storage Tank Systems by Cathodic Protection.” The staff reviewed this enhancement and finds it acceptable for the following reasons: (1) the use of these standards is consistent with GALL-LR Report AMP XI.M41 recommendations and (2) as noted in Enhancement 11 below, the program includes a limiting critical potential of -1,200 millivolts (mV) to prevent damage to coatings or base metals, consistent with GALL-LR Report AMP XI.M41 recommendations.

Enhancement 3. LRA Section B.2.3.27 includes an enhancement to the “parameters monitored or inspected” program element, which relates to revising procedures to ensure pit depth gauges or calipers used for measuring wall thickness (1) have been demonstrated to be effective for the material, environment, and conditions during the examination and (2) are capable of quantifying general wall thickness and the depth of pits. The staff reviewed this enhancement and finds it acceptable because, when the enhancement is implemented, the parameters monitored or inspected for buried and underground piping and tanks will be consistent with GALL-LR Report AMP XI.M41.

Enhancement 4. LRA Section B.2.3.27 includes an enhancement to the “detection of aging effects” program element, which relates to revising procedures to state that inspections of buried and underground piping and tanks within the fire protection, station service water, and EDG and auxiliary systems will be conducted in accordance with GALL-LR Report Table XI.M41-2, for steel. The staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancement 5 are implemented, the “detection of aging effects” program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M41.

Enhancement 5. LRA Section B.2.3.27 includes an enhancement to the “detection of aging effects” program element, which relates to revising procedures to ensure a minimum of 25 percent of the internal surface of the diesel generator fuel oil storage tanks are inspected volumetrically. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancement 4 are implemented, the “detection of aging effects” program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M41.

Enhancement 6. LRA Section B.2.3.27 includes an enhancement to the “monitoring and trending” program element, which relates to revising cathodic protection procedures to trend potential difference and current measurements to identify changes in the effectiveness of the systems, coatings, or both. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancement 7 are implemented, the "monitoring and trending" program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M41.

Enhancement 7. As amended by letter dated April 6, 2023 (ML23096A302), LRA Section B.2.3.27 includes an enhancement to the "monitoring and trending" program element, which relates to revising procedures to trend the main fire pump activity and, for smaller leaks, FWST level indicator alarms and associated makeup from the treated water system (or similar parameter) to identify concerns with leakage from the buried fire water yard loop header. The staff noted that although GALL-LR Report AMP XI.M41 recommends monitoring jockey pump activity, the approach proposed by the applicant provides a similar method to detect indications of fire main leakage. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancement 6 are implemented, the "monitoring and trending" program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M41.

Enhancement 8. LRA Section B.2.3.27 includes an enhancement to the "acceptance criteria" program element, which relates to the qualifications of individuals evaluating the type and extent of coating degradation. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancements 9, 10, and 11 are implemented, the "acceptance criteria" program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M41.

Enhancement 9. LRA Section B.2.3.27 includes an enhancement to the "acceptance criteria" program element, which relates to projecting wall thickness to the end of the period of extended operation to verify that minimum wall thickness requirements are maintained. The staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 8, 10, and 11 are implemented, the "acceptance criteria" program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M41.

Enhancement 10. As amended by letter dated July 27, 2023, LRA Section B.2.3.27 includes an enhancement to the "acceptance criteria" program element, which relates to revising acceptance criteria to ensure that (1) there is no evidence that backfill caused damage to the respective component coatings or the surface of the component (if not coated) and (2) changes in main fire pump activity or increasing frequency of FWST level indicator alarms (and associated makeup from the treated water system) that cannot be attributed to causes other than leakage from buried piping are not occurring. The staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 8, 9, and 11 are implemented, the "acceptance criteria" program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M41.

Enhancement 11. As amended by letter dated April 6, 2023 (ML23096A302), LRA Section B.2.3.27 includes an enhancement to the "acceptance criteria" program element, which relates to (1) using a cathodic protection acceptance criterion equal to or more negative than -850 mV instant off for all in-scope buried components and (2) ensuring the cathodic protection critical potential limit does not exceed -1,200 mV. The staff reviewed this enhancement and finds it acceptable because these values for cathodic protection acceptance criteria and critical potential are consistent with GALL-LR Report AMP XI.M41 recommendations.

Enhancement 12. LRA Section B.2.3.27 includes an enhancement to the “corrective actions” program element, which relates to revising procedures to conduct an extent of condition evaluation when damage to a coating has been evaluated as significant (and the damage was caused by nonconforming backfill) to determine the extent of degraded backfill in the vicinity of the observed damage. The staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 13, 14, 15, and 16 are implemented, the “corrective actions” program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M41.

Enhancement 13. LRA Section B.2.3.27 includes an enhancement to the “corrective actions” program element, which relates to revising procedures to state that unacceptable cathodic protection survey results are entered into the plant corrective action program. The staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 12, 14, 15, and 16 are implemented, the “corrective actions” program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M41.

Enhancement 14. As amended by letter dated July 27, 2023, LRA Section B.2.3.27 includes an enhancement to the “corrective actions” program element, which relates to revising procedures to state that a flow test or system leak rate test is conducted by the end of the next refueling outage or as directed by the CLB, whichever period is shorter, when unexplained changes in main fire pump activity, FWST level indicator alarms, or equivalent equipment or parameters are observed. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancements 12, 13, 15, and 16 are implemented, the “corrective actions” program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M41.

Enhancement 15. LRA Section B.2.3.27 includes an enhancement to the “corrective actions” program element, which relates to measuring the remaining wall thickness to ensure that minimum wall thickness is maintained if coated or uncoated metallic piping or tanks show evidence of corrosion. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancements 12, 13, 14, and 16 are implemented, the “corrective actions” program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M41.

Enhancement 16. LRA Section B.2.3.27 includes an enhancement to the “corrective actions” program element, which relates to revising procedures to state (1) where the coatings, backfill or the condition of exposed piping does not meet acceptance criteria, the degraded condition is repaired, or the affected component is replaced and (2) the sample size is expanded in cases where 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 period of extended operation. The staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 12, 13, 14, and 15 are implemented, the “corrective actions” program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M41.

Based on a review of the LRA (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-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M41. The staff also reviewed the exception between the applicant’s program and GALL-LR Report AMP XI.M41 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 "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. As amended by letter dated April 6, 2023 (ML23096A302), LRA Section B.2.3.27 summarizes OE related to the Buried and Underground Piping and Tanks program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff reviewed plant OE information provided by the applicant to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (2) 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 period of extended operation.

The staff identified OE for which it determined the need for additional information related to buried piping coating damage (from construction dunnage) noted during an opportunistic inspection in April 2015, which resulted in the submittal of an LRA supplement from the applicant (ML23096A302). The supplement clarified that (1) the subject piping is nonnuclear-safety-related and is located outside the site's protected area (PA) and thus not subject to the same quality control requirements as the excavations and backfills inside the PA, and (2) buried piping within the PA and within the scope of LR was installed in compliance with the requirements of the CPNPP Steam Electric Station Excavation and Backfill Specification. Based on the supplemental response, the staff finds that the subject OE is not representative of the condition of buried piping in-scope for LR. Based on its audit and review of the application (as amended by the supplement), the staff finds that the conditions and OE at the plant are bounded by those for which the Buried and Underground Piping and Tanks program was evaluated.

FSAR Supplement. As amended by letters dated April 6, 2023 (ML23096A302), and April 24, 2023 (ML23114A377), LRA Section A.2.2.27 provides the FSAR supplement for the Buried and Underground Piping and Tanks program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR table 3.0-1. The staff also noted that the applicant committed to ongoing implementation of the existing Buried and Underground Piping and Tanks program for managing the effects of aging for applicable components during the period of extended operation. The staff also noted that the applicant committed to performing the pre-period of extended operation inspections within the 10-year period prior to the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Buried and Underground Piping and Tanks program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. The staff also reviewed the exception and enhancements and finds that, when the exception and 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

LRA Section B.2.3.28 states that the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program is an existing program with enhancements that will be consistent with the program elements in the GALL-LR Report AMP XI.M42, as supplemented by LR-ISG-2013-01, “Aging Management of Loss of Coating or Lining Integrity for Internal Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks,” not including the exceptions identified in the LRA. The applicant amended this LRA section by letter dated April 24, 2023 (ML23114A377).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant’s claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.M42, as supplemented by LR-ISG-2013-01.

The 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 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 four exceptions and 12 enhancements follows.

Exception 1. LRA Section B.2.3.28 includes an exception to the “scope of program” program element related to including internally coated/lined components exposed to an air environment to the program scope. The staff reviewed this exception and finds it acceptable because, as amended by SLR-ISG-2021-02-MECHANICAL, GALL-SLR Report AMP XI.M42 was revised to include an air environment in the scope of the program. As discussed in the GALL-SLR Report, applicants for initial LR (40–60 years) may use aging management guidance from SLR (60-80 years) in their applications. Therefore, the exception makes the applicant’s program consistent with the staff’s current guidance for LR.

Exception 2. As amended by letter dated April 24, 2023 (ML23114A377), LRA Section B.2.3.28 includes an exception to the “parameters monitored or inspected” and “detection of aging effects” program elements related to crediting quarterly oil sampling and quarterly oil filter cleaning for aging management of the internally coated safety injection (SI) pump lube oil cooler reservoirs (in lieu of periodic inspections recommended in GALL-LR Report AMP XI.M42). The staff reviewed this exception and finds it acceptable for the following reasons: (1) the combination of quarterly oil sampling and quarterly cleaning of the 5 mil (5 thousandths of an inch) mesh size oil filter provides reasonable assurance that degradation of the internal plastic coating or of the base metal will be adequately managed and (2) as amended by letter dated April 24, 2023 (ML23114A377), the Lubricating Oil Analysis program and FSAR supplement appropriately reflect that these are credited as required aging management activities during the period of extended operation.

Exception 3. LRA 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 recommended in GALL-LR Report AMP XI.M42) of the cement lining applied to the internal surface of buried fire protection piping. During its review, the staff noted that GALL-SLR Report AMP XI.M42 (as amended by SLR-ISG-2021-02-MECHANICAL) was revised to state that opportunistic inspections are acceptable for buried internally lined fire water system piping provided the following conditions are met: (1) flow tests and internal piping inspections will occur at intervals specified in NFPA 25, or as modified by AMP XI.M27, "Fire Water System," Table XI.M27-1, "Fire Water System Inspection and Testing Recommendations," (2) through-wall flaws in the piping can be detected through continuous system pressure monitoring, and (3) plant-specific OE is acceptable (i.e., no leaks due to age-related degradation of representative internal linings used in buried in-scope fire water system components). The staff reviewed this exception and finds it acceptable because (1) flow testing and internal piping inspections will occur at intervals specified by NFPA 25, (2) through-wall flaws in piping will be detected through continuous monitoring of system pressure through a main control room alarm, and (3) the staff's review of OE did not identify evidence of leaks due to age-related degradation of representative internal linings used in buried internally lined fire water system piping. As discussed in the GALL-SLR Report, applicants for initial LR (40–60 years) may use aging management guidance from SLR (60–80 years) in their applications. Therefore, the exception makes the applicant's program consistent with the staff's current guidance for LR.

Exception 4. LRA Section B.2.3.28 includes an exception to the "corrective actions" program element related to lightly tapping the coating/lining surrounding a blister as an alternative to adhesion testing to determine whether the remaining coating/lining is tightly bonded to the base metal. The staff reviewed this exception and finds it acceptable because, as noted in GALL-LR Report AMP XI.M42, lightly tapping the coating/lining is an acceptable alternative when adhesion testing is not possible because of physical constraints.

Enhancement 1. LRA Section B.2.3.28 includes an enhancement to the "scope of program" program element, which relates to including the following internal coatings/linings in the scope of the program: (1) EDG intercoolers, (2) fire protection cement-lined piping, and (3) internally coated 4-inch service water piping within the service water intake structure. The staff reviewed this enhancement and finds it acceptable because, when it is implemented, the "scope of program" program element will be consistent with GALL-LR Report AMP XI.M42.

Enhancement 2. LRA Section B.2.3.28 includes an enhancement to the "parameters monitored or inspected" program element, which relates to performing visual inspections capable of identifying flaking, peeling, delamination, and spalling. The staff reviewed this enhancement and finds it acceptable because, when it is implemented, the parameters monitored or inspected for coatings/linings will be consistent with GALL-LR Report AMP XI.M42.

Enhancement 3. LRA Section B.2.3.28 includes an enhancement to the "detection of aging effects" program element, which relates to performing baseline inspections of the EDG intercoolers and internally coated 4-inch service water piping within the service water intake structure in the 10-year period prior to the period of extended operation. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancements 4, 5, 6, 7, and 8 are implemented, the "detection of aging effects" program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M42.

Enhancement 4. LRA Section B.2.3.28 includes an enhancement to the "detection of aging effects" program element, which relates to performing inspections at intervals not to exceed those specified in GALL-LR Report AMP XI.M42, Table 4a, "Inspection Intervals for Internal

Coatings/Linings for Tanks, Piping, Piping Components, and Heat Exchangers." The staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 3, 5, 6, 7, and 8 are implemented, the "detection of aging effects" program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M42.

Enhancement 5. LRA Section B.2.3.28 includes an enhancement to the "detection of aging effects" program element, which relates to performing inspections of all accessible internally coated surfaces of in-scope heat exchangers. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancements 3, 4, 6, 7, and 8 are implemented, the "detection of aging effects" program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M42.

Enhancement 6. As amended by letter dated April 24, 2023 (ML23114A377), LRA Section B.2.3.28 includes an enhancement to the "detection of aging effects" program element, which relates inspecting a representative sample of 73 1-foot axial length circumferential segments of piping or 50 percent of the total length of each coating/lining material and environment combination, whichever is less, for internally coated 4-inch service water piping within the service water intake structure. The staff reviewed this enhancement and finds it acceptable because this inspection sample size is consistent with GALL-LR Report AMP XI.M42 recommendations.

Enhancement 7. LRA Section B.2.3.28 includes an enhancement to the "detection of aging effects" program element, which relates to the qualifications of individuals performing cementitious coatings/linings inspections. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancements 3, 4, 5, 6, and 8 are implemented, the "detection of aging effects" program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M42.

Enhancement 8. LRA Section B.2.3.28 includes an enhancement to the "detection of aging effects" program element, which relates to performing opportunistic inspections of the cement lining applied to the internal surface of buried fire protection piping and is associated with Exception 3 discussed above. Accordingly, the staff's review of this enhancement is consistent with the staff's review of Exception 3 above.

Enhancement 9. LRA Section B.2.3.28 includes an enhancement to the "monitoring and trending" program element, which relates to performing a pre-inspection review of the previous two inspections (when available) and includes reviewing the results of inspections and any subsequent repair activities. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancement 10 are implemented, the "monitoring and trending" program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M42.

Enhancement 10. LRA Section B.2.3.28 includes an enhancement to the "monitoring and trending" program element, which relates to (1) requirements for the post-inspection report conducted by a coatings specialist and (2) trending corrosion rates of the base metal when external wall thickness measurements are used in lieu of internal visual inspections of the coating or lining. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancement 9 are implemented, the "monitoring and trending" program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M42.

Enhancement 11. LRA Section B.2.3.28 includes an enhancement to the "acceptance criteria" program element, which relates to including acceptance criteria related to peeling, delamination, blistering, cracking, flaking, rusting, spalling, and wall thickness measurements. The staff reviewed this enhancement and finds it acceptable because, when it is implemented, the "acceptance criteria" program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M42.

Enhancement 12. LRA Section B.2.3.28 includes an enhancement to the "corrective actions" program element, which relates to revising corrective actions with respect to the following: (1) clarifying conditions in which coatings exhibiting indications of peeling and delamination may be returned to service, (2) verifying that minimum wall thickness is met and will be met until the next inspection when the base metal has been exposed or is beneath a blister, and (3) conducting physical testing or light tapping to ensure that blisters are completely surrounded by sound coating or lining bonded to the surface. The staff reviewed this enhancement and finds it acceptable because, when it is implemented, the "corrective actions" program element will be consistent with the corresponding program element in GALL-LR Report AMP XI.M42.

Based on a review of the LRA (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-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M42. The staff also reviewed the exceptions associated with the "scope of program," "parameters monitored or inspected," "detection of aging effects," and "corrective actions" 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," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, the enhancements will make the AMP adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.3.28 summarizes OE related to the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff reviewed plant OE information provided by the applicant to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation.

The staff did not identify any OE 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 OE at the plant are bounded by those for which the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program was evaluated.

FSAR Supplement. LRA Section A.2.2.28 provides the FSAR supplement for the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to ongoing implementation of the existing Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program for managing the effects of aging for applicable components during the period of extended operation. The staff also noted that the applicant committed to performing the pre-period of extended operation inspections no earlier than 10 years prior to the period of extended operation and no later than 6 months prior to the period of extended operation or the last refueling outage prior to the period of extended operation. The staff finds that the information in the FSAR 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 program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. The staff also reviewed the exceptions and enhancements and finds that, when these exceptions and 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.21 ASME Section XI, Subsection IWE

LRA Section B.2.3.29 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-LR Report AMP XI.S1, "ASME Section XI, Subsection IWE." The applicant amended this LRA section by Supplement 2, dated April 24, 2023 (ML23114A377).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.S1.

The staff also reviewed the portions of the "preventive actions" and "detection of aging effects" 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 these four enhancements are as follows.

Enhancement 1. LRA Section B.2.3.29 includes an enhancement to the "preventive actions" program element, which relates to preventive actions to prevent or mitigate degradation and failure of containment closure bolting. The staff reviewed this enhancement, as modified by Supplement 2 (ML23114A377), against the corresponding program elements in GALL-LR Report AMP XI.S1 and finds it acceptable because, when implemented, the revised plant procedures will provide guidance for preventive actions for proper selection of bolting material, lubricants, and appropriate installation torque or tension consistent with industry standards (EPRI NP-5769, EPRI TR-104213, NUREG-1339) to ensure that bolting integrity is maintained, which is consistent with the recommendations of GALL-LR Report AMP XI.S1.

Enhancement 2. LRA Section B.2.3.29 includes an enhancement to the "preventive actions" program element, which relates to preventive actions prohibiting the use of molybdenum disulfide (MoS_2) or other sulfur-containing lubricants for structural bolting. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.S1 and finds it acceptable because, when the enhancement is implemented, the program will include preventive actions to explicitly prohibit the use of MoS_2 or other sulfur-containing lubricants for structural bolting, which are potential contributors to SCC, to ensure that bolting integrity is maintained.

Enhancement 3. LRA Section B.2.3.29 includes an enhancement to the "detection of aging effects" program element, which relates to performing periodic surface examinations at intervals no greater than 10 years to monitor cracking due to cyclic loading for specific containment pressure-retaining boundary components. The components to which the enhancement applies are equipment hatch, personnel airlocks, electrical penetrations, piping penetrations of stainless steel or with dissimilar metal welds (DMWs), and fuel transfer tube sleeve. The staff reviewed this enhancement, as modified by Supplement 2 (ML23114A377), against the corresponding program element in GALL-LR Report AMP XI.S1 and finds it acceptable because, when the enhancement is implemented, (1) the AMP will perform supplemental surface examinations, in addition to visual examinations once in a 10-year interval, for the specified containment pressure-retaining boundary components that have no CLB fatigue analysis, to detect and manage cracking due to cyclic loading, (2) the inspection methods that will be used are consistent with the recommendations of the GALL-LR Report to detect cracking in pressure-retaining components subject to cyclic loading, and (3) the frequency of examination of once in a 10-year interval is reasonable because no plant-specific OE of cracking has been identified in these components.

Enhancement 4. LRA Section B.2.3.29 includes an enhancement to the "detection of aging effects" program element that relates to conducting a supplemental one-time volumetric/surface examination or enhanced visual examination (EVT-1) to confirm the absence of cracking due to SCC for a representative sample of a population of 22 containment high-temperature (above 140°F) piping penetration assemblies and fuel transfer tubes involving stainless steel or DMWs or both. The enhancement states that the representative sample for this one-time inspection, performed by qualified personnel prior to the period of extended operation, will comprise (1) four stainless steel penetrations or DMWs associated with high-temperature (above 140°F) stainless steel piping systems on each unit and (2) the one stainless steel fuel transfer tube on each unit. If the supplemental one-time inspection detects cracking, additional inspections will be conducted and the need for periodic inspections determined in accordance with the site's corrective action process. Periodic inspection of the subject components for cracking will be added to the Subsection IWE AMP, if necessary, based on the inspection results. The staff reviewed this enhancement, as modified by Supplement 2 (ML23114A377), against the corresponding program element in GALL-LR Report AMP XI.S1 and finds it acceptable because, when implemented, (1) it will require a one-time supplemental examination, within the 5 years prior to the period of extended operation, of the stainless steel fuel transfer tube and a representative sample of four stainless steel penetrations or DMWs of susceptible containment high-temperature penetrations in each unit to confirm the absence of cracking due to SCC, (2) if absence of the aging effect cannot be confirmed based on evaluation of examination results, additional examinations will be made to determine the need for periodic supplemental examination in accordance with the site corrective action process, (3) the examination methods that will be used (surface, volumetric, or EVT-1) for one-time (and periodic if necessary) inspection and the 20 percent sample size for the one-time inspection are consistent with those recommended in the GALL-LR Report (AMP XI.M32) for detecting cracking due to SCC of pressure-retaining components, and (4) the one-time inspection approach is acceptable since, thus far, there is no plant-specific OE of cracking in these components.

Based on a review of the LRA 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-LR Report are consistent or will be consistent (when enhancements are implemented) with the corresponding program elements of GALL-LR Report AMP XI.S1. In addition, the staff reviewed the enhancements associated with the "preventive actions" and "detection of aging effects" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.3.29, as amended by Supplement 2 (ML23114A377), summarizes OE related to the ASME Section XI, Subsection IWE program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff searched the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on its audit and review of the application as amended, the staff finds that the conditions and OE at the plant are bounded by those for which the ASME Section XI, Subsection IWE program was evaluated.

FSAR Supplement. LRA Section A.2.2.29 and Table A-3, item 31, as amended by Supplement 2 (ML23114A377), provides the FSAR supplement for the ASME Section XI, Subsection IWE program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to ongoing implementation of the existing ASME Section XI, Subsection IWE program for managing the effects of aging for applicable components during the period of extended operation. The staff also noted that the applicant committed to implementing the four LRA AMP enhancements no later than 6 months prior to the period of extended operation, or no later than the last refueling outage prior to the period of extended operation, and performing the one-time inspection for cracking due to SCC within the 5 years prior to the period of extended operation. The staff finds that the information in the FSAR supplement, as amended, is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's ASME Section XI, Subsection IWE program, as amended, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement, as amended, 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 ASME Section XI, Subsection IWL

LRA 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-LR Report AMP XI.S2, "ASME Section XI, Subsection IWL."

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.S2.

For the "parameters monitored or inspected" program element, the applicant's response to RAI B.2.3.34-1 (ML23208A193) is acceptable because (1) CPNPP has no plant-specific OE related to cracking due to expansion from reaction of aggregates, and (2) the applicant considered the industry OE with concrete degradation by alkali-silica reaction (ASR) discussed in NRC Information Notice 2011-20, "Concrete Degradation by Alkali-Silica Reaction," dated November 18, 2011 (ML112241029), and (3) the periodic visual inspections required by the ASME Section XI, Subsection IWL program are capable of detecting the cracking associated with aggregate reactions such as "mapping" or "patterned" cracking to determine the presence of alkali-silica gel.

The staff also reviewed the portions of the "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 four enhancements follows.

Enhancement 1. LRA Section B.2.3.30 includes an enhancement to the "parameters monitored or inspected" program element, which relates to clarifying that concrete deterioration and distress include degradation as described in American Concrete Institute (ACI) 201.1R and ACI 349.3R. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S2 and finds it acceptable because, when it is implemented, it will align the program with the guidance in the GALL-LR Report for using ACI 201.1R and ACI 349.3R to identify indications of degradation.

Enhancement 2. LRA Section B.2.3.30 includes an enhancement to the "detection of aging effects" program element, which relates to explicitly requiring that areas of concrete degradation be recorded in accordance with the guidance in ACI 349.3R. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S2 and finds it acceptable because, when implemented, it will ensure that degradation is properly recorded after each inspection, which allows for trending and future detection of aging.

Enhancement 3. LRA Section B.2.3.30 includes an enhancement to the "monitoring and trending" program element, which relates to specifying that inspection results should be recorded and compared to previous results. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S2 and finds it acceptable because, when implemented, it will ensure that degradation is being trended through the period of extended operation. As discussed in the GALL-SLR Report, applicants for initial LR (40–60 years) may use aging management guidance from SLR (60–80 years) in their applications. Accordingly, this enhancement also aligns the program with the guidance in the GALL-SLR Report.

Enhancement 4. LRA Section B.2.3.30 includes an enhancement to the "acceptance criteria" program element, which relates to including a statement in the program that quantitative acceptance based on the "Evaluation Criteria" in Chapter 5 of ACI 349.3R will be used to augment the assessment of the responsible engineer. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S2 and finds it acceptable because, when implemented, it will align the program with the guidance in the GALL-LR Report AMP.

Based on a review of the LRA, 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-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.S2. In addition, the staff reviewed the enhancements associated with the “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. LRA Section B.2.3.30 summarizes OE related to the ASME Section XI, Subsection IWL AMP. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program.

FSAR Supplement. LRA Section A.2.2.30 provides the FSAR supplement for the ASME Section XI, Subsection IWL AMP. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that in LRA Table A-3, 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 period of extended operation and to implementing the enhancements no later than 6 months prior to the period of extended operation. The staff finds that the information in the FSAR 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 staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.23 ASME Section XI, Subsection IWF

LRA Section B.2.3.31 states that the ASME Section XI, Subsection IWF AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-LR Report, Revision 2, AMP XI.S3, “ASME Section XI, Subsection IWF,” not including the exception identified in the LRA. The applicant amended this LRA section by letter dated April 6, 2023 (ML23096A302).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR Report, Revision 2. 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 LRA to the corresponding program elements of GALL-LR Report, Revision 2, AMP XI.S3, ASME Section XI, Subsection IWF.

The staff also reviewed portions of the "scope of program," "preventive actions," 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 is as follows.

Exception 1. LRA Section B.2.3.31 includes an exception to the "scope of program" program element related to requirements for examination of fuel transfer tube ASME Class MC component supports, polar crane rail supports, and those for ladders or platforms attached to the metal liner. The LRA states that these inspections are performed by the ASME Section XI, Subsection IWE (B.2.3.29), Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B.2.3.13), and Structures Monitoring (B.2.3.34) AMPs. By letter dated June 13, 2023 (ML23164A223), CPNPP confirmed through RCI B.2.3.31-2 that these AMPs manage the effects of aging for the aforementioned supports and attachments consistent with the CLB and its QA Program (described in CPNPP LRA Section B.1.3, reviewed and evaluated in SE Section B.1.3) implementing the requirements of 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," for corrective actions, confirmation process, and administrative controls program elements.

The staff reviewed this exception against the corresponding program element in GALL-LR Report, Revision 2, AMPs XI.S1, XI.M23, and XI.S6 and finds it acceptable for the following reasons: (1) all three AMPs include in their "scope of program" program element metallic components and their integral attachments/components, and bolted connections, (2) for detection of abnormal conditions, all three of the AMPs include in their "detection of aging effects" program element periodic visual inspections at the same or greater frequency than that recommended by GALL-LR Report, Revision 2, ASME Section XI, Subsection IWF AMP, and (3) all three of the AMPs manage the effects of aging consistent with the CPNPP CLB and its QA program.

Enhancement 1. LRA Section B.2.3.31 includes an enhancement to the "preventive actions" program element, which addresses (1) reconciliation of regulatory and industry guidance for preventive actions to existing plant structural bolting procedures, (2) consistency of bolting storage, lubricants, and SCC with Section 2 of Research Council on Structural Connections specifications for structural joints using ASTM A325 or A490 bolts, and (3) prevention of the use of MoS_2 or other sulfur-containing lubricants on structural bolting. The staff reviewed the consolidated enhancement against the corresponding program element in GALL-LR Report, Revision 2, AMP XI.S3 and finds it acceptable because, when implemented, it will align the LRA B.2.3.31 AMP preventive action program element with that of GALL-LR Report AMP XI.S3.

Enhancement 2. LRA Section B.2.3.31 includes an enhancement to the "acceptance criteria" program element, which includes revision of plant procedures addressing dirt, debris, excessive wear restricting motion of sliding surfaces and cracked/sheared bolts, including high-strength bolts and anchors as unacceptable conditions. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.S3 and finds it acceptable because, when implemented, it will align the AMP's preventive action program element with that of GALL-LR Report AMP XI.S3.

Based on a review of the LRA and 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-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.S3. The staff also reviewed the exception between the applicant's program and GALL-LR Report 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 "preventive actions" and "acceptance criteria" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.3.31 summarizes OE related to the ASME Section XI, Subsection IWF AMP. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff searched the applicant-provided plant OE to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the period of extended operation. The staff identified OE and determined the need for clarification of the effects of aging for loss of material due to a preexisting boric acid residue and cracking due to an impactive force associated with hardware failure at or near the RV supports and bolting. After discussing with the NRC staff during the audit whether these aging effects were properly addressed so that the RV supports and bolting maintain their structural integrity and the intended function remains consistent with the CLB, CPNPP amended the LRA AMP OE with supplemental information and responded to the staff's RCI B.2.3.31-1 by letters dated April 6 (ML23096A302) and June 13, 2023 (ML23164A223), respectively. The staff finds CPNPP's supplement and RCI response for effects of aging concerns on the noted OE acceptable for the following reasons: (1) for the impactive force, engineering evaluation and follow-up inspections performed by CPNPP indicated that there were no nonconforming conditions, (b) for loss of material due to an existing boric acid accumulation, CPNPP entered the observation in the corrective action process for further evaluation, and (3) for potential loss of material due to boric acid accumulation during the period of extended operation, CPNPP plans to manage this aging effect consistent with GALL-LR Report, Revision 2, AMP XI.M10 (LRA AMP B.2.3.4) so that an acceptable level of safety is maintained to the end of the period of extended operation.

Based on its audit and review of the application and review of the applicant's supplement, the staff finds that the conditions and OE at the plant are bounded by those for which the ASME Section XI, Subsection IWF AMP was evaluated.

FSAR Supplement. LRA Section A.2.2.31, as amended by letter dated April 6, 2023 (ML23096A302), provides the FSAR supplement for the ASME Section XI, Subsection IWF AMP. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to ongoing implementation of the existing ASME Section XI, Subsection IWF program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's ASME Section XI, Subsection IWF AMP, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. The staff also reviewed the exception and the 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.24 Masonry Walls

LRA Section B.2.3.33 states that the Masonry Walls program is an existing program with enhancements that will be consistent with the program elements in the GALL-LR Report AMP XI.S5, "Masonry Walls." The applicant amended this LRA section in Supplement 1, dated April 6, 2023 (ML23096A302).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR Report. The staff compared the "preventive actions," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the LRA AMP to the corresponding program elements of GALL-LR Report AMP XI.S5. The staff also reviewed the portions of the "scope of program," "parameters monitored or inspected," and "detection of aging effects" 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 these three enhancements follow.

Enhancement 1. LRA Section B.2.3.33 includes an enhancement to the "scope of program" and "detection of aging effects" program elements, which relates to including the bricks and mortar near the silencer for each EDG in program scope and performing a baseline inspection. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S5 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendation to ensure that the scope includes these masonry walls identified as performing LR intended functions, and these masonry walls will be inspected prior to entering the period of extended operation to establish a baseline for future inspections.

Enhancement 2. LRA Section B.2.3.33 includes an enhancement to the "parameters monitored or inspected" program element, which relates to monitoring and inspecting for gaps between the supports and masonry walls. The staff reviewed this enhancement, as modified by Supplement 1 (ML23096A302), against the corresponding program element in GALL-LR Report AMP XI.S5 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendation to monitor and inspect for gaps between the supports and masonry walls that could potentially impact the intended function or potentially invalidate its evaluation basis.

Enhancement 3. LRA Section B.2.3.33 includes an enhancement to the "detection of aging effects" program element, which relates to enhancement of inspector and reviewer qualifications for masonry walls and other structural components to meet the guidance outlined in ACI 349.3R through the Structures Monitoring (B.2.3.34) AMP. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S5 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendation that masonry walls and other structural components are inspected by qualified inspectors to ensure that aging degradation will be detected and quantified before there is loss of intended function.

Based on a review of the LRA and amendments, the staff finds that the “preventive actions,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.S5. In addition, the staff reviewed the enhancements associated with the “scope of program,” “parameters monitored or inspected,” and “detection of aging effects” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.3.33 summarizes OE related to the Masonry Walls program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (2) 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 period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on its audit and review of the LRA and amendments, the staff finds that the conditions and OE at the plant are bounded by those for which the Masonry Walls program was evaluated.

FSAR Supplement. LRA Section A.2.2.33 provides the FSAR supplement for the Masonry Walls program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that in LRA Table A-3, the applicant committed to ongoing implementation of the existing Masonry Walls program for managing the effects of aging for applicable components during the period of extended operation. The staff also noted that the applicant committed to implementing the enhancements no later than 6 months, or the last refueling outage, prior to the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s Masonry Walls program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.25 Structures Monitoring

LRA Section B.2.3.34 states that the Structures Monitoring program is an existing program with enhancements that will be consistent with the program elements in GALL-LR Report AMP XI.S6, “Structures Monitoring.” The applicant amended this LRA section by letters dated April 24, 2023, October 17, 2023 (ML23290A273), December 6, 2023 (ML23340A191), and January 31, 2024 (ML24031A608).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA AMP to the corresponding program elements of GALL-LR Report AMP XI.S6.

For the "parameters monitored or inspected" program element, the applicant's response to RAI B.2.3.34-1 (ML23208A193) is acceptable because (1) CPNPP has no plant-specific OE related to the cracking due to expansion from reaction of aggregates and (2) the applicant considered the industry OE with concrete degradation by ASR discussed in NRC Information Notice 2011-20 (ML112241029) and enhanced the "parameters monitored or inspected" program element in the Structures Monitoring program to identify the cracking associated with aggregate reactions such as "craze," "mapping," or "patterned" cracking to determine the presence of alkali-silica gel.

The 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 the 28 program enhancements is as follows.

Enhancement 1. LRA Section B.2.3.34 includes an enhancement to the "scope of program" program element, which relates to including the diesel generator buildings, switchgear buildings, transmission towers associated with startup transformers, alternate startup transformers, firewater valve houses, seismic Category I manholes, handholes, and duct banks within the scope of the Structures Monitoring AMP. The staff reviewed this enhancement, as modified by LRA Supplement 2 (ML23114A377), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendations to include these SCs within the scope of the program.

Enhancement 2. LRA Section B.2.3.34 includes an enhancement to the "scope of program" program element, which relates to performing periodic sampling and testing of ground water chemistry. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendations to perform periodic sampling and testing of ground water chemistry at a frequency of once every 5 years.

Enhancement 3. LRA Section B.2.3.34 includes an enhancement to the "scope of program" program element, which relates to inspecting structural members of crane supports, HELB and spray shields, stairs and platforms, and industrial and HELB doors. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because, when implemented, it will expand the scope of the program to include these additional components determined to be in the scope of LR.

Enhancement 4. LRA Section B.2.3.34 includes an enhancement to the "scope of program" program element, which relates to including exposed steel embedment in the "Steel Structural Elements" group. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendations to include exposed steel embedment in the "Steel Structural Elements" group.

Enhancement 5. LRA Section B.2.3.34 includes an enhancement to the “preventive actions” program element, which relates to specifying that the selection of bolting material, lubricants, and installation torque or tension is in accordance with the guidelines of EPRI NP-5769 (ML003727113), NP-5067, and TR-104213 (ML003767012), and additional recommendations from NUREG-1339. The staff reviewed this enhancement, as modified by LRA Supplement 2 (ML23114A377), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendations to ensure that preventive actions are in accordance with applicable industry guidelines to ensure that structural bolting integrity is maintained.

Enhancement 6. LRA Section B.2.3.34 includes an enhancement to the “preventive actions” program element, which relates to specifying the use of preventive actions for storage, lubricants, and SCC potential discussed in Section 2 of Research Council for Structural Connections publication “Specification for Structural Joints Using ASTM A325 or A490 Bolts” for structural bolting consisting of ASTM A325, ASTM A490, and equivalent bolts. The staff reviewed this enhancement, as modified by LRA Supplement 2 (ML23114A377), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendations to ensure that preventive actions are in accordance with applicable industry guidelines to ensure that structural bolting integrity is maintained.

Enhancement 7. LRA Section B.2.3.34 includes an enhancement to the “preventive actions” program element, which relates to prohibiting the use of MoS_2 or other sulfur-containing lubricants for structural bolts. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because, when implemented, the program will include preventive actions to explicitly prohibit the use of MoS_2 or other sulfur-containing lubricants for structural bolts, which are potential contributors to SCC, to ensure that structural bolting integrity is maintained.

Enhancement 8. LRA Section B.2.3.34 includes an enhancement to the “parameters monitored or inspected” program element, which relates to inspecting concrete structures for increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete degradation. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendations to inspect concrete structures for increases in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete degradation.

Enhancement 9. LRA Section B.2.3.34 includes an enhancement to the “parameters monitored or inspected” program element which relates to visually inspecting concrete structures for unique cracking such as "craze," "mapping," or "patterned" cracking to determine the presence of alkali-silica gel. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because, when it is implemented, it will be consistent with the GALL-LR Report recommendations to visually inspect concrete structures for cracking.

Enhancement 10. LRA Section B.2.3.34 includes an enhancement to the “parameters monitored or inspected” program element, which relates to monitoring structural sealants for cracking, loss of material, and hardening. The staff reviewed this enhancement, as modified by LRA Supplement 2 (ML23114A377), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the

GALL-LR Report recommendations to monitor structural sealants for cracking, loss of material, and hardening.

Enhancement 11. LRA Section B.2.3.34 includes an enhancement to the "parameters monitored or inspected" program element, which relates to explicitly addressing the potential for exposure of SSCs to leakage containing boric acid. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML23340A191), and finds it acceptable because, when implemented, it will be in accordance with applicable industry guidelines described in EPRI 3002007348, "Aging Management for Leaking Spent Fuel Pools." These guidelines include periodic walkdowns of all accessible interior walls and ceilings of rooms that are adjacent to (including below) the spent fuel pool (SFP), fuel transfer canal, and refueling cavity (when accessible) and address the potential for exposure of SSCs to leakage containing boric acid. These specific boric acid aging management activities are based upon latest industry experience, consistent with branch technical positions per SRP-LR Appendix A.

Enhancement 12. LRA Section B.2.3.34 includes an enhancement to the "parameters monitored or inspected" program element. The enhancement relates to revising existing preventive maintenance tasks to require periodic inspection and cleaning, including blockage removal, of the fuel transfer canal and refueling cavity tell-tale drains, in addition to the SFP tell-tale drains. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML23340A191) and Supplement 3, Revision 1 (ML24031A608), and finds it acceptable because, when implemented, it will be in accordance with applicable industry guidelines described in EPRI 3002007348. These guidelines include periodic inspection and cleaning, including blockage removal, of the fuel transfer canal and refueling cavity tell-tale drains, in addition to the SFP tell-tale drains. These specific preventive maintenance activities are based upon latest industry experience, consistent with branch technical positions per SRP-LR Appendix A.

Enhancement 13. LRA Section B.2.3.34 includes an enhancement to the "parameters monitored or inspected" program element, which relates to sampling and analyzing discharge from the leak chase system. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML23340A191), and finds it acceptable because, when implemented, it will be in accordance with applicable industry guidelines described in EPRI 3002007348 to sample and analyze discharge from the leak chase system for, at a minimum, flow (drip) rate and the following chemistry parameters: pH, boron concentration, and iron content. These specific sampling and analyzing activities are based upon latest industry experience, consistent with branch technical positions per SRP-LR Appendix A.

Enhancement 14. LRA Section B.2.3.34 includes an enhancement to the "detection of aging effects" program element, which relates to inspecting component supports every 5 years. The staff reviewed this enhancement, as modified by LRA Annual Update 1 (ML23290A273), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendations to ensure that component supports are inspected every 5 years.

Enhancement 15. LRA Section B.2.3.34 includes an enhancement to the "detection of aging effects" program element which relates to evaluating the acceptability of inaccessible areas. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-LR Report recommendations to evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas.

Enhancement 16. LRA Section B.2.3.34 includes an enhancement to the “detection of aging effects” program element which relates to specifying the qualification requirements for inspection of SCs as well as requirements to match current ACI 349.3R code requirements. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-LR Report recommendations to ensure that qualifications of inspection and evaluation personnel meet current ACI 349.3R code requirements.

Enhancement 17. LRA Section B.2.3.34 includes an enhancement to the “detection of aging effects” program element, which relates to requiring engineering evaluation, more frequent inspections, or destructive testing of affected concrete if ground water leakage is identified. The staff reviewed this enhancement, as modified by LRA Supplement 2 (ML23114A377), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because, when implemented, the program will include an engineering evaluation, more frequent inspections, or destructive testing of affected concrete if ground water leakage is identified, and the program will include analysis of the leakage pH, along with mineral, chloride, sulfate, and iron content in the water when leakage volumes allow.

Enhancement 18. LRA Section B.2.3.34 includes an enhancement to the “detection of aging effects” program element, which relates to inspecting for evidence of leakage from the SFP, fuel transfer canals, or refueling cavities. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML23340A191) and Supplement 3, Revision 1 (ML24031A608), and finds it acceptable because, when implemented, it will be in accordance with applicable industry guidelines described in EPRI 3002007348 to inspect for evidence of leakage from the SFP, fuel transfer canals, or refueling cavities, such as the formation of deposits or wet areas on the structures. These specific inspection activities are based upon latest industry experience, consistent with branch technical positions per SRP-LR Appendix A.

Enhancement 19. LRA Section B.2.3.34 includes an enhancement to the “detection of aging effects” program element, which relates to establishing initial frequency and assessing the frequency of inspection of the tell-tale drains, including sample collection and analysis to increase confidence that there are no blockages. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML23340A191) and Supplement 3, Revision 1 (ML24031A608), and finds it acceptable because, when implemented, it will be in accordance with applicable industry guidelines described in EPRI 3002007348. These guidelines include establishing initial frequency and adjusting the long-term frequency of inspection of the tell-tale drains, including sample collection and analysis, by elevating internal and external operating experience. These specific inspection activities are based upon latest industry experience, consistent with branch technical positions per SRP-LR Appendix A.

Enhancement 20. LRA Section B.2.3.34 includes an enhancement to the “detection of aging effects” program element, which relates to assessing blockage detection techniques. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML23340A191), and finds it acceptable because, when implemented, it will be in accordance with applicable industry guidelines described in EPRI 3002007348 to assess blockage detection techniques, including the use of video probes to check for development of blockages in the tell-tales. These specific inspection activities are based upon latest industry experience, consistent with branch technical positions per SRP-LR Appendix A.

Enhancement 21. LRA Section B.2.3.34 includes an enhancement to the “monitoring and trending” program element which relates to providing guidance for documenting significant findings of the inspection. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented the program will provide guidance for documenting significant findings of the inspection to be completed in accordance with ACI 349.3R, Section 3.5.5, to monitor and trend the extend the extent of degradation, consistent with GALL-LR Report AMP XI.S6.

Enhancement 22. LRA Section B.2.3.34 includes an enhancement to the “acceptance criteria” program element which relates to providing guidance for documentation and archival requirements. The staff reviewed this enhancement, as modified by LRA Supplement 2 (ML23114A377), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented, the program will provide guidance for documentation and archival requirements in accordance with ACI 349.3R Section 3.4, consistent with GALL-LR Report AMP XI.S6.

Enhancement 23. LRA Section B.2.3.34 includes an enhancement to the “acceptance criteria” program element, which relates to providing guidance for inspection reports. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because, when implemented, the program will be consistent with the GALL-LR Report recommendations to ensure that inspection reports will be completed in accordance with ACI 349.3R, Section 3.5.5, consistent with GALL-LR Report AMP XI.S6.

Enhancement 24. LRA Section B.2.3.34 includes an enhancement to the “acceptance criteria” program element, which relates to specifying that the condition of structural sealants is acceptable if observed loss of material, cracking, and hardening will not result in loss of sealing. The staff reviewed this enhancement, as modified by LRA Supplement 2 (ML23114A377), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendations to include acceptance criteria for the structural sealants.

Enhancement 25. LRA Section B.2.3.34 includes an enhancement to the “acceptance criteria” program element, which relates to developing appropriate acceptance criteria for the parameters that are monitored for the leaking detection system. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML23340A191) and Supplement 3, Revision 1 (ML24031A608), and finds it acceptable because, when implemented, it will be in accordance with applicable industry guidelines described in EPRI 3002007348. These guidelines include acceptance criteria for the parameters that are monitored for the leaking detection system. These specific inspection activities are based upon latest industry experience, consistent with branch technical positions per SRP-LR Appendix A.

Enhancement 26. LRA Section B.2.3.34 includes an enhancement to the “corrective actions” program element, which relates to revising existing preventive maintenance tasks to include cleaning of the fuel transfer canal and refueling cavity (in addition to the SFP) tell-tale drains. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML23340A191) and Supplement 3, Revision 1 (ML24031A608), and finds it acceptable because, when implemented, it will be in accordance with applicable industry guidelines described in EPRI 3002007348 to clean the fuel transfer canal and refueling cavity (in addition to the SFP) tell-tale drains using a rod or brush or by high-pressure cleaning (hydrolasing) if inspection results indicate that cleaning is necessary. These specific inspection activities are based upon latest industry experience, consistent with branch technical positions per SRP-LR Appendix A.

Enhancement 27. LRA Section B.2.3.34 includes an enhancement to the “corrective actions” program element, which relates to requiring that any results of inspections of analysis of data collected (associated with leak detection for the SFP, fuel transfer canals, and refueling cavities) that do not meet the acceptance criteria will be entered into the CAP and evaluated. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML23340A191) and Supplement 3, Revision 1 (ML24031A608), and finds it acceptable because, when implemented, it will be in accordance with applicable industry guidelines described in EPRI 3002007348. These guidelines include entering into the CAP any results of inspections of analysis of data collected (associated with leak detection for the SFP, fuel transfer canals, and refueling cavities) that do not meet the acceptance criteria and considering revisiting structural evaluations to determine whether any future observed indications of changes in the leakage conditions may cause structural margins to become inadequate. These specific inspection activities are based upon latest industry experience, consistent with branch technical positions per SRP-LR Appendix A.

Enhancement 28. LRA Section B.2.3.34 includes an enhancement to the “corrective actions” program element, which relates to evaluating operating experience relative to effective methods for restoring flow to tell-tale drains. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML23340A191), and finds it acceptable because, when implemented, it will be in accordance with applicable industry guidelines described in EPRI 3002007348 to evaluate operating experience relative to effective methods for restoring flow to tell-tale drains. These specific inspection activities are based upon latest industry experience, consistent with branch technical positions per SRP-LR Appendix A.

The staff conducted an audit to verify the applicant’s claim of consistency with the GALL-LR Report. Based on a review of the LRA, LRA Supplement 2 (ML23114A377), and the applicant’s responses to RAI B.2.3.34-1 (ML23208A193), 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-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.S6. In addition, the staff reviewed the enhancements associated with the “scope of program,” “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.

Operating Experience. LRA Section B.2.3.34 summarizes OE related to the Structures Monitoring program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a review of the plant OE search results to: (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (2) 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 period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the Structures Monitoring program was evaluated.

FSAR Supplement. LRA Appendix A, Section A.2.2.34, provides the FSAR supplement for the Structures Monitoring program. The staff reviewed this FSAR supplement description of the program, as amended by Supplement 2 (ML23114A377), and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff noted that the applicant committed to ongoing implementation of the existing Structures Monitoring program for managing the effects of aging for applicable components during the period of extended operation. The staff also noted that the applicant committed to implementing AMP enhancements for LR no later than 6 months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation. The staff finds that the information in the FSAR supplement, as amended, is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Structures Monitoring program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. The staff also reviewed the program 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement, as amended, 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 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants

LRA Section B.2.3.35 states that the Inspection of Water-Control Structures Associated with Nuclear Power Plants program is an existing program with enhancements that will be consistent with the program elements in the GALL-LR Report AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants." The applicant amended this LRA section by letters dated April 6, 2023 (ML23096A302), and April 24, 2023 (ML23114A377).

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant's claim of consistency with the GALL-LR 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 LRA AMP to the corresponding program elements of GALL-LR Report AMP XI.S7.

For the "parameters monitored or inspected" program element, the applicant's response to RAI B.2.3.34-1 (ML23208A193) is acceptable because (1) CPNPP has no plant-specific OE related to cracking due to expansion from reaction of aggregates, and (2) the applicant considered the industry OE with concrete degradation by ASR discussed in NRC Information Notice 2011-20 (ML112241029) and added an enhancement of the "parameters monitored or inspected" program element in the Inspection of Water-Control Structures Associated with Nuclear Power Plants program to identify the cracking associated with aggregate reactions such as "craze," "mapping," or "patterned" cracking to determine the presence of alkali-silica gel.

The staff also reviewed the portions of the "preventive actions," "parameters monitored or inspected," "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 the seven program enhancements is as follows.

Enhancement 1. LRA Section B.2.3.35 includes an enhancement to the "preventive actions" program element, which relates to specifying that the selection of bolting material, lubricants, and installation torque or tension is in accordance with the guidelines of EPRI NP-5769, NP-5067, and TR-104213, and additional recommendations from NUREG-1339. The staff reviewed this enhancement, as modified by LRA Supplement 2 (ML23114A377), against the corresponding program element in GALL-LR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendations to ensure that preventive actions follow applicable industry guidelines to ensure that structural bolting integrity is maintained.

Enhancement 2. LRA Section B.2.3.35 includes an enhancement to the “preventive actions” program element, which relates to specifying the use of preventive actions for storage, lubricants, and SCC potential discussed in Section 2 of Research Council for Structural Connections publication “Specification for Structural Joints Using ASTM A325 or A490 Bolts” for structural bolting consisting of ASTM A325, ASTM A490, and equivalent bolts. The staff reviewed this enhancement, as modified by LRA Supplement 2 (ML23114A377), against the corresponding program element in GALL-LR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendations to ensure that preventive actions follow applicable industry guidelines to ensure that structural bolting integrity is maintained.

Enhancement 3. LRA Section B.2.3.35 includes an enhancement to the “preventive actions” program element, which relates to prohibiting the use of MoS_2 or other sulfur-containing lubricants for structural bolts. The staff reviewed this enhancement, as modified by LRA Supplement 2 (ML23114A377), against the corresponding program element in GALL-LR Report AMP XI.S7 and finds it acceptable because, when implemented, the program will include preventive actions to explicitly prohibit the use of MoS_2 or other sulfur-containing lubricants for structural bolts, which are potential contributors to SCC, to ensure that structural bolting integrity is maintained.

Enhancement 4. LRA Section B.2.3.35 includes an enhancement to the “parameters monitored or inspected” program element, which relates to inspecting concrete structures for an increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete degradation. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendations to include these parameters in the monitoring or inspection of concrete structures.

Enhancement 5. LRA Section B.2.3.35 includes an enhancement to the “parameters monitored or inspected” program element, which relates to visually inspecting concrete structures for unique cracking, such as “craze,” “mapping,” or “patterned” cracking, to determine the presence of alkali-silica gel. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendations for visual inspection of concrete structures for cracking.

Enhancement 6. LRA Section B.2.3.35 includes an enhancement to the “detecting of aging effects” program element, which relates to evaluating the acceptability of inaccessible areas. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendations to evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas.

Enhancement 7. LRA Section B.2.3.35 includes an enhancement to the “monitoring and trending” program element, which relates to including guidance for documenting and trending all significant findings of the inspection. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report recommendations to include guidance for documenting and trending all significant findings of the inspection, consistent with ACI 349.3R, Section 3.5.5.

Based on a review of the LRA, LRA Supplement 1 (ML23096A302), LRA Supplement 2 (ML23114A377), and the applicant’s response to RAI B.2.3.34-1 (ML23208A193), 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-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.S7. In addition, the staff reviewed the enhancements associated with the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” and “monitoring and trending” program elements and finds that, when implemented, the AMP will be adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.3.35 summarizes OE related to the Inspection of Water-Control Structures Associated with Nuclear Power Plants program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a review of the plant OE search results to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on its audit and review of the application as amended, the staff finds that the conditions and OE at the plant are bounded by those for which the Inspection of Water-Control Structures Associated with Nuclear Power Structures program was evaluated.

FSAR Supplement. LRA Section A.2.2.35 provides the FSAR supplement for the Inspection of Water-Control Structures Associated with Nuclear Power Plants program. The staff reviewed this FSAR supplement description of the program, as amended by LRA Supplement 1 (ML23096A302), and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff noted that the applicant committed to ongoing implementation of the existing Inspection of Water-Control Structures Associated with Nuclear Power Plants program for managing the effects of aging for applicable components during the period of extended operation. The staff also noted that the applicant committed to implementing AMP enhancements for LR no later than 6 months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation. The staff finds that the information in the FSAR supplement, as amended, is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s Inspection of Water-Control Structures Associated with Nuclear Power Plants program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement, as amended, 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 Protective Coating Monitoring and Maintenance Program

The LRA states that AMP B.2.3.36, “Protective Coating Monitoring and Maintenance,” is an existing program that, with enhancement, will be consistent with the program elements in GALL-LR Report AMP XI.S8, “Protective Coating Monitoring and Maintenance Program.”

Staff Evaluation. During its audit (ML23172A136), the staff reviewed the applicant’s claim of consistency with the GALL-LR 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 LRA to the corresponding program elements of GALL-LR Report AMP XI.S8.

The staff also reviewed the portions of the “monitoring and trending” 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 one enhancement follows.

Enhancement. LRA Section B.2.3.36 includes an enhancement to the “monitoring and trending” program element, which relates to enhancing implementing documents to ensure that the inspection report prioritizes repair areas as either needing repair during the same outage or as postponed to future outages but under surveillance in the interim period. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S8 and finds it acceptable because, when implemented, it will be consistent with the GALL-LR Report.

Operating Experience. LRA Section B.2.3.36 summarizes OE related to the Protective Coating Monitoring and Maintenance program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML23172A136), the staff conducted a search of the plant OE information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the period of extended operation. The staff did not identify any OE 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 OE at the plant are bounded by those for which the Protective Coating Monitoring and Maintenance program was evaluated.

FSAR Supplement. LRA Section A.2.2.36 provides the FSAR supplement for the Protective Coating Monitoring and Maintenance program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to implementing the enhancement no later than 6 months prior to the period of extended operation or no later than the last refueling outage prior to the period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s Protective Coating Monitoring and Maintenance program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. The staff also reviewed the enhancement 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.4 QA Program Attributes Integral to Aging Management Programs

The regulations at 10 CFR 54.21(a)(3) require license renewal applicants to demonstrate that, for SCs subject to AMR, they will adequately manage aging in a way that maintains intended function(s) consistent with the CLB for the period of extended operation. SRP-LR, 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 License Renewal,” describes these program elements as follows:

7. Corrective Actions—Corrective actions, including root cause determination and prevention of recurrence, should be timely.
8. Confirmation Process—Confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective.
9. Administrative Controls—Administrative controls should provide a formal review and approval process.

SRP-LR, Appendix A.2, BTP IQMB-1, “Quality Assurance for Aging Management Programs,” notes that AMP aspects that affect the quality of safety-related structures, systems, and components (SSCs) are subject to the QA requirements of 10 CFR Part 50, Appendix B. Additionally, for nonsafety-related SCs subject to an AMR, applicants may use the existing 10 CFR Part 50, Appendix B, QA program to address the “corrective actions,” “confirmation process,” and “administrative controls” program elements. BTP IQMB-1 provides the following guidance on the QA attributes of AMPs:

1. Safety-related SCs are subject to 10 CFR Part 50 Appendix B requirements, which are adequate to address all quality-related aspects of an aging management program consistent with the CLB of the facility for the period of extended operation.
2. For nonsafety-related SCs that are subject to an AMR for license renewal, an applicant has the option to expand the scope of its 10 CFR Part 50 Appendix B program to include these SCs and to address [Program Element 7] corrective actions, [Program Element 8] the confirmation process, and [Program Element 9] administrative controls for aging management during the 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).
3. If an applicant chooses an alternative means to address corrective actions, the confirmation process, and administrative controls for managing aging of nonsafety-related SCs that are subject to an AMR for license renewal, the applicant’s proposal is reviewed on a case-by-case

basis following the guidance in Branch Technical Position RLSB-1 (Appendix A.1 of this SRP-LR).

3.0.4.1 Summary of Technical Information in Application

LRA Appendix A, Section A.1.3, and LRA Appendix B, Section B.1.3, 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.

LRA Appendix A, Section A.1.3, states the following:

> The QA Program for CPNPP implements the requirements of 10 CFR 50, Appendix B, and will be consistent with the summary in Appendix A.2, “Quality Assurance for Aging Management Programs (Branch Technical Position IQMB-1),” of NUREG-1800. The QA Program includes the elements of corrective action, confirmation process, and administrative controls, and is applicable to nuclear safety related SSCs. CPNPP will enhance the QA Program to include NNS SSCs that are subject to AMR for LR.

LRA Appendix B, Section B.1.3, states the following:

> The CPNPP QA Program implements the requirements of 10 CFR Part 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-1800. The CPNPP QA Program includes the elements of corrective action, confirmation process, and administrative controls, and is applicable to nuclear safety related SSCs. CPNPP will enhance the QA Program to include NNS SSCs that are subject to AMR for LR. This enhancement will be implemented no later than the date that the renewed operating licenses are issued and conducted on an ongoing basis throughout the period of extended operation.

3.0.4.2 Staff Evaluation

The staff reviewed LRA Appendix A, Section A.1.3, and Appendix B, Section B.1.3, which describe how the applicant’s existing QA program includes the QA-related elements (corrective action, confirmation process, and administrative controls) for AMPs, consistent with the staff’s guidance described in BTP IQMB-1. During its audit (ML23172A136), the staff also reviewed a sample of the applicant’s AMP basis documents and confirmed that the AMPs implement the corrective action program, confirmation processes, and administrative controls as described in the LRA. Based on its review, the staff determined that the quality attributes presented in the AMP basis documents and the associated AMPs are consistent with the staff’s position regarding QA for aging management.

3.0.4.3 Conclusion

On the basis of the staff’s review of LRA Appendix A, Section A.1.3, and LRA Appendix B, Section B.1.3, the staff finds that the QA attributes presented in the AMP basis documents and the associated AMPs are consistent with SRP-LR, BTP RLSB-1, and that the QA attributes will be maintained such that the licensee will adequately manage aging in a way that maintains the intended function(s) consistent with the CLB for the 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

LRA Appendix A, Section A.1.4, and LRA Appendix B, Section B.1.4, describe the programmatic activities for the ongoing review of operating experience for AMPs. LRA Sections A.1.4 and B.1.4 state that the applicant does a systematic review of plant-specific and industry operating experience concerning aging management and age-related degradation to ensure that the license renewal AMPs will be effective in managing the aging effects for which they are credited. The LRA states that operating experience for the programs credited with managing the effects of aging are reviewed to identify corrective actions that may result in program enhancements.

The staff noted that although the applicant had submitted an initial LRA, LRA Sections A.1.4 and B.1.4 describe the review and dispositioning of plant-specific and industry operating experience consistent with guidance contained Appendix A.4, "Operating Experience for Aging Management Programs," to NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants—Final Report," issued July 2019 (ML17188A158) (SRP-SLR). Accordingly, the staff's evaluation, as discussed below, makes reference to SRP-SLR Appendix A.4 to provide context for the staff's review and the basis for the staff's conclusions.

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 the SC intended functions will be maintained in a way that is consistent with the CLB for the period of extended operation.

NUREG-2192, Appendix A.4, 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 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 staff reviewed LRA Sections A.1.4 and 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 LRA. SE Sections 3.0.5.2.3 and 3.0.5.2.4 contain the staff's evaluations with respect to SRP-LR Sections A.1.4 and B.1.4, respectively.

3.0.5.2.3 Acceptability of Existing Programs

SRP-SLR Section A.4.2, "Position," describes existing programs generally acceptable to the staff for the capture, processing, and evaluation of operating experience concerning age-related degradation and aging management during the term of a renewed operating license. The acceptable programs are those relied on to meet the requirements of 10 CFR Part 50, Appendix B, and Item I.C.5, “Procedures for Feedback of Operating Experience to Plant Staff,” in NUREG-0737, “Clarification of TMI Action Plan Requirements,” issued November 1980 (ML051400209), as incorporated into the licensee’s technical specifications. SRP-SLR Section A.4.2 also states that, as part of meeting the requirements of NUREG-0737, Item I.C.5, the applicant’s 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 Generic Letter 82-04, “Use of INPO SEE-IN Program,” dated March 9, 1982.

LRA Sections A.1.4 and 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 applicant stated that the operating experience program meets the requirements of NUREG-0737. The applicant further stated that the operating experience program interfaces with and relies on active participation in the INPO operating experience program. Based on this information, the 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

Application of Existing Programs and Procedures to the Processing of Operating Experience Related to Aging. SRP-SLR Section A.4.2 states that the programs and procedures relied on to meet the requirements of 10 CFR Part 50, Appendix B, and NUREG-0737, Item I.C.5, should not preclude the consideration of operating experience on age-related degradation and aging management.

LRA Sections A.1.4 and B.1.4 state that operating experience from plant-specific and industry sources is systematically captured and reviewed on an ongoing basis in accordance with the QA program, which is consistent with 10 CFR Part 50, Appendix B, and the operating experience program, which is consistent with NUREG-0737, Item I.C.5. LRA Sections A.1.4 and B.1.4 state that the ongoing evaluation of operating experience includes a review of corrective actions, which may result in program enhancements. LRA Section B.1.4 states that trending reports, program health reports, assessments, and corrective action program items were reviewed to determine whether aging effects have been identified for applicable components. Based on this information, the staff determined that the processes implemented under the QA program, the corrective action program, and the operating experience program 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 10 CFR Part 50, Appendix B, to include nonsafety related SCs.

LRA Sections A.1.3 and LRA Section B.1.3 state that the applicant’s QA program includes nonsafety related SCs, which the staff finds consistent with the guidance in SRP-SLR Section A.2 and, therefore, consistent with SRP-SLR Section A.4.2 as well. SE Section 3.0.4 documents the staff’s evaluation of LRA Sections A.1.3 and B.1.3 relative to the application of the QA program to nonsafety related SSCs.

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

LRA Sections A.1.4 and 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 staff finds that the applicant will consider an appropriate breadth of industry operating experience for impacts to its aging management activities, including 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 the approach to considering guidance documents as industry operating experience with the guidance in SRP-SLR Section A.4.2, the staff finds the approach acceptable.

Screening of Incoming Operating Experience. SRP-SLR Section A.4.2 states that all incoming plant-specific and industry operating experience should be screened to determine whether the experience involves age-related degradation or impacts to aging management activities. LRA Sections A.1.4 and B.1.4 state that internal and external operating experience is captured and systematically reviewed on an ongoing basis. Site-specific and industry operating experience items 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 through the evaluation of operating experience that the effects of aging are not adequately managed. The 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 the approach to screening incoming operating experience with the guidance in SRP-SLR Section A.4.2, the staff finds this approach acceptable.

Identification of Operating Experience Related to Aging. SRP-SLR Section A.4.2 states that coding should be used within the plant corrective action 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.

LRA Sections A.1.4 and B.1.4 state that the corrective action program identifies either plant-specific or industry operating experience related to aging, and LRA Section B.1.4 discusses the tracking and trending of this information.

Based on the completion of the staff’s review and the consistency of the approach to identifying operating experience related to aging with the guidance in SRP-SLR Section A.4.2, the staff finds the approach 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 by considering factors 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 action 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.

LRA Sections A.1.4 and B.1.4 state that the applicant's program requires that when evaluations indicate that the effects of aging are not being adequately managed, the affected AMPs are either enhanced or new AMPs are developed, as appropriate.

The staff determined that the applicant's evaluations of age-related operating experience include the assessment of appropriate information to determine potential impacts to the aging management activities. The staff also determined that the applicant's operating experience program, in conjunction with the corrective action 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 use of the operating experience program and corrective action program to ensure that the effects of aging are adequately managed are 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 action 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.

LRA Section B.1.4 states that internal operating experience includes event investigations, trending reports, and lessons learned from in-house events as captured in program health reports, program assessments, and the 10 CFR Part 50, Appendix B, corrective action program. In additions, LRA Section B.1.4 states that AMPs are either 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. LRA Section B.1.4 states that the operating experience program also meets the requirements of NEI 14-12, "Aging Management Program Effectiveness," issued December 2014 (ML15090A665), for periodic program assessments. In addition, LRA 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 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 approach 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 who 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.

LRA Sections A.1.4 and B.1.4 state that the operating experience program provides for training to those responsible for activities including screening, evaluating, and communicating operating experience items related to aging management and aging-related degradation.

Based on the completion of the 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 approach 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 on age-related degradation and aging management to the industry.

LRA Sections A.1.4 and B.1.4 state that the operating experience program provides for guidelines for reporting plant-specific operating experience on age-related degradation and aging management to the industry.

Based on the completion of the staff's review and the consistency of the applicant's reporting operating experience to the industry with the guidance in SRP-SLR Section 4.2, the staff finds the approach 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 renewed license.

LRA Sections A.1.4 and B.1.4 state that the applicant's self-assessment process provides for periodic evaluation of the effectiveness of this operating experience program. LRA Sections A.1.4 and B.1.4 state that the operating experience program will be implemented on an ongoing basis throughout the terms of the renewed licenses. LRA Section A.1.4 provides the FSAR supplement summary description of the applicant's enhanced programmatic activities for the ongoing review of operating experience. Upon issuance of the 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 staff finds the implementation schedule acceptable because the applicant will implement the operating experience review activities on an ongoing basis throughout the terms of the renewed operating licenses.

Based on its review of the LRA, the staff determined that the applicant's programmatic activities for the ongoing review of operating experience are acceptable for (1) the systematic review of plant-specific and industry operating experience to ensure that the license renewal AMPs are, and will continue to be, effective in managing the aging effects for which they are credited and (2) the enhancement of AMPs or 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 LRA, the staff determined that the applicant's programmatic activities for the ongoing review of operating experience are acceptable for (1) the systematic review of plant-specific and industry operating experience to ensure that the license renewal AMPs are, and will continue to be, effective in managing the aging effects for which they are credited and (2) the enhancement of AMPs or 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 Final Safety Analysis Report Supplement

In accordance with 10 CFR 54.21(d), the FSAR supplement must contain a summary description of the programs and activities for managing the effects of aging. LRA Section A.1.4 provides the FSAR 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 staff determined that the content of the applicant's summary description is consistent with the example 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 FSAR supplement summary description adequate.

3.0.5.4 Conclusion

Based on its review of the applicant's programmatic activities for the ongoing review of operating experience, the 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR 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

LRA Section 3.1 provides AMR results for those components the applicant identified in LRA Section 2.3.1, "Reactor Vessel, Internals, and Reactor Coolant System," as being subject to an AMR. LRA Table 3.1-1, "Summary of Aging Management Programs for the Reactor Vessel, Internals, and Reactor Coolant System," is a summary comparison of the applicant's AMRs with those evaluated in the GALL-LR Report for the reactor coolant system components and component groups.

3.1.2 Staff Evaluation

SE Table 3.1-1, below, summarizes the staff's evaluation of the component groups listed in LRA Section 3.1 and addressed in the GALL-LR Report.

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

Component Group (SRP-LR Item No.)	Staff Evaluation
3.1-1, 001	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.1)
3.1-1, 002	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.1)
3.1-1, 003	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.1)
3.1-1, 004	Not applicable to CPNPP (see SE Section 3.1.2.2.1)
3.1-1, 005	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.1)
3.1-1, 006	Not applicable to PWRs
3.1-1, 007	Not applicable to PWRs
3.1-1, 008	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.1)
3.1-1, 009	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.1)
3.1-1, 010	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.1)
3.1-1, 011	Not applicable to PWRs
3.1-1, 012	Consistent with the GALL-LR Report (see SE Sections 3.1.2.2.2.1 and 3.1.2.2.2.2)
3.1-1, 013	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.3.1)
3.1-1, 014	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.3.2)
3.1-1, 015	Not applicable to CPNPP
3.1-1, 016	Not applicable to PWRs
3.1-1, 017	Not applicable to PWRs
3.1-1, 018	Not applicable to CPNPP (see SE Section 3.1.2.2.5)
3.1-1, 019	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.6.1)
3.1-1, 020	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.6.2)
3.1-1, 021	Not applicable to PWRs (see SE Section 3.1.2.2.7)
3.1-1, 022	Not applicable to CPNPP (see SE Section 3.1.2.2.8)
3.1-1, 023	This item number is not used in the SRP-LR or the GALL-LR Report
3.1-1, 024	This item number is not used in the SRP-LR or the GALL-LR Report
3.1-1, 025	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.11)
3.1-1, 026	This item number is not used in the SRP-LR or the GALL-LR Report
3.1-1, 027	This item number is not used in the SRP-LR or the GALL-LR Report
3.1-1, 028	Not used (addressed by LRA Table 3.1-1, item 3.1-1, 055c; see SE Section 3.1.2.2.9)
3.1-1, 029	Not applicable to PWRs
3.1-1, 030	Not applicable to PWRs
3.1-1, 031	Not applicable to PWRs
3.1-1, 032	This item number is not used in the SRP-LR or the GALL-LR Report
3.1-1, 033	Consistent with the GALL-LR Report
3.1-1, 034	Consistent with the GALL-LR Report
3.1-1, 035	Consistent with the GALL-LR Report
3.1-1, 036	Not used (addressed by LRA Table 3.1-1, item 3.1-1, 040 and LRA Table 3.5-1, items 3.5-1, 091 and 3.5-1, 089)
3.1-1, 037	Consistent with the GALL-LR Report
3.1-1, 038	Consistent with the GALL-LR Report
3.1-1, 039	Consistent with the GALL-LR Report
3.1-1, 040	Consistent with the GALL-LR Report
3.1-1, 040.5	Consistent with the GALL-LR Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.1-1, 041	Not applicable to PWRs
3.1-1, 042	Not used (addressed by LRA Table 3.1-1, items 3.1-1, 018; 3.1-1, 019; 3.1-1, 020; 3.1-1, 025; 3.1-1, 033; 3.1-1, 034; 3.1-1, 035; 3.1-1, 039; 3.1-1, 040; 3.1-1, 046; 3.1-1, 047; 3.1-1, 070; 3.1-1, 071; 3.1-1, 080; and 3.1-1, 082)
3.1-1, 043	Not applicable to PWRs
3.1-1, 044	Consistent with the GALL-LR Report
3.1-1, 045	Consistent with the GALL-LR Report
3.1-1, 046	Consistent with the GALL-LR Report
3.1-1, 047	Consistent with the GALL-LR Report
3.1-1, 048	Consistent with the GALL-LR Report
3.1-1, 049	Consistent with the GALL-LR Report
3.1-1, 050	Consistent with the GALL-LR Report
3.1-1, 051a	Not applicable to CPNPP
3.1-1, 051b	Not applicable to CPNPP
3.1-1, 052a	Not applicable to CPNPP
3.1-1, 052b	Not applicable to CPNPP
3.1-1, 052c	Not applicable to CPNPP
3.1-1, 053a	Consistent with the GALL-LR Report
3.1-1, 053b	Consistent with the GALL-LR Report
3.1-1, 053c	Consistent with the GALL-LR Report
3.1-1, 054	Consistent with the GALL-LR Report
3.1-1, 055a	Not applicable to CPNPP
3.1-1, 055b	Not applicable to CPNPP
3.1-1, 055c	Consistent with the GALL-LR Report
3.1-1, 056a	Not applicable to CPNPP
3.1-1, 056b	Not applicable to CPNPP
3.1-1, 056c	Not applicable to CPNPP
3.1-1, 057	This item number is not used in the SRP-LR or the GALL-LR Report
3.1-1, 058a	Not applicable to CPNPP
3.1-1, 058b	Not applicable to CPNPP
3.1-1, 059a	Consistent with the GALL-LR Report
3.1-1, 059b	Consistent with the GALL-LR Report
3.1-1, 059c	Consistent with the GALL-LR Report
3.1-1, 060	Not applicable to PWRs
3.1-1, 061	Consistent with the GALL-LR Report
3.1-1, 062	Not used (addressed by LRA Table 3.1-1, item 3.1-1, 092)
3.1-1, 063	Not applicable to PWRs
3.1-1, 064	Consistent with the GALL-LR Report
3.1-1, 065	Consistent with the GALL-LR Report
3.1-1, 066	Consistent with the GALL-LR Report
3.1-1, 067	Consistent with the GALL-LR Report
3.1-1, 068	Not used (addressed by LRA Table 3.1-1, item 3.1-1, 077)
3.1-1, 069	Consistent with the GALL-LR Report
3.1-1, 070	Consistent with the GALL-LR Report
3.1-1, 071	Consistent with the GALL-LR Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.1-1, 072	Consistent with the GALL-LR Report
3.1-1, 073	Consistent with the GALL-LR Report
3.1-1, 074	Consistent with the GALL-LR Report
3.1-1, 075	Consistent with the GALL-LR Report
3.1-1, 076	Consistent with the GALL-LR Report
3.1-1, 077	Consistent with the GALL-LR Report
3.1-1, 078	Consistent with the GALL-LR Report
3.1-1, 079	Not applicable to PWRs
3.1-1, 080	Consistent with the GALL-LR Report
3.1-1, 081	Consistent with the GALL-LR Report
3.1-1, 082	Consistent with the GALL-LR Report
3.1-1, 083	Consistent with the GALL-LR Report
3.1-1, 084	Not applicable to PWRs
3.1-1, 085	Not applicable to PWRs
3.1-1, 086	Consistent with the GALL-LR Report
3.1-1, 087	Consistent with the GALL-LR Report
3.1-1, 088	Consistent with the GALL-LR Report
3.1-1, 089	Consistent with the GALL-LR Report
3.1-1, 090	Consistent with the GALL-LR Report
3.1-1, 091	Not applicable to PWRs
3.1-1, 092	Consistent with the GALL-LR Report
3.1-1, 093	Not applicable to CPNPP
3.1-1, 094	Not applicable to PWRs
3.1-1, 095	Not applicable to PWRs
3.1-1, 096	Not applicable to PWRs
3.1-1, 097	Not applicable to PWRs
3.1-1, 098	Not applicable to PWRs
3.1-1, 099	Not applicable to PWRs
3.1-1, 100	Not applicable to PWRs
3.1-1, 101	Not applicable to PWRs
3.1-1, 102	Not applicable to PWRs
3.1-1, 103	Not applicable to PWRs
3.1-1, 104	Not applicable to PWRs
3.1-1, 105	Not applicable to CPNPP
3.1-1, 106	Consistent with the GALL-LR Report
3.1-1, 107	Consistent with the GALL-LR Report
3.1-1, 108	This item number is not used in the SRP-LR or the GALL-LR Report
3.1-1, 109	This item number is not used in the SRP-LR or the GALL-LR Report
3.1-1, 110	Not applicable to PWRs
3.1-1, 114	Consistent with the GALL-LR Report
3.1-1, 118	Not used (addressed by LRA Table 3.1-1, items 3.1-1, 028; 3.1-1, 053a; 3.1-1, 053b, and 3.1-1, 053c; see SE Section 3.1.2.2.9)
3.1-1, 119	Consistent with the GALL-LR Report
3.1-1, 127a	Consistent with the GALL-LR Report

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

(1) SE Section 3.1.2.1 discusses AMR results for components that the applicant stated are either not applicable to CPNPP or are consistent with the GALL-LR 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.

(2) SE Section 3.1.2.2 discusses AMR results for which the GALL-LR Report and SRP-LR recommend further evaluation. The table above identifies these items as consistent with the GALL-LR Report and provides citations within SE Section 3.1.2.2 that provides additional information.

(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-LR Report. These AMR results typically are identified by generic notes F through J and plant-specific notes in the LRA.

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

The following subsections document the staff's review of AMR results listed in LRA Tables 3.1.2-1 through 3.1.2-4 that the applicant determined to be consistent with the GALL-LR Report. The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL-LR Report; however, the staff did verify that the material presented in the GALL-LR Report was applicable and that the applicant identified the appropriate GALL-LR Report AMRs. For those AMR items that the staff found to be consistent with the GALL-LR Report, and for which no additional evaluation or RAI applies, the staff's review and conclusions, as documented in the GALL-LR Report, are considered to be the basis for acceptability of the AMR items. The staff's conclusion of "Consistent with the GALL-LR Report" is documented in SE Table 3.1-1, and no separate writeup is required or provided.

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

The staff did not identify any AMR items that required additional review with an associated writeup.

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

For LRA Table 3.1-1, items 3.1-1, 004; 3.1-1, 018; 3.1-1, 022; 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; 3.1-1, 058b; 3.1-1, 093; and 3.1-1, 105, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable to CPNPP. The staff reviewed the LRA, description of the material and environment associated with each AMR item, and the associated AMP and plant-specific documents, and the staff has concluded that the applicant's claim is reasonable.

For LRA Table 3.1-1, items 3.1-1, 006; 3.1-1, 007; 3.1-1, 011; 3.1-1, 016; 3.1-1, 017; 3.1-1, 021; 3.1-1, 029 through 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 through 3.1-1, 104; and 3.1-1, 110, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable because the associated items are applicable only to boiling-water reactors (BWRs). The staff reviewed the SRP-LR, confirmed that these items apply only to BWRs, and finds that these items are not applicable to CPNPP because it is a PWR.

For the following LRA Table 3.1-1 items, the applicant claimed that the corresponding items in the GALL-LR Report are not used and are addressed by other LRA Table 1 AMR items: 3.1-1, 028 (addressed by 3.1 1, 055c), 3.1 1, 036 (addressed by 3.1-1, 040, 3.5-1, 091, and 3.5-1, 089), 3.1-1, 042 (addressed by 3.1-1, 018; 3.1-1, 019; 3.1-1, 020; 3.1-1, 025; 3.1-1, 033; 3.1-1, 034; 3.1-1, 035; 3.1-1, 039; 3.1-1, 040; 3.1-1, 046; 3.1-1, 047; 3.1-1, 070; 3.1-1, 071; 3.1-1, 080; and 3.1-1, 082), 3.1-1, 062 (addressed by 3.1-1, 092), 3.1-1, 068 (addressed by 3.1-1, 077), and 3.1-1, 118 (addressed by 3.1-1, 028; 3.1-1, 053a; 3.1-1, 053b; and 3.1-1, 053c). The staff reviewed the LRA and confirmed that the aging effects for each of these items will be addressed by other LRA Table 1 AMR 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-LR Report

In LRA Section 3.1.2.2, the applicant further evaluates aging management for certain RVIs and reactor coolant system components, as recommended by the GALL-LR Report, and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant’s evaluation of these component groups against the criteria in SRP-LR Section 3.1.2.2. The following subsections document the staff’s review.

3.1.2.2.1 Cumulative Fatigue Damage

LRA Section 3.1.2.2.1 is associated with LRA Table 3.1-1, items 001, 002, 003, 005, 008, 009, 010, and 011. The section indicates that the TLAA on cumulative fatigue damage in RCS components is evaluated in accordance with 10 CFR 54.21(c) and is addressed in LRA Section 4.3. This is consistent with SRP-LR Section 3.1.2.2.1 and is, therefore, acceptable. The staff’s evaluation of the fatigue TLAAs for RCS components is documented in SE Sections 4.3.2 and 4.3.4.

In addition, the applicant determined that LRA Table 3.1-1, item 004, for RV support skirts does not apply to the CPNPP, Units 1 and 2, because the RV is supported by RV nozzles, and there is no RV support skirt. LRA Section 2.4.1 also states that the RV supports consist of support pads and shoes that are mounted on support members within the concrete cavity structure. The staff evaluated the applicant’s determination in accordance with SRP-LR Section 3.1.2.2.1 and finds it acceptable because a review of the FSAR shows that there is no support skirt for the RV.

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

<u>Item 1</u>. SRP-LR 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 cone exposed to secondary feedwater and steam. The existing program relies on control of water chemistry to mitigate corrosion and ISI to detect loss of material. The extent and schedule of the existing SG inspections are designed to ensure that flaws cannot attain a depth sufficient to threaten the integrity of the welds. However, according to NRC Information Notice (IN) 90-04, “Cracking of the Upper Shell-to-Transition Cone Girth Welds in Steam Generators,” dated January 26, 1990, the program may not be sufficient to detect pitting and crevice corrosion, if

general and pitting corrosion of the shell is known to exist. The GALL-LR Report recommends augmented inspection to manage this aging effect. Furthermore, the GALL-LR Report clarifies that this issue is limited to Westinghouse Model 44 and 51 SGs, in which a high-stress region exists at the shell-to-transition cone weld. Branch Technical Position RLSB-1, “Aging Management Review—Generic” (Appendix A.1 to the SRP-LR) describes the acceptance criteria.

LRA 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 cone exposed to secondary feedwater and steam, but they do not require augmented inspection. The CPNPP Unit 1 SGs are Westinghouse Model Delta 76 and the Unit 2 SGs are Westinghouse Model D-5.

Given that the aging-related degradation identified in SRP-LR Section 3.1.2.2.2, item 1, is limited to Westinghouse Model 44 and 51 SGs, the staff finds that the augmented inspections recommended for Westinghouse Model 44 and 51 SGs are not required for the SGs (i.e., model Delta 76 and D-5) at CPNPP, Units 1 and 2, respectively.

Additionally, the staff’s evaluations of the applicant’s ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, program and Water Chemistry program are documented in SE Sections 3.0.3.1.1 and 3.0.3.2.3, respectively. In its review of components associated with item 3.1-1-012, the staff finds that the applicant has addressed the further evaluation criteria and that the applicant’s proposal to manage the effects of aging using these programs is acceptable because (1) the ISI program includes techniques to confirm that the integrity of the SG shell is adequately maintained by detecting and monitoring potential flaws, (2) the Water Chemistry program 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-LR Report.

Based on the programs identified, the staff determined that the applicant’s programs meet the criteria of SRP-LR Section 3.1.2.2.2, item 1. For those items associated with LRA Section 3.1.2.2.2, item 1, the staff concludes that the LRA is consistent with the GALL-LR 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 extended operation, as required by 10 CFR 54.21(a)(3).

Item 2. SRP-LR 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 existing program relies on control of secondary water chemistry to mitigate corrosion. However, some applicants have replaced only the bottom part of their recirculating SGs, generating a cut in the middle of the transition cone and, consequently, a new transition cone closure weld. The GALL-LR Report recommends volumetric examinations performed in accordance with the requirements of ASME Code Section XI for upper shell to 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, in which a high-stress region exists at the shell-to-transition-cone weld.

SRP-LR Section 3.1.2.2.2, item 2, also states the new continuous circumferential weld, resulting from cutting the transition cone as discussed above, is a different situation from the SG transition cone welds containing geometric discontinuities. Control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations of stagnant flow conditions. The new transition area weld is a field weld, as opposed to having been made in a controlled manufacturing facility, and the surface conditions of the transition weld may result in flow conditions more conducive to initiation of general, pitting, and crevice corrosion than those of the upper and lower transition cone welds. For the new continuous circumferential weld, the GALL-LR Report recommends further evaluation to verify the effectiveness of the chemistry control program. A one-time inspection at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly, such that the component's intended function will be maintained during the period of extended operation. Furthermore, the GALL-LR Report clarifies that this issue is limited to replacement recirculating SGs with a new transition cone closure weld.

LRA Section 3.1.2.2.2, item 2, states that the Unit 1 model Delta 76 replacement SGs were complete replacements, and therefore, the Unit 1 SGs do not have a circumferential field weld. The Unit 2 SGs are original to the plant and therefore also do not have a circumferential field weld. Note that the inspections of the original SG transition cone welds on both units will continue to be performed consistent with the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program.

The aging-related degradation identified in SRP-LR Section 3.1.2.2.2, item 2, is associated with Westinghouse Model 44 and 51 SGs, where a high-stress region exists at the shell-to-transition-cone weld, and a new transition area weld is a field weld, as opposed to having been made in a controlled manufacturing facility. Therefore, the staff finds that a one-time inspection at susceptible locations is not applicable to the SGs Model Delta 76 and Model D-5 at CPNPP, Units 1 and 2, respectively.

Additionally, the staff's evaluations of the applicant's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program and Water Chemistry program are documented in SE Sections 3.0.3.1.1 and 3.0.3.2.3, respectively. In its review of components associated with item 3.1-1-012, the staff finds that the applicant has addressed the further evaluation criteria and that the applicant's proposal to manage the effects of aging using these programs is acceptable because (1) the ISI program includes techniques to confirm that the integrity of the SG shell is adequately maintained by detecting and monitoring potential flaws, (2) the Water Chemistry program 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-LR Report.

Based on the programs identified, the staff determined that the applicant's programs meet the criteria of SRP-LR Section 3.1.2.2.2, item 2. For those items associated with LRA Section 3.1.2.2.2, item 2, the staff concludes that the LRA is consistent with the GALL-LR 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 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. LRA Section 3.1.2.2.3, item 1, states that loss of fracture toughness due to neutron irradiation embrittlement is an aging effect and mechanism evaluated for the RV beltline and extended beltline by a TLAA. The TLAA evaluation of neutron irradiation embrittlement is discussed in LRA Section 4.2, "Reactor Vessel Neutron Embrittlement." This is consistent with SRP-LR Section 3.1.2.2.3, item 1, and is, therefore, acceptable. The staff's evaluation of the TLAAs for loss of fracture toughness due to neutron irradiation embrittlement is documented in SE Section 4.2.

Item 2. LRA Section 3.1.2.2.3, item 2, associated with LRA Table 3.1.1, item 3.1.1-014, addresses loss of fracture toughness due to neutron irradiation of the reactor pressure vessel beltline and extended beltline exposed to reactor coolant and neutron flux. The item states, in part, that the Reactor Vessel Material Surveillance program manages reduction in fracture toughness due to neutron embrittlement of RV beltline and extended beltline (e.g., nozzle) materials. The program uses surveillance capsule data and monitors changes in the fracture toughness properties of ferritic materials in the reactor pressure vessel beltline and extended beltline region. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.1.2.2.3, item 2.

In its review of components associated with AMR item 3.1.1-014, the staff finds that the applicant has met the further evaluation criteria and its proposal to manage the effects of aging for the RV shell (intermediate shell plates, lower shell plates, circumferential and longitudinal welds) and nozzle forgings (inlet/outlet) using the Reactor Vessel Material Surveillance program is acceptable because it is consistent with AMR items IV.A2.RP-229 and IV.A2.RP-228, respectively, in the GALL-LR Report.

Based on the AMPs identified, the staff concludes that the applicant meets SRP-LR Section 3.1.2.2.3, item 2, criteria and the LRA is consistent with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. LRA Section 3.1.2.2.3, Subsection 3, associated with LRA Table 3.1-1, AMR item 3.1-1, 015, addresses reduction of ductile fracture toughness in stainless steel or nickel-alloy PWR vessel internal components exposed to a reactor coolant with neutron flux environment. This reduction is to be managed through use and application of the generic TLAA in Babcock and Wilcox (B&W) Owners Group Report No. BAW-2248A. The applicant stated that this item is not applicable to CPNPP.

The staff evaluated the applicant's claim against the AMR further evaluation criteria in SRP-LR Section 3.1.2.2.3, item 3, and finds the applicant's claim acceptable because the AMR items in SRP-LR Table 3.1-1, item 3.1-1, 015, and GALL-LR Report, Revision 2, AMR item IV.B4 (as updated by SLR-ISG-2021-01-PWRVI), identify that the applicable generic TLAA invoked by the SRP-LR AMR is only applicable to B&W-designed RVI components whereas the RVI components at CPNPP, Units 1 and 2, were designed with a Westinghouse nuclear steam supply system (NSSS). Based on SRP-LR and GALL-LR Report, Revision 2, as updated by SLR-ISG-2021-01-PWRVI, the staff confirmed that item 3.1-1, 015 is not applicable to CPNPP.

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

Item 1. LRA Section 3.1.2.2.4, item 1, associated with LRA Table 3.1-1, AMR item 3.1-1, 016, addresses cracking due to SCC and IGSCC in the BWR RV flange leakage detection lines made of stainless steel and nickel-alloy and exposed to the reactor coolant leakage environment. The applicant claimed that this item is not applicable, as it applies to BWRs only. The NRC staff reviewed the applicant's non-applicability claim against the criteria in SRP-LR Section 3.1.2.2.4, item 1.

The NRC staff finds that the applicant's non-applicability claim for components associated with LRA Table 3.1-1, AMR item 3.1-1, 016, is acceptable because this item corresponds to SRP-LR Table 3.1-1, AMR item 16, which applies only to BWRs, and CPNPP units are PWRs.

Item 2. LRA Section 3.1.2.2.4, item 2, associated with LRA Table 3.1-1, item 3.1-1, 017, addresses cracking due to SCC and IGSCC for stainless steel BWR isolation condenser components exposed to reactor coolant. The applicant stated that this item is not applicable. FSAR Section 1.2.2.2 indicates that the NSSS consists of a Westinghouse PWR and supporting auxiliary systems. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.1.2.2.4, item 2, and finds it acceptable because CPNPP units are PWRs and do not have BWR isolation condenser components.

Item 3. LRA Section 3.1.2.2.3, item 3, states that this item is not applicable to CPNPP and is only applicable to B&W reactor internals. FSAR Section 1.2.2.2 indicates that the NSSS consists of a Westinghouse PWR and supporting auxiliary systems. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.1.2.2.3, item 3, and finds it acceptable because this item applies only to B&W RVI components, and there is no TLAA in the CLB concerning reduction in fracture toughness for the CPNPP RVI components, which are of a Westinghouse design.

3.1.2.2.5 Crack Growth Due to Cyclic Loading

LRA Section 3.1.2.2.5 states that all applicable SA-508-Cl-2 forgings are not affected by underclad cracking because the cladding welding process was controlled in accordance with RG 1.43, "Control of Stainless Steel Weld Cladding of Low-Alloy Steel Components." Additionally, LRA Table 3.1-1, item 018, states that the materials potentially susceptible to underclad cracking were clad using low-heat input techniques, which would avoid the formation of underclad cracking. As a result, the applicant stated that the underclad cracking TLAA is not applicable. The applicant explained that the relevant applicable components include the Unit 1 RV flange, Unit 1 primary inlet and outlet nozzles, Unit 2 closure head flange, Unit 2 RV flange, and Unit 2 primary inlet and outlet nozzles.

The staff reviewed FSAR Appendix 1A(N), "Discussion of Regulatory Guides," which discusses the applicant's positions on, and compliance with, Division 1 RGs as they apply to the NSSS scope of equipment and services. Specifically, FSAR Appendix 1A(N) indicates that the RV complies with RG 1.43.

The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.1.2.2.5 and finds it acceptable because the Unit 1 and 2 RVs comply with RG 1.43, such that materials potentially susceptible to underclad cracking were clad using low-heat input techniques, which avoid the formation of underclad cracking.

3.1.2.2.6 Cracking Due to Stress Corrosion Cracking

LRA Section 3.1.2.2.6, Item 1, associated with LRA Table 3.1-1, Item 3.1.1-019, addresses the management of SCC in PWR RV bottom-mounted instrumentation guide tubes exposed to a reactor coolant environment. The LRA states that the bottom-mounted instrumentation guide tubes will be managed using the Water Chemistry AMP to minimize the contaminants in the reactor coolant that promote SCC and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP to identify degradation of the stainless steel bottom-mounted instrumentation guide tubes and RV flange leak detection components. The staff's evaluations of the AMPs the applicant credited for managing the applicable aging effects are documented in the appropriate SE sections for those AMPs. The staff finds the applicant's proposal to manage the applicable aging effects acceptable.

Item 2. LRA Section 3.1.2.2.6 associated with LRA Table 3.1.1, AMR item 3.1-1, 020, addresses cracking due to SCC for the CASS Class 1 reactor coolant piping components exposed to the reactor coolant, which will be managed by the Water Chemistry AMP (LRA Section B.2.3.2) and the One-Time Inspection AMP (LRA Section B.2.3.19). The applicant stated that its review of industry and CPNPP OE did not identify any occurrences of SCC in the CASS piping components exposed to PWR reactor coolant. It stated that SCC of CASS components occurred primarily in BWRs due to susceptible CASS components being exposed to BWR water chemistry with high levels of oxygen and other contaminants, based on industry experience reviewed in NUREG-0313, Revision 2, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping," issued January 1988 (ML031470422). In addition, NUREG-0313 does not identify SCC of CASS components as being problematic in PWRs like CPNPP, Units 1 and 2.

SRP-LR 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. The SRP-LR recommends further evaluation of a plant-specific program for CASS Class 1 reactor coolant piping components to ensure that this aging effect is adequately managed. The staff reviewed the applicant's proposal against the criteria in SRP-LR 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 Water Chemistry AMP to mitigate potential cracking, and the One-Time Inspection AMP to verify the effectiveness of the Water Chemistry AMP to manage cracking due to SCC in the CASS piping components. The staff's evaluation of the One-Time Inspection AMP and the Water Chemistry AMP are documented in SE Sections 3.0.3.1.6 and 3.0.3.2.3, respectively.

For the components associated with LRA Section 3.1.2.2.6, item 2, the staff concludes that the LRA is consistent with the GALL-LR 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 extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.7 Cracking Due to Cyclic Loading

LRA Section 3.1.2.2.7, associated with LRA Table 3.1-1, AMR item 3.1-021, addresses cracking due to cyclic loading for steel and stainless steel BWR isolation condenser components exposed to reactor coolant. The applicant stated that this item is not applicable. FSAR Section 1.2.2.2 indicates that the NSSS consists of a Westinghouse PWR and supporting auxiliary systems. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.1.2.2.7 and finds it acceptable because CPNPP Units 1 and 2 are PWRs and do not have BWR isolation condenser components.

3.1.2.2.8 Loss of Material Due to Erosion

LRA Section 3.1.2.2.8, associated with LRA Table 3.1-1, item 3.1-1, 022, addresses loss of material due to erosion in steel SG feedwater impingement plates and supports exposed to secondary feedwater. The GALL-LR Report recommends further evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed. The applicant stated that this item is not applicable at CPNPP because the Unit 1 Model Delta 76 SG design does not contain feedwater impingement plates and supports. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.1.2.2.8 and finds it acceptable because the Unit 1 SGs do not contain feedwater impingement plates and supports. The licensee also stated that this item is not applicable to the Unit 2 Model D-5 SGs because they have stainless steel feedwater impingement plates and supports. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.1.2.2.8 and finds it acceptable because stainless steel impingement plates and supports are resistant to erosion in secondary feedwater and because GALL-LR Report item IV.D1.R-39 and SRP-LR Table 3.1-1, item 3.1-1, 022, associated with LRA AMR item 3.3-1, 022, apply only to steel.

3.1.2.2.9 Aging Management of Pressurized-Water Reactor Vessel Internals

LRA Section 3.1.2.2.9 associated with LRA Table 3.1-1, items 3.1-1, 003; 3.1-1, 028; 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; and 3.1-1, 119, addresses management of cracking (due to SCC, irradiation-assisted SCC, or fatigue), loss of fracture toughness (due to neutron irradiation embrittlement or thermal aging embrittlement), loss of preload (due to irradiation-assisted stress relaxation or creep), loss of material (due to wear), and changes in dimension (due to void swelling or distortion) in specified PWR RVI components that (1) are exposed to a reactor coolant with neutron flux environment and (2) will be managed by either the applicant's Reactor Vessel Internals program (LRA AMP B.2.3.7) or a combination of the Reactor Vessel Internals program, the ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD program (LRA AMP B.2.3.1), and the Water Chemistry program (LRA AMP B2.3.2).

The staff reviewed the applicant's Table 1 AMR line items for the RVI components in LRA Table 3.1-1 and the associated Table 2 AMR line items for the RVI components in LRA Table 3.1.2-2 in comparison to the corresponding AMR item criteria in the SRP-LR and GALL-SLR Report, as updated in Appendices A and B.2 of ISG SLR-ISG-2021-01-PWRVI. The applicant amended its application, by letter dated April 6, 2023 (ML23096A302), to address the staff's audit observations. Based on its review, the staff finds the AMR items for referenced RVI components in the LRA to be acceptable because the staff has confirmed that the AMR items are consistent with those for Westinghouse-design RVI components in both the SRP-LR and GALL-SLR Report, as updated by SLR-ISG-2021-01-PWRVI.

For those AMR items associated with LRA Section 3.1.2.2.9, the staff concludes that the LRA is consistent with the GALL-SLR Report as updated by SLR-ISG-2021-01-PWRVI, and the SRP-LR. The staff further 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 period of extended operation as required by 10 CFR 54.21(a)(3).

3.1.2.2.10 Loss of Material Due to Wear

SRP-LR Section 3.1.2.2.10 discusses aging effects of loss of fracture toughness due to neutron irradiation embrittlement, change in dimension due to void swelling, loss of preload due to stress relaxation, or loss of material due to wear that may occur in inaccessible locations for stainless steel and nickel-alloy Primary and Expansion PWR vessel internal components. However, LR-ISG-2011-04, "Updated Aging Management Criteria for Reactor Vessel Internal Components of Pressurized Water Reactors," dated June 3, 2013, removed SRP-LR Section 3.1.2.2.10 based on the staff-approved MRP-227, Revision 1-A. The applicant incorporated the information in SRP-LR Section 3.1.2.2.10 into SRP-LR Section 3.1.2.2.9. The staff noted that for SLR guidance, SRP-SLR does include Section 3.1.2.2.10, which discusses loss of material due to wear for the LRA. LR-ISG-2021-01-PWRVI indicates that loss of material due to wear of vessel internal components is managed by AMP XI.M16A, “PWR Vessel Internals.”

LRA Section 3.1.2.2.10 indicates that SRP-LR Section 3.1.2.2.10 has been removed and refers further evaluations regarding loss of material to LRA Section 3.1.2.2.9. LRA Section 3.1.2.2.9 states that the RVI aging mechanisms formerly addressed by further evaluation in SRP-LR, Revision 2, Section 3.1.2.2.10 are now encompassed by the current Section 3.1.2.2.9 in the SRP-SLR and SLR-ISG-2021-01-PWRVI. The applicant stated that the susceptibility rankings and inspection categorizations from RVI components in MRP-227, Revision 1-A, for 60 years of operation are applicable to the CPNPP LRA. As such, a plant-specific AMP (or failure modes and effects criticality analysis) is not necessary because CPNPP follows MRP-227, Revision 1-A.

To be consistent with the guidance of SLR-ISG-2021-01-PWRVI, the applicant identified that LRA items 3.1-1, 059a, 059b, 059c, and 119 will have the aging effect of loss of material due to wear for pertinent RVI components at CPNPP. The applicant stated that these items will be managed by LRA AMP B.2.3.7, “PWR Vessel Internals.”

The staff evaluated the applicant’s claim against the criteria in SRP-SLR Section 3.1.2.2.9 and SLR-ISG-2021-01-PWRVI. The staff finds the applicant’s claim acceptable because (1) the staff confirmed that LR-ISG-2011-04 removed Section 3.1.2.2.10 from the SRP-LR, (2) for LRA items 3.1-1, 059a, 059b, 059c, and 119, the applicant will follow SLR-ISG-2021-01-PWRVI, (3) the applicant will use LRA AMP B.2.3.7 to manage loss of material due to wear, and (4) the applicant will follow MRP-227, Revision 1-A, or the latest staff-approved version of MRP-227 to manage CPNPP vessel internal components.

For those AMR items associated with loss of material due to wear, the staff determines that the LRA is consistent with GALL-SLR Report; SLR-ISG-2021-01-PWRVI; and LR-ISG-2011-04. The staff further determines that the applicant will follow MRP-227, Revision 1-A, or the latest NRC-approved version of MRP-227. 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 period of extended operation as required by 10 CFR 54.21(a)(3).

3.1.2.2.11 Cracking Due to Primary Water Stress Corrosion Cracking

LRA Table 3.1-1, item 3.1-1, 025, addresses cracking due to primary water stress corrosion cracking 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). LRA Section 3.1.2.2.11, associated with LRA Table 3.1-1, item 3.1-1, 025, addresses cracking for nickel-alloy material exposed to reactor coolant, which will be managed by the Steam Generators and Water Chemistry programs. The staff reviewed the applicant’s proposal against the criteria in SRP-LR Section 3.1.2.2.11, items 1 and 2.

Item 1. The CPNPP Unit 1 SGs are Westinghouse Model D76 and have Alloy 690 divider plate assemblies and weld materials. The CPNPP Unit 2 SGs are Westinghouse Model D5 and have Alloy 600 divider plate assemblies and weld materials. The applicant stated that the industry analyses in EPRI Report 3002002850, “Steam Generator Management Program: Investigation of Crack Imitation and Propagation in the Steam Generator Channel Head Assembly,” dated October 30, 2014, are applicable and bounding for the Unit 2 SGs. The SRP-LR, as modified by

LR-ISG-2016-01, 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. For plants with divider plate assemblies fabricated of Alloy 600 or Alloy-600-type weld materials, the SRP-LR, as modified by LR-ISG-2016-01, states that a plant-specific AMP is not necessary if the industry analyses in EPRI 3002002850 are bounding, in which case primary water stress corrosion cracking can be managed by the Water Chemistry and Steam Generators programs.

The staff finds that the applicant has met the further evaluation criteria for CPNPP Unit 1 because the SG divider plate assemblies are fabricated of Alloy 690 and Alloy-690-type weld materials, and therefore a plant-specific AMP is not required. The staff finds that the applicant has met the further evaluation criteria for CPNPP Unit 2 because the SG divider plate assemblies are fabricated of Alloy 600 and Alloy-600-type weld materials, and the industry analyses in EPRI Report 3002002850 are bounding. During the audit, the applicant provided the staff access to the applicant’s detailed assessment of the divider plate assembly. Because the industry analyses are applicable and bounding, a plant-specific AMP is not required.

Based on the programs identified, the staff concludes that the applicant’s programs meet the criteria for item 1 in SRP-LR Section 3.1.2.2.11, as modified by LR-ISG-2016-01. For the AMR item associated with LRA Section 3.1.2.2.11, the staff concludes that the LRA is consistent with the GALL-LR Report, as modified by LR-ISG-2016-01, 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 extended operation as required by 10 CFR 54.21(a)(3).

Item 2. The CPNPP Unit 1 SGs have thermally treated Alloy 690 tubes, and the CPNPP Unit 2 SGs have thermally treated Alloy 600 tubes. In addition, the Unit 1 SG tubesheets are clad with Alloy-690-type material on the primary side. The applicant stated in LRA Section 3.1.2.2.11 that plant-specific AMPs are not necessary for the tube-to-tubesheet welds in the Unit 1 or Unit 2 SGs. For Unit 1, this is based on having thermally treated Alloy 690 tubes and Alloy-690-type tubesheet cladding. For Unit 2, this is based on having a permanently approved H* alternative repair criteria for both the hot and cold leg tube-to-tubesheet joints.

The guidance in SRP-LR Section 3.1.2.2.11, as modified by LR-ISG-2016-01, states that a plant-specific AMP is not necessary for managing aging of the tube-to-tubesheet welds for plants that have SGs with thermally treated Alloy 690 SG tubes and Alloy-690-type tubesheet cladding. That guidance also states that a plant-specific AMP is not necessary for plants that have SGs with thermally treated Alloy 600 SG tubes and a permanently approved H* ARC that apply to both the hot-leg and cold-leg side of the SG.

The staff finds that the applicant has met the further evaluation criteria for Unit 1 because the tubes are thermally treated Alloy 690 and the tubesheets are clad with Alloy-690-type material, and therefore a plant-specific AMP is not necessary. The staff finds that the applicant has met the further evaluation criteria for CPNPP Unit 2 because the applicant has a permanently approved H* ARC on the hot leg and cold leg for the Unit 2 SGs. Therefore, the portion of the tube greater than 14.01 inches below the top of the tubesheet (including the tube-to-tubesheet weld) is not credited for resisting tube end cap pressure loads and the tube-to-tubesheet welds do not have a pressure boundary function. Consistent with SRP-LR Section 3.1.2.2.11, as modified by LR-ISG-2016-01, the weld is no longer part of the reactor coolant pressure boundary, and a plant-specific AMP is not necessary.

Based on the programs identified, the staff concludes that the applicant's programs meet the criteria for item 2 in SRP-LR Section 3.1.2.2.11, as modified by LR-ISG-2016-01. For the AMR item associated with LRA Section 3.1.2.2.11, the staff concludes that the LRA is consistent with the GALL-LR 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 extended operation as required by 10 CFR 54.21(a)(3).

3.1.2.2.12 Removed as a Result of LR-ISG-2011-04
3.1.2.2.13 Removed as a Result of LR-ISG-2011-04
3.1.2.2.14 Removed as a Result of LR-ISG-2011-04
3.1.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

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

3.1.2.2.16 Ongoing Review of Operating Experience

SE Section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of OE.

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

The following subsections document the staff's review of those AMR results listed in LRA Tables 3.1.2-1 through 3.1.2-4 that are either not consistent with or not addressed in the GALL-LR 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 an SRP-LR Table 1 item, the subsections are organized by applicable AMR sections and then by material and environment combinations.

For component type, material, and environment combinations not evaluated in the GALL-LR Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended functions consistent with the CLB for the period of extended operation. There is OE that is documented in the GALL-SLR Report for component type, material, and environment combinations that are not evaluated in the GALL-LR Report. As discussed in the GALL-SLR Report, future applicants for initial LR (40–60 years) may use aging management guidance from SLR (60–80 years) in their applications. Following the GALL-SLR Report aging management recommendations for those component type, material, and environment combinations are acceptable because it aligned with the staff's current guidance for LR. The following sections document the staff's evaluation.

3.1.2.3.1 Steam Generators—Summary of Aging Management Evaluation

<u>Nickel-Alloy Steam Generator Tubes Exposed Externally to Treated Water</u>. LRA Table 3.1.2-004 states that reduction of heat transfer for nickel-alloy SG tubes exposed to an external environment of treated water will be managed by the Steam Generators and Water Chemistry programs. The AMR items cite generic note H, for which the applicant has identified reduction of heat transfer as an additional aging effect. The AMR items cite plant-specific note 2, which states that, although the reduction of heat transfer due to fouling is not in the GALL-LR Report for this component, material, and environment combination, it is included as item IV.D1.R-407 in the GALL-SLR Report based on OE, with the Steam Generator and Water Chemistry AMPs identified for managing the aging effect. The staff reviewed the associated

items in the LRA and considered whether the aging effects proposed by the applicant constitute all of the applicable aging effects for this component, material, and environment description. In addition to reduction of heat transfer, the staff noted that the applicant addressed cracking and loss of material for this component, material, and environment combination in other AMR items.

The staff finds the applicant’s proposal to manage reduction of heat transfer acceptable because, consistent with the GALL-SLR Report item IV.D1.R-407, this aging effect can be effectively managed with the Steam Generator and Water Chemistry programs.

3.1.2.3.2 Reactor Pressure Vessel—Summary of Aging Management Evaluation

Control Rod Drive Mechanism Thermal Sleeves. LRA Table 3.1.2-1 states that loss of material due to wear can occur from the interactions between the control rod drive mechanism head penetration nozzle and thermal sleeve and will be managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP. The AMR item cites generic note H, which identifies that this aging effect is not in the GALL-LR Report for the component identified. The AMR item also cites Plant Specific Note 3, which states the following:

> Based on the OE [operating experience] reflected in NUREG-2191 (IV.A2.R-414) and NUREG-2192 (3.1-1, 117), loss of material due to wear can occur in the stainless-steel thermal sleeves of PWR CRD [control rod drive] head penetration nozzles due to interaction between the nozzle and the thermal sleeve. This SLR OE recommends the use of a plant-specific AMP to manage this aging effect; as such, the ASME Section XI, ISI Subsection IWB, IWC, and IWD (B.2.3.1) AMP includes inspection for the loss of material due to wear of the CRDM [control rod drive mechanism] thermal sleeves.

Therefore, the staff finds the applicant’s plan to manage the applicable aging effects identified for this component with the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP acceptable because it is consistent with the GALL-SLR Report.

3.2 Aging Management of Engineered Safety Features

3.2.1 Summary of Technical Information in the Application

LRA Section 3.2 provides AMR results for those components that the applicant identified in LRA Section 2.3.2, “Engineered Safety Features,” as being subject to an AMR. LRA Table 3.2-1, “Summary of Aging Management Programs for Engineered Safety Features,” gives a summary comparison of the applicant’s AMRs with those evaluated in the GALL-LR Report for the ESF components.

3.2.2 Staff Evaluation

SE Table 3.2-1, below, summarizes the staff’s evaluation of the component groups listed in LRA Section 3.2 and addressed in the GALL-LR Report.

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

Component Group (SRP-LR Item No.)	Staff Evaluation
3.2-1, 001	Consistent with the GALL-LR Report (see SE Section 3.2.2.2.1)
3.2-1, 002	Not applicable to CPNPP
3.2-1, 003	Not applicable to CPNPP
3.2-1, 004	Consistent with the GALL-LR Report (see SE Section 3.2.2.2.3)
3.2-1, 005	Consistent with the GALL-LR Report (see SE Section 3.2.2.2.4)
3.2-1, 006	Not applicable to PWRs
3.2-1, 007	Not applicable to CPNPP (see SE Section 3.2.2.2.6)
3.2-1, 008	Not applicable to CPNPP
3.2-1, 009	Consistent with the GALL-LR Report
3.2-1, 010	Not applicable to CPNPP
3.2-1, 011	Not applicable to PWRs
3.2-1, 012	Not applicable to CPNPP
3.2-1, 013	Consistent with the GALL-LR Report
3.2-1, 014	Not used (addressed by LRA Table 3.2-1, item 3.2-1, 013)
3.2-1, 015	Consistent with the GALL-LR Report
3.2-1, 016	Not used (addressed by LRA Table 3.4-1, items 3.4-1, 013 and 3.4-1, 014)
3.2-1, 017	Not applicable to PWRs
3.2-1, 018	Consistent with the GALL-LR Report
3.2-1, 019	Consistent with the GALL-LR Report
3.2-1, 020	Consistent with the GALL-LR Report
3.2-1, 021	Not applicable to CPNPP
3.2-1, 022	Consistent with the GALL-LR Report
3.2-1, 023	Not applicable to CPNPP
3.2-1, 024	Not applicable to CPNPP
3.2-1, 025	Consistent with the GALL-LR Report
3.2-1, 026	Not applicable to PWRs
3.2-1, 027	Consistent with the GALL-LR Report
3.2-1, 028	Not applicable to CPNPP
3.2-1, 029	Not applicable to CPNPP
3.2-1, 030	Consistent with the GALL-LR Report
3.2-1, 031	Consistent with the GALL-LR Report
3.2-1, 032	Not applicable to CPNPP
3.2-1, 033	Consistent with the GALL-LR Report
3.2-1, 034	Not applicable to CPNPP
3.2-1, 035	Not applicable to CPNPP
3.2-1, 036	Not applicable to CPNPP
3.2-1, 037	Not applicable to CPNPP
3.2-1, 038	Not applicable to PWRs
3.2-1, 039	Not used (addressed by LRA Table 3.2-1, item 3.2-1, 040 and LRA Table 3.3-1, item 3.3-1, 132)
3.2-1, 040	Consistent with the GALL-LR Report
3.2-1, 041	Not applicable to CPNPP
3.2-1, 042	Not applicable to CPNPP

Component Group (SRP-LR Item No.)	Staff Evaluation
3.2-1, 043	Not applicable to PWRs
3.2-1, 044	Consistent with the GALL-LR Report
3.2-1, 045	Not used (addressed by LRA Table 3.2-1, item 3.2-1, 063 and LRA Table 3.5-1, item 3.5-1, 077)
3.2-1, 046	Not applicable to PWRs
3.2-1, 047	Not applicable to CPNPP
3.2-1, 048	Not applicable to CPNPP
3.2-1, 049	Consistent with the GALL-LR Report
3.2-1, 050	Consistent with the GALL-LR Report
3.2-1, 051	Consistent with the GALL-LR Report
3.2-1, 052	Not applicable to CPNPP
3.2-1, 053	Not used (addressed by LRA Table 3.2-1, item 3.2-1, 063)
3.2-1, 053.5	Not used (addressed by LRA Table 3.2-1, item 3.2-1, 063)
3.2-1, 054	Not applicable to PWRs
3.2-1, 055	Not applicable to CPNPP
3.2-1, 056	Not applicable to CPNPP
3.2-1, 057	Not applicable to CPNPP
3.2-1, 058	Not applicable to CPNPP
3.2-1, 059	Not applicable to CPNPP
3.2-1, 060	Not applicable to CPNPP
3.2-1, 061	Not applicable to CPNPP
3.2-1, 062	Not applicable to CPNPP
3.2-1, 063	Consistent with the GALL-LR Report
3.2-1, 064	Consistent with the GALL-LR Report
3.2-1, 065	Consistent with the GALL-LR Report
3.2-1, 066	Not applicable to CPNPP
3.2-1, 067	Not applicable to CPNPP
3.2-1, 068	Not applicable to CPNPP
3.2-1, 069	Not applicable to CPNPP
3.2-1, 070	Not applicable to CPNPP
3.2-1, 071	Not applicable to CPNPP
3.2-1, 072	Consistent with the GALL-LR Report
3.2-1, 073	Consistent with the GALL-LR Report
3.2-1, 074	Not applicable to CPNPP

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

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

(2) SE Section 3.2.2.2 discusses AMR results for which the GALL-LR Report and SRP-LR recommend further evaluation. The table above identifies these items as consistent with

the GALL-LR Report and provides citations within SE Section 3.2.2.2 that provides additional information.

(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-LR Report. These AMR results typically are identified by generic notes F through J and plant-specific notes in the LRA.

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

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

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

For the AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in SE Sections 3.2.2.1.2 through 3.2.2.1.4 below.

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

For LRA Table 3.2-1, items 3.2-1, 002; 3.2-1, 003; 3.2-1, 007; 3.2-1, 008; 3.2-1, 010; 3.2-1, 012; 3.2-1, 021; 3.2-1, 023; 3.2-1, 024; 3.2-1, 028; 3.2-1, 029; 3.2-1, 032; 3.2-1, 034; 3.2-1, 035; 3.2-1, 036; 3.2-1, 037; 3.2-1, 041; 3.2-1, 042; 3.2-1, 047; 3.2-1, 048; 3.2-1, 052; 3.2-1, 055; 3.2-1, 056; 3.2-1, 057; 3.2-1, 058; 3.2-1, 059; 3.2-1, 060; 3.2-1, 061; 3.2-1, 062; 3.2-1, 066; 3.2-1, 067; 3.2-1, 068; 3.2-1, 069; 3.2-1, 070; 3.2-1, 071; and 3.2-1, 074, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable to CPNPP. The staff reviewed the LRA, the description of the material and environment associated with each AMR item, and the associated AMP and plant-specific documents and has concluded that the applicant's claim is reasonable.

For LRA Table 3.2-1, items 3.2-1, 006; 3.2-1, 011; 3.2-1, 017; 3.2-1, 026; 3.2-1, 038; 3.2-1, 043; 3.2-1, 046; and 3.2-1, 054, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable because the associated items are applicable only to BWRs. The staff reviewed the SRP-LR, confirmed that these items apply only to BWRs, and finds that these items are not applicable to CPNPP because it is a PWR.

For the following LRA Table 3.2-1 items, the applicant claimed that the corresponding items in the GALL-LR Report are not used and are addressed by other LRA Table 1 AMR items: 3.2-1, 014 (addressed by 3.2-1, 013); 3.2-1, 016 (addressed by 3.4-1, 013 and 3.4-1, 014); 3.2-1, 039 (addressed by 3.2-1, 040 and 3.3-1, 132); 3.2-1, 045 (addressed by 3.2-1, 063 and 3.5-1, 077); 3.2-1, 053 (addressed by 3.2-1, 063); and 3.2-1, 053.5 (addressed by 3.2-1, 063). The staff reviewed the LRA and confirmed that the aging effects for each of these items will be addressed by other LRA Table 1 AMR items. Therefore, the staff finds the applicant's proposal to use alternate items acceptable.

3.2.2.1.2 Loss of Material Due to Cladding Breach

LRA Section 3.2.2.2.2, associated with LRA Table 3.2-1, item 3.2.1-002, addresses loss of material due to a breach in the stainless steel cladding of steel pump casings exposed to treated, borated water. The applicant stated that this item is not applicable because pump casings in ESF systems exposed to treated, borated water are stainless steel and are not steel with stainless steel cladding. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.2.2.2.2 and finds it acceptable because the ESF pump casings are not constructed of steel with stainless steel cladding.

3.2.2.1.3 Loss of Coating or Lining Integrity Due to Blistering, Cracking, Flaking, Peeling, Delamination, Rusting, or Physical Damage, and Spalling for Cementitious Coatings/Linings; Loss of Material Due to General, Pitting, Crevice Corrosion, or MIC

LRA Table 3.2-1, items 3.2.1-072 and 3.2.1-073, address (1) loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage, and spalling for cementitious coatings/linings (AMR item 3.2.1-72) and (2) loss of material due to general, pitting, crevice corrosion, or MIC (AMR item 3.2.1-73) for metallic piping, piping components, heat exchangers, and tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Lubricating Oil Analysis and One-Time Inspection programs to manage the aging effects for internally coated carbon steel SI pump lubricating oil reservoirs. The staff's evaluation of the applicant's proposal for managing the effects of aging for these reservoirs is documented in SE Section 3.0.3.2.20, specifically Exception 2). The staff's evaluation of the Lubricating Oil Analysis and One-Time Inspection programs is documented in SE Sections 3.0.3.2.17 and 3.0.3.1.6, respectively.

3.2.2.1.4 Cracking Due to Stress Corrosion Cracking

LRA Table 3.2-1, item 3.21-021, addresses cracking due to SCC for steel (with stainless steel or nickel-alloy cladding) SI tank (accumulator) exposed to treated water (borated) greater than 60°C (140°F). The applicant claimed that item 3.2-1, 021 is not applicable because the CPNPP SI accumulators are maintained at containment ambient conditions (<140°F). The NRC staff reviewed the LRA and FSAR and was unable to verify the applicant's claim of non-applicability. In LRA Supplement 1 dated April 6, 2023 (ML23096A302), the applicant revised Table 3.2-1, item 3.2-1, 021, to state that cracking is an AERM for the CPNPP SI accumulators at temperatures above 140°F and revised Table 3.2.2-5 to include cracking as an AERM for the SI accumulators. The NRC staff finds the applicant's revisions to item 3.2-1, 021 and Table 3.2.2-5 acceptable because the revisions address the aging effect on accumulators at temperatures exceeding 140°F.

3.2.2.2 Aging Management Review Results for Which Further Evaluation Is Recommended by the GALL-LR Report

In LRA Section 3.2.2.2, the applicant further evaluates aging management for certain ESF components as recommended by the GALL-LR Report and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria in SRP-LR Section 3.2.2.2. The following subsections document the staff's review.

3.2.2.2.1 Cumulative Fatigue Damage

LRA Section 3.2.2.2.1, associated with LRA Table 3.2-1, item 001, indicates that the TLAA on cumulative fatigue damage in the components of ESFs is evaluated in accordance with 10 CFR 54.21(c) and is addressed in LRA Section 4.3.3. The applicant's evaluation of the TLAA is consistent with SRP-LR Section 3.2.2.2.1 and is therefore acceptable. The staff's evaluation of the TLAA for the components of ESFs is documented in SE Section 4.3.3.

3.2.2.2.2 Loss of Material Due to Cladding Breach

LRA Section 3.2.2.2, associated with LRA Table 3.2-1, item 3.2.1-002, addresses loss of material due to a breach in the stainless steel cladding of steel pump casings exposed to treated, borated water. The applicant stated that this item is not applicable because pump casings in ESF systems exposed to treated, borated water are stainless steel and are not steel with stainless steel cladding. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.2.2.2 and finds it acceptable because the ESF pump casings are not constructed of steel with stainless steel cladding.

3.2.2.2.3 Loss of Material Due to Pitting and Crevice Corrosion

Item 1. LRA Section 3.2.2.2.3, associated with LRA Table 3.2-1, item 3.2.1-3, addresses loss of material due to pitting and crevice corrosion in partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.2.2.2.3, item 1, and finds it acceptable because, based on a review of the LRA and FSAR, the ESF systems do not include partially encased stainless steel tanks exposed to this environment.

Item 2. LRA Section 3.2.2.2.3.2, associated with LRA Table 3.2-1, item 3.2.1-004, addresses loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air, which will be managed by the External Surfaces Monitoring of Mechanical Components program. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.2.2.2.3.2.

In its review of components associated with AMR item 3.2.1-004, the staff determined the need for additional information about the scope of aging management for loss of material of stainless steel components exposed to outdoor air. The staff also determined the need for additional information about managing stress corrosion cracking of stainless steel components in cases where loss of material is being managed, which would involve similar halide concentrations. Therefore, the staff issued RAI 3.2.2.2.3.2-1 (ML23181A018) and RAI 3.2.2.2.3.2-1a (ML23256A144) requesting that the applicant provide additional information regarding loss of material and stress corrosion cracking in the ESF systems, auxiliary systems, and steam and power conversion systems (LRA Further Evaluation Sections 3.2.2.2.3.2, 3.2.2.2.6, 3.3.2.2.3, 3.3.2.2.5, 3.4.2.2.2, and 3.4.2.2.3).

In the response to RAI 3.2.2.2.3.2-1, dated July 27, 2023 (ML23208A193), the applicant reevaluated the plant environments for components in several systems associated with these further evaluations and determined that exposure to outdoor air did not apply. The applicant also modified LRA Sections 3.2.2.2.3.2, 3.2.2.2.6, 3.3.2.2.3, 3.3.2.2.5, 3.4.2.2.2, and 3.4.2.2.3, relating to loss of material and stress corrosion cracking of stainless steel components, to reiterate the absence of any plant-specific operating experience relating to either of these aging effects in an outdoor air environment. For the LRA sections associated with cracking, the applicant also noted that the components exposed to outdoor air are not subjected to elevated temperature. The response also stated that there are no nickel alloy components in the scope of license renewal in the ESF, auxiliary, or steam and power conversion systems exposed to outdoor air. The SRP-LR does not include loss of material of nickel alloys for these further evaluation sections for license renewal, but the SRP-SLR does include nickel alloys in the corresponding sections for SLR.

In the response to RAI 3.2.2.2.3.2-1a, dated October 4, 2023 (ML23277A176), the applicant noted that part (a) of the previous RAI response had been superseded by part (4) of the current response. These parts are related to the fire protection system. As a result, the applicant revised LRA Table 3.3.2-7 to delete items for stainless steel components in the fire protection system based on additional evaluations that determined the components were exposed to uncontrolled indoor air instead of outdoor air. The response also stated that all in-scope stainless steel components exposed to outdoor air in the ESF, auxiliary, and steam and power conversion systems are managed for loss of material. In addition, as requested, the response discussed the site’s previous disposition of industry operating experience associated with stress corrosion cracking in Licensee Event Report 254/2006-004 and Information Notice 2012-20, “Chloride-Induced Stress Corrosion Cracking of Austenitic Stainless Steel and Maintenance of Dry Cask Storage System Canisters,” dated November 14, 2012. The applicant had previously determined that these operating experiences were not applicable to CPNPP.

In the response to RAI 3.2.2.2.3.2-1, the applicant revised LRA Section 3.2.2.2.3.2 to state that there is no plant-specific operating experience with loss of material due to pitting or crevice corrosion, and that the stainless steel vent piping and liner inside the reactor water storage tank are the only components considered susceptible in ESF systems. The response to RAI 3.2.2.2.3.2-1 also modified the LRA to state there are no other stainless steel components exposed to outdoor air within ESF systems.

In its evaluation of the applicant’s responses to RAIs 3.2.2.2.3.2-1 and 3.2.2.2.3.2-1a, the staff noted the following, which apply to LRA Sections 3.2.2.2.3.2, 3.2.2.2.6, 3.3.2.2.3, 3.3.2.2.5, 3.4.2.2.2, and 3.4.2.2.3: (1) the outdoor air environment is nominally not aggressive to stainless steel with respect to pitting corrosion, crevice corrosion, or stress corrosion cracking, (2) the plant-specific operating experience does not reveal a history of loss of material due to pitting corrosion, crevice corrosion, or stress corrosion cracking of stainless steel components in outdoor air, (3) the applicant identified certain components in the ESF, auxiliary, and steam and power conversion systems that have the most potential for an unexpected accumulation of contaminants that could cause pitting or crevice corrosion in outdoor air, (4) to manage aging due to pitting or crevice corrosion for those components, the applicant proposed an AMP that is identified in the SRP-LR as an acceptable method, (5) the uninsulated stainless steel components in the ESF systems exposed to outdoor air are not at elevated temperature or exposed to halide and moisture conditions that resulted in stress corrosion cracking at near-ambient temperature in stainless steel components at other operating plants, and (6) cracking of outdoor insulated components is addressed by the External Surfaces Monitoring of Mechanical Components program. Based on items (1) through (6) above, in its review of components associated with AMR item 3.2.1-004, the staff finds that the applicant has met the further evaluation criteria, and the applicant’s proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components program is acceptable.

Based on the programs identified, the staff concludes that the applicant's programs meet the criteria in SRP-LR Section 3.2.2.2.3.2. For those AMR items associated with LRA Section 3.2.2.2.3.2, the staff concludes that the LRA is consistent with the GALL-LR 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 period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.4 Loss of Material Due to Erosion

LRA Section 3.2.2.2.3, associated with LRA Table 3.2-1, item 3.2.1-3, addresses loss of material due to pitting and crevice corrosion in partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.2.2.2.3, item 1, and finds it acceptable because, based on a review of the LRA and FSAR, the staff confirmed that the ESF systems do not include partially encased stainless steel tanks exposed to this environment.

3.2.2.2.5 Loss of Material Due to General Corrosion and Fouling That Leads to Corrosion

LRA Section 3.2.2.2.5, associated with LRA Table 3.2-1, item 3.2.1 006, addresses loss of material due to general corrosion and fouling for steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to indoor air. The applicant stated that this item is not applicable and applies to BWRs only. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.2.2.2.5 and finds it acceptable because there are no in-scope steel nozzles or orifices exposed to indoor air in the ESF systems.

3.2.2.2.6 Cracking Due to Stress Corrosion Cracking

LRA Section 3.2.2.2.6, as modified by letter dated July 27, 2023 (ML23208A193), is associated with LRA Table 3.2-1, item 3.2.1-007, and addresses cracking due to stress corrosion cracking for stainless steel piping, piping components, and tanks exposed to outdoor air. The applicant stated that this item is not applicable. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.2.2.2.6.

In its review of components associated with AMR item 3.2.1-007, the staff determined the need for additional information about managing stress corrosion cracking of stainless steel components in outdoor air in cases where loss of material is being managed, which would involve similar halide concentrations. The staff also determined the need for additional information about the scope of aging management for loss of material of stainless steel components exposed to outdoor air. Therefore, the staff issued RAI 3.2.2.2.3.2-1 (ML23181A018) and RAI 3.2.2.2.3.2-1a (ML23256A144) requesting that the applicant provide additional information regarding loss of material and stress corrosion cracking in the ESF systems, auxiliary systems, and steam and power conversion systems (LRA Further Evaluation Sections 3.2.2.2.3.2, 3.2.2.2.6, 3.3.2.2.3, 3.3.2.2.5, 3.4.2.2.2, and 3.4.2.2.3).

Section 3.2.2.2.3, Item 2 of this SE details the applicant's responses applicable to all six LRA further evaluation sections listed above. Specifically for stress corrosion cracking, in the response to RAI 3.2.2.2.3.2-1, dated July 27, 2023 (ML23208A193), the applicant modified LRA Sections 3.2.2.2.6, 3.3.2.2.3, and 3.4.2.2.2 to reiterate the absence of any plant-specific operating experience relating to stress corrosion cracking of stainless steel in an outdoor air environment. The applicant also noted that the components exposed to outdoor air are not subjected to elevated temperature. In the response to RAI 3.2.2.2.3.2-1a, dated October 4, 2023 (ML23277A176), the applicant discussed the site's previous disposition of industry operating experience associated with stress corrosion cracking in Licensee Event Report 254/2006-004 and Information Notice 2012-20. The applicant had previously determined that these operating experiences were not applicable to CPNPP.

Section 3.2.2.2.3, Item 2 of this SE details the staff evaluation of the responses applicable to the six LRA further evaluation sections related to loss of material and stress corrosion cracking in outdoor air. With respect to stress corrosion cracking, the responses and staff evaluation are applicable to all three related LRA Sections (3.2.2.2.6, 3.3.2.2.3, and 3.4.2.2.2) and no parts of the responses are specific to LRA Section 3.2.2.2.6. Therefore, for the reasons discussed in SE Section 3.2.2.2.3, Item 2, in its review of components associated with AMR item 3.2.1-007, the staff finds the applicant's proposal acceptable, and this item is not applicable.

3.2.2.2.7 Quality Assurance for Aging Management of Nonsafety-Related Components

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

3.2.2.2.8 Ongoing Review of Operating Experience

SE Section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of OE.

3.2.2.2.9 Loss of Material Due to Recurring Internal Corrosion

LRA Section 3.2.2.2.9 is associated with LRA Table 3.2-1, item 3.2.1-066, for loss of material due to recurring internal corrosion in metallic piping components and tanks exposed to several water environments. The applicant stated that none of the ESF systems exhibited corrosion that met the criteria for loss of material due to recurring internal corrosion. Consequently, the applicant determined that none of the AMPs credited for managing the effects of aging in the ESF systems required enhancements to address this aging effect or mechanism, and item 3.2.1-066 was not applicable. The staff evaluated the applicant's determination against the criteria in SRP-LR Section 3.2.2.2.9 and finds it is acceptable because the staff did not identify instances of recurring internal corrosion in ESF systems during its review of the OE documentation provided as part of the audit.

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

The LRA did not identify any AMR results in LRA Tables 3.2.2-1 through 3.2.2-5 that are not consistent with, or not addressed in, the GALL-LR Report.

3.3 Aging Management of Auxiliary Systems

3.3.1 Summary of Technical Information in the Application

LRA Section 3.3 provides AMR results for those components that the applicant identified in LRA Section 2.3.3, "Auxiliary Systems," as being subject to an AMR. LRA Table 3.3-1, "Summary of Aging Management Programs for Auxiliary Systems," gives a summary comparison of the applicant's AMRs with those evaluated in the GALL-LR Report for the auxiliary system components.

3.3.2 Staff Evaluation

SE Table 3.3-1, below, summarizes the staff's evaluation of the component groups listed in LRA Section 3.3 and addressed in the GALL-LR Report.

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

Component Group (SRP-LR Item No.)	Staff Evaluation
3.3-1, 001	Consistent with the GALL-LR Report (see SE Section 3.3.2.2.1)
3.3-1, 002	Consistent with the GALL-LR Report (see SE Section 3.3.2.2.1)
3.3-1, 003	Consistent with the GALL-LR Report (see SE Section 3.3.2.2.2)
3.3-1, 004	Not applicable to CPNPP (see SE Section 3.3.2.2.3)
3.3-1, 005	Not applicable to CPNPP (see SE Section 3.3.2.2.4)
3.3-1, 006	Consistent with the GALL-LR Report (see SE Section 3.3.2.2.5)
3.3-1, 007	Consistent with the GALL-LR Report
3.3-1, 008	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 020)
3.3-1, 009	Consistent with the GALL-LR Report
3.3-1, 010	Not applicable to CPNPP
3.3-1, 011	Not applicable to CPNPP
3.3-1, 012	Consistent with the GALL-LR Report
3.3-1, 013	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 012)
3.3-1, 014	Consistent with the GALL-LR Report
3.3-1, 015	Consistent with the GALL-LR Report t
3.3-1, 016	Not applicable to PWRs
3.3-1, 017	Consistent with the GALL-LR Report
3.3-1, 018	Consistent with the GALL-LR Report
3.3-1, 019	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 020)
3.3-1, 020	Consistent with the GALL-LR Report
3.3-1, 021	Not applicable to PWRs
3.3-1, 022	Not applicable to PWRs
3.3-1, 023	Not applicable to CPNPP
3.3-1, 024	Not applicable to PWRs
3.3-1, 025	Not applicable to PWRs
3.3-1, 026	Not applicable to CPNPP
3.3-1, 027	Not applicable to PWRs
3.3-1, 028	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 124)
3.3-1, 029	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 125)
3.3-1, 030	Not applicable to CPNPP
3.3-1, 030.5	Not applicable to CPNPP
3.3-1, 031	Not applicable to CPNPP
3.3-1, 032	Not applicable to CPNPP
3.3-1, 032.5	Not applicable to CPNPP
3.3-1, 033	Not applicable to CPNPP
3.3-1, 034	Consistent with the GALL-LR Report
3.3-1, 035	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 036; 3.3-1, 064; and 3.3-1, 093)
3.3-1, 036	Consistent with the GALL-LR Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.3-1, 037	Consistent with the GALL-LR Report
3.3-1, 038	Consistent with the GALL-LR Report
3.3-1, 039	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 040)
3.3-1, 040	Consistent with the GALL-LR Report
3.3-1, 041	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 040)
3.3-1, 042	Consistent with the GALL-LR Report
3.3-1, 043	Consistent with the GALL-LR Report
3.3-1, 044	Consistent with the GALL-LR Report
3.3-1, 045	Consistent with the GALL-LR Report
3.3-1, 046	Consistent with the GALL-LR Report
3.3-1, 047	Not applicable to PWRs
3.3-1, 048	Not applicable to CPNPP
3.3-1, 049	Consistent with the GALL-LR Report
3.3-1, 050	Consistent with the GALL-LR Report
3.3-1, 051	Not applicable to CPNPP
3.3-1, 052	Consistent with the GALL-LR Report
3.3-1, 053	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 052)
3.3-1, 054	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 114)
3.3-1, 055	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 121; and LRA Table 3.2-1, item 3.2-1, 044)
3.3-1, 056	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 120)
3.3-1, 057	Consistent with the GALL-LR Report
3.3-1, 058	Consistent with the GALL-LR Report
3.3-1, 059	Consistent with the GALL-LR Report
3.3-1, 060	Consistent with the GALL-LR Report
3.3-1, 061	Consistent with the GALL-LR Report
3.3-1, 062	Consistent with the GALL-LR Report
3.3-1, 063	Consistent with the GALL-LR Report
3.3-1, 064	Consistent with the GALL-LR Report
3.3-1, 065	Not applicable to CPNPP
3.3-1, 066	Consistent with the GALL-LR Report
3.3-1, 067	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 136)
3.3-1, 068	Consistent with the GALL-LR Report
3.3-1, 069	Not applicable to CPNPP
3.3-1, 070	Consistent with the GALL-LR Report
3.3-1, 071	Consistent with the GALL-LR Report
3.3-1, 072	Consistent with the GALL-LR Report
3.3-1, 073	Consistent with the GALL-LR Report
3.3-1, 074	Consistent with the GALL-LR Report
3.3-1, 075	Consistent with the GALL-LR Report
3.3-1, 076	Consistent with the GALL-LR Report
3.3-1, 077	Consistent with the GALL-LR Report
3.3-1, 078	Consistent with the GALL-LR Report
3.3-1, 079	Consistent with the GALL-LR Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.3-1, 080	Consistent with the GALL-LR Report
3.3-1, 081	Consistent with the GALL-LR Report
3.3-1, 082	Consistent with the GALL-LR Report
3.3-1, 083	Consistent with the GALL-LR Report
3.3-1, 084	This item number is not used in the SRP-LR or the GALL-LR Report
3.3-1, 085	Not applicable to CPNPP
3.3-1, 086	Consistent with the GALL-LR Report
3.3-1, 087	This item number is not used in the SRP-LR or the GALL-LR Report
3.3-1, 088	Consistent with the GALL-LR Report
3.3-1, 089	Consistent with the GALL-LR Report
3.3-1, 090	Consistent with the GALL-LR Report
3.3-1, 091	Consistent with the GALL-LR Report
3.3-1, 092	Not applicable to CPNPP
3.3-1, 093	Consistent with the GALL-LR Report
3.3-1, 094	Consistent with the GALL-LR Report
3.3-1, 095	Consistent with the GALL-LR Report
3.3-1, 096	Consistent with the GALL-LR Report
3.3-1, 097	Consistent with the GALL-LR Report
3.3-1, 098	Consistent with the GALL-LR Report
3.3-1, 099	Consistent with the GALL-LR Report
3.3-1, 100	Consistent with the GALL-LR Report
3.3-1, 101	Not applicable to CPNPP
3.3-1, 102	Consistent with the GALL-LR Report
3.3-1, 103	Not applicable to CPNPP
3.3-1, 104	Not applicable to CPNPP
3.3-1, 105	Not applicable to CPNPP
3.3-1, 106	Consistent with the GALL-LR Report
3.3-1, 107	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 120)
3.3-1, 108	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 120)
3.3-1, 109	Consistent with the GALL-LR Report
3.3-1, 109.5	Not applicable to CPNPP
3.3-1, 110	Not applicable to PWRs
3.3-1, 111	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 120; and LRA Table 3.5-1, item 3.5-1, 077)
3.3-1, 112	Consistent with the GALL-LR Report
3.3-1, 113	Consistent with the GALL-LR Report
3.3-1, 114	Consistent with the GALL-LR Report
3.3-1, 115	Consistent with the GALL-LR Report
3.3-1, 116	Consistent with the GALL-LR Report
3.3-1, 117	Consistent with the GALL-LR Report
3.3-1, 118	Consistent with the GALL-LR Report
3.3-1, 119	Consistent with the GALL-LR Report
3.3-1, 120	Consistent with the GALL-LR Report
3.3-1, 121	Consistent with the GALL-LR Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.3-1, 122	Not applicable to CPNPP
3.3-1, 123	Not applicable to CPNPP
3.3-1, 124	Consistent with the GALL-LR Report
3.3-1, 125	Consistent with the GALL-LR Report
3.3-1, 126	Consistent with the GALL-LR Report
3.3-1, 127	Not applicable to CPNPP
3.3-1, 128	Not used (addressed by LRA Table 3.3-1, items 3.3-1, 106 and 3.3-1, 136)
3.3-1, 129	Not applicable to CPNPP
3.3-1, 130	Consistent with the GALL-LR Report
3.3-1, 131	Consistent with the GALL-LR Report
3.3-1, 132	Consistent with the GALL-LR Report
3.3-1, 133	Not applicable to CPNPP
3.3-1, 134	Consistent with the GALL-LR Report
3.3-1, 135	Consistent with the GALL-LR Report
3.3-1, 136	Consistent with the GALL-LR Report
3.3-1, 137	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 136 and 3.3-1, 125; and LRA Table 3.4-1, item 3.4-1, 012)
3.3-1, 138	Consistent with the GALL-LR Report
3.3-1, 139	Consistent with the GALL-LR Report
3.3-1, 140	Consistent with the GALL-LR Report

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

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

(2) SE Section 3.2.2.2 discusses AMR results for which the GALL-LR Report and SRP-LR recommend further evaluation. The table above identifies these items as consistent with the GALL-LR Report and provides citations within SE Section 3.3.2.2 that provides additional information.

(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-LR Report. These AMR results typically are identified by generic notes F through J and plant-specific notes in the LRA.

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

The following subsections document the staff's review of AMR results listed in LRA Tables 3.3.2-1 through 3.3.2-14 that the applicant determined to be consistent with the GALL-LR Report. The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL-LR Report; however, the staff did verify that the material presented in the GALL-LR Report was applicable and that the applicant identified the appropriate GALL-LR Report AMRs. For those AMR items that the staff found to be consistent with the GALL-LR Report, and for which no additional evaluation or RAI applies, the staff's review and conclusions, as documented in the GALL-LR Report, are considered to be the basis for acceptability of the AMR items. The staff's conclusion of "Consistent with the GALL-LR Report" is documented in SE Table 3.3-1, and no separate writeup is required or provided.

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

For the AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in SE Sections 3.3.2.1.2 through 3.3.2.1.8 below.

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

For LRA Table 3.3-1, items 3.3-1, 004; 3.3-1, 005; 3.3-1, 010; 3.3-1, 011; 3.3-1, 023; 3.3-1, 026; 3.3-1, 030; 3.3-1, 030.5; 3.3-1, 031; 3.3-1, 032; 3.3-1, 032.5; 3.3-1, 033; 3.3-1, 048; 3.3-1, 051; 3.3-1, 065; 3.3-1, 069; 3.3-1, 085; 3.3-1, 092; 3.3-1, 101; 3.3-1, 103; 3.3-1, 104; 3.3-1, 105; 3.3-1, 109.5; 3.3-1, 122; 3.3-1, 123; 3.3-1, 127; 3.3-1, 129; and 3.3-1, 133, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable to CPNPP. The staff reviewed the LRA, description of the material and environment associated with each AMR item, and the associated AMP and plant-specific documents and has concluded that the applicant's claim is reasonable.

For LRA Table 3.3-1, items 3.3-1, 016; 3.3-1, 021; 3.3-1, 022; 3.3-1, 024; 3.3-1, 025; 3.3-1, 027; 3.3-1, 047; and 3.3-1, 110, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable because the associated items are only applicable to BWRs. The staff reviewed the SRP-LR, confirmed that these items only apply to BWRs, and finds that these items are not applicable to CPNPP because it is a PWR.

For the following LRA Table 3.3-1 items, the applicant claimed that the corresponding items in the GALL-LR Report are not used and are addressed by other LRA Table 1 AMR items: 3.3-1, 008 (addressed by 3.3-1, 020); 3.3-1, 013 (addressed by 3.3-1, 012); 3.3-1, 019 (addressed by 3.3-1, 020); 3.3-1, 028 (addressed by 3.3-1, 124); 3.3-1, 029 (addressed by 3.3-1, 125); 3.3-1, 035 (addressed by 3.3-1, 036, 3.3-1, 064, and 3.3-1, 093); 3.3 1, 039 (addressed by 3.3-1, 040); 3.3-1, 041 (addressed by 3.3-1, 040); 3.3-1, 053 (addressed by 3.3-1, 052); 3.3-1, 054 (addressed by 3.3-1, 114); 3.3-1, 055 (addressed by 3.3-1, 121 and 3.2-1, 044); 3.3-1, 056 (addressed by 3.3-1, 120); 3.3-1, 067 (addressed by 3.3-1, 136); 3.3-1, 107 (addressed by 3.3-1, 120); 3.3-1, 108 (addressed by 3.3-1, 120); 3.3-1, 111 (addressed by 3.3-1, 120 and 3.5-1, 077); 3.3-1, 128 (addressed by 3.3-1, 106 and 3.3-1, 136); and 3.3-1, 137 (addressed by 3.3-1, 136, 3.3-1, 125, and 3.4-1, 012). The staff reviewed the LRA and confirmed that the aging effects for each of these items will be addressed by other LRA Table 1 AMR items. Therefore, the staff finds the applicant's proposal to use alternate items acceptable.

3.3.2.1.2 Loss of Material Due to Cladding Breach

LRA Section 3.3.2.2.4, associated with LRA Table 3.3-1, item 3.3.1-005, addresses loss of material due to a breach in the stainless steel cladding of steel pump casings exposed to treated, borated water. The applicant stated that this item is not applicable because pump casings in auxiliary systems exposed to treated, borated water are stainless steel and are not steel with stainless steel cladding. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.3.2.2.4 and finds it acceptable because the pump casings in the auxiliary systems are not constructed of steel with stainless steel cladding.

3.3.2.1.3 Loss of Coating or Lining Integrity Due to Blistering, Cracking, Flaking, Peeling, Delamination, Rusting, or Physical Damage, and Spalling for Cementitious Coatings/Linings

LRA Table 3.3-1, AMR item 3.3.1-138, addresses loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage, and spalling for cementitious coatings/linings for metallic piping, piping components, heat exchangers, and tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, or fuel oil. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the Fire Water System program to manage the aging effects for internally coated carbon steel FWSTs.

During its review, the staff noted that GALL-LR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," as supplemented by LR-ISG-2013-01, states the following:

> The aging effects associated with fire water tank internal coatings/linings are managed by GALL-LR Report AMP XI.M27, "Fire Water System," instead of this AMP. However, where the FWST internals are coated, the Fire Water System program and FSAR Summary Description of the Program should be enhanced to include the recommendations associated with training and qualification of personnel and the "corrective actions" program element. The Fire Water System program should also be enhanced to include the recommendations from the "acceptance criteria" program element.

Based on its review of components associated with AMR item 3.3.1-138 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Fire Water System program acceptable because, consistent with GALL-LR Report recommendations, the Fire Water System program (and FSAR supplement) includes an enhancement to address training and qualification of personnel, acceptance criteria, and corrective actions associated with inspections of the FWST internal linings.

3.3.2.1.4 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion and Fouling That Lead to Corrosion

LRA Table 3.3.1, AMR item 3.3.1-036 addresses loss of material due to general, pitting, crevice, and microbiologically influenced corrosion and fouling that lead to corrosion in copper alloy piping and piping components exposed to raw water. For LRA Table 3.3.2-012, AMR item 3.3.1-036 cites generic note E and credits the Bolting Integrity AMP to manage the aging of copper alloy (greater than 15 percent zinc or 8 percent aluminum) bolting exposed to raw water. For LRA Table 3.5.2-013, AMR item 3.3.1-036 cites generic note E and credits the ASME Section XI, Subsection IWF AMP to manage the aging of copper alloy (greater than 15 percent zinc or 8 percent aluminum) support bolting for ASME Class 3 components exposed to raw water. Based on its review of components associated with AMR item 3.3.1-036 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Bolting Integrity and ASME Section XI, Subsection IWF AMPs acceptable because both programs include periodic inspections by qualified personnel for indications of loss of preload, cracking, and loss of material due to corrosion, and thus are designed for and capable of managing bolting degradation.

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

LRA Table 3.3.1, AMR item 3.3.1-079 addresses loss of material due to general, pitting, and crevice corrosion for copper alloy piping, piping components, and piping elements exposed externally to condensation. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP to manage the aging effect for copper alloy cooling coils and fins exposed externally to condensation in the containment ventilation systems. Based on its review of components associated with AMR item 3.3.1-079 for which the applicant cited generic note E, 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 the credited AMP includes visual inspections and, when appropriate, surface examinations that are capable of detecting loss of material due to general, pitting, and crevice corrosion.

LRA Table 3.3.1, AMR item 3.3.1-080, addresses loss of material due to general, pitting, and crevice corrosion for steel heat exchanger components, piping and piping components, and piping elements exposed externally to uncontrolled indoor air or exposed externally to outdoor air. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP to manage the aging effect for steel intercooler heat exchanger components exposed externally to uncontrolled indoor air in the EDG and auxiliary systems. Based on its review of components associated with AMR item 3.3.1-080 for which the applicant cited generic note E, 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 the credited AMP includes visual inspections and, when appropriate, surface examinations that are capable of detecting loss of material due to general, pitting, and crevice corrosion.

LRA Table 3.3.1, AMR item 3.3.1-097, addresses loss of material due to general, pitting, and crevice corrosion for steel piping, piping components, and tanks exposed to lubricating oil (internal). For the LRA Table 2 AMR item that cites generic note E, the LRA credits the One-Time Inspection program to manage the aging effect for the carbon steel/drip pan (reactor coolant system oil spillage collection) exposed to lubricating oil (internal).

Based on its review of components associated with AMR item 3.3.1-097 for which the applicant cited generic note E, as modified by LRA Supplement 2, dated April 24, 2023 (ML23114A377), the staff finds the applicant's proposal to manage the effects of aging using the One-Time Inspection program acceptable because the applicant is consistent with the GALL-SLR Report, based on the cited plant-specific note 10, which states, "Consistent with OE found in SLR-ISG-2021-02-MECHANICAL (VII.G.AP-116, VII.G.AP-117), loss of material of carbon steel reactor coolant pump oil collection piping and tanks exposed to lubricating oil (waste oil) is managed by the One-Time Inspection (B.2.3.19) AMP." As discussed in the GALL-SLR Report, future applicants for initial LR (40–60 years) may use aging management guidance from SLR (60–80 years) in their applications. This makes the applicant's use of the One-Time Inspection program consistent with the staff's current guidance for LR. SE Section 3.0.3.1.6 presents the staff's safety evaluation of the One-Time Inspection program.

In LRA Table 3.3-1, items 3.3-1, 114, 120, and 121 identify no aging effects or mechanisms and no AMPs for copper alloy, stainless steel, and steel (respectively) piping, piping components, and piping elements exposed externally and internally to a variety of environments. These items are consistent with the recommendations in the GALL-LR Report. However, for the items internally exposed to dry air, LRA Table 3.3-1 (for each of these three items) notes that the Compressed Air Monitoring program is credited with ensuring that the air remains dry, such that the copper alloy, stainless steel, or steel components exposed to a dry air environment in associated systems are not susceptible to aging degradation. The LRA cites a generic note E, with companion plant-specific notes reflecting this information.

The staff notes that activities associated with subsequent license renewal (SLR) revisions have consolidated all metallic components exposed to dry air into a single new AMR item (SRP-SLR item 3.3.1-235 (GALL-SLR Report item VII.D.A-764)). The new item cites loss of material due to general, pitting, and crevice corrosion and recommends the Compressed Air Monitoring program for managing these aging effects. The staff also notes that the technical basis for this new item (see NUREG-2221, "Technical Bases for Changes in the Subsequent License Renewal Guidance Documents NUREG-2191 and NUREG-2192," issued December 2017 (ML17362A126)) states that although loss of material for metallic components exposed to dry air is not anticipated, some water accumulation downstream of system air dryers may occur and recommends performance of opportunistic inspections through the Compressed Air Monitoring program. Based on its review of the components associated with items 3.3-1 114, 120, and 121, for which the applicant cited generic note E, the staff finds the applicant's proposal to use the Compressed Air Monitoring program acceptable because the program's periodic air sampling and testing will minimize moisture in the system to limit loss of material, and the program's periodic inspections of accessible internal surfaces provides assurance that loss of material is not occurring in the system. As discussed in the GALL-SLR Report, future applicants for initial LR (40–60 years) may use aging management guidance from SLR (60–80 years) in their applications. This makes the applicant's use of the Compressed Air Monitoring program consistent with the staff's current guidance for LR. SE Section 3.0.3.2.11 presents the staff's safety evaluation of the Compressed Air Monitoring program.

3.3.2.1.6 Wall Thinning Due to Erosion

LRA Table 3.3-1, item 3.3.1-126, addresses wall thinning due to erosion for piping made of any material exposed to any of several water environments. For the LRA Table 2 items that cite generic note E, the LRA credits the Open-Cycle Cooling Water System AMP to manage wall thinning due to erosion for carbon steel, stainless steel, and internally lined carbon steel piping exposed to raw water in the station service water system. Plant-specific note 5 clarifies that the program manages erosion for piping covered by NRC Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment," dated July 18, 1989 (ML031150348).

Based on its review of components associated with item 3.3.1-126 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the open-cycle cooling water system acceptable because, in its January 26, 1990, response (ML20006B700) to Generic Letter 89-13, Action III, the applicant developed the "Corrosion Monitoring Program, Service Water Subsection," to periodically measure and trend samples of service water system piping to identify and correct any detrimental wall thinning.

3.3.2.1.7 Cracking; Loss of Material Due to Freeze-Thaw, Aggressive Chemical Attack, and Reaction with Aggregates; Loss of Material Due to Corrosion of Embedded Steel

As amended by letter dated July 27, 2023 (ML23208A193), LRA Table 3.3-1, AMR items 3.3-1, 061 and 062, address, respectively, (1) cracking and loss of material due to freeze-thaw, aggressive chemical attack, and reaction with aggregates and (2) loss of material due to corrosion of embedded steel, for reinforced concrete structural fire barrier walls, ceilings, and floors exposed to outdoor air. For the LRA Table 2 AMR items that cite generic note E, the LRA credits only the Fire Protection program for managing the aging effects of the reinforced concrete berm/dike associated with the auxiliary boiler fuel oil storage tank exposed to outdoor air. In contrast, the SRP-LR credits both the Fire Protection and Structures Monitoring programs for managing the aging effects of reinforced concrete components in this environment. In addition, these AMR items cite plant-specific note 8, which states, "The Fire Protection (B.2.3.15) AMP alone manages the aging of the berm/dike around the auxiliary boiler fuel oil storage tank. The berm/dike is located outside the protected area and has a conservative fire barrier intended function." The staff notes that a Fire Protection program procedure will be enhanced to include visual inspection of the reinforced concrete berm/dike associated with the auxiliary boiler fuel oil storage tank.

Based on its review of components associated with AMR items 3.3-1, 061 and 062, for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using only the Fire Protection program acceptable because the LRA includes an enhancement to a program implementing procedure to perform periodic visual inspections that are capable of detecting cracking and loss of material before a loss of intended function, consistent with the GALL-LR Report. The discussions of RAI B.2.3.15-1 and Enhancement 4 in SE section 3.0.3.2.12 contain additional information.

3.3.2.1.8 Loss of Material Due to General, Pitting, or Crevice Corrosion; Cracking Due to Stress Corrosion Cracking

As amended by letter dated April 6, 2023 (ML23096A302), LRA Table 3.3-1, AMR item 3.3-1, 128, addresses loss of material and cracking of steel, stainless steel, or aluminum tanks exposed to concrete, soil, outdoor air, indoor uncontrolled air, moist air, or condensation. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Fire Water System program to manage loss of material for the carbon steel FWST exposed to concrete and soil. These AMR items cite plant-specific note 9, which states, "Consistent with LR-ISG-2012-02, the FWST, including the steel/concrete interface at the base of the tank, is managed by the Fire Water System (B.2.3.16) AMP (Note: The Aboveground Metallic Tanks program is not used for CPNPP License Renewal)."

Based on its review of components associated with AMR item 3.3-1, 128, for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Fire Water System program acceptable because the applicant enhanced the program to (1) install sealant between the FWST and concrete foundation ring and to periodically visually inspect the sealant each refueling outage, which will minimize water intrusion into the interface, mitigating corrosion of the bottom surface of the tank, and (2) volumetrically measure the tank bottom thickness within the first 10 years of the extended operating period, which will identify any loss of material caused by prior water intrusion. The discussions of RAI B.2.3.16-2 and Enhancements 6 and 7 in SE Section 3.0.3.2.13 contain additional information.

3.3.2.2 Aging Management Review Results for Which Further Evaluation Is Recommended by the GALL-LR Report

In LRA Section 3.3.2.2, the applicant further evaluates aging management for certain auxiliary system components as recommended by the GALL-LR Report and provides information on how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria contained in SRP-LR Section 3.3.2.2. The following subsections document the staff's review.

3.3.2.2.1 Cumulative Fatigue Damage

LRA Section 3.3.2.2.1, associated with LRA Table 3.3-1, item 002, indicates that the TLAA on cumulative fatigue damage in the components of auxiliary systems is evaluated in accordance with 10 CFR 54.21(c) and is addressed in LRA Section 4.3.3. The applicant's evaluation of the TLAA is consistent with SRP-LR Section 3.3.2.2.1 and is therefore acceptable. The staff's evaluation of the TLAA for the components of auxiliary systems is documented in SE Section 4.3.3.

3.3.2.2.2 Cracking Due to Stress Corrosion Cracking and Cyclic Loading

LRA Section 3.3.2.2.2, associated with LRA Table 3.3.1 AMR item 3.3.1-003, addresses cracking for stainless steel nonregenerative heat exchanger components exposed to treated borated water greater than 140°F, which will be managed by the Water Chemistry AMP, as augmented by the One-Time Inspection AMP and the Closed Treated Water Systems AMP. The applicant revised this section in its response to RAI 3.3.2.2.2-1, dated July 27, 2023 (ML23208A193), by clarifying that diagnostic radiation level monitoring in the component cooling water system is performed through the Closed Treated Water Systems AMP, in accordance with EPRI 3002000590, Revision 2, "Closed Cooling Water Chemistry Guidelines," dated December 9, 2013. The revised LRA notes that, as additional assurance that cracking has not occurred in the letdown heat exchanger components, any radiation level above the minimum detectable activity will cause an alert for investigation and evaluation.

The staff noted that LRA Section 2.3.3.2 provides information on the component cooling water system and states that the system consists of radiation monitors that detect any leakage of reactor coolant into the system. The staff also noted that the component cooling water system evaluation in FSAR Section 9.2.2.3 states that high radiation levels, which are indicative of a system malfunction, are annunciated in the control room. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.3.2.2.2 and finds that the applicant has met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Water Chemistry AMP, as augmented by the One-Time Inspection AMP and the Closed Treated Water Systems AMP, is acceptable because the absence of cracking will be verified (1) on a one-time basis through the use of appropriate visual, surface, or volumetric nondestructive examination techniques consistent with the One-Time Inspection AMP, and (2) on a periodic basis through radiation monitoring in the component cooling water system, performed in accordance with EPRI's "Closed Cooling Water Chemistry Guidelines," and through radiation monitors in the component cooling water system that annunciate in the control room. Based on the programs identified, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.2 criteria. For those AMR items associated with LRA Section 3.3.2.2.2, the staff concludes that the LRA is consistent with the GALL-LR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation as required by 10 CFR 54.21(a)(3).

3.3.2.2.3 Cracking Due to Stress Corrosion Cracking

LRA Section 3.3.2.2.3, associated with LRA Table 3.3-1, item 3.3.1-004, addresses cracking due to stress corrosion cracking for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air. The applicant stated that this item is not applicable. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.3.2.2.3.

Section 3.2.2.2.3, Item 2 of this SE details the staff evaluation of the responses applicable to the six LRA further evaluation sections related to loss of material and stress corrosion cracking in outdoor air. With respect to stress corrosion cracking, the responses and staff evaluation are applicable to all three related LRA Sections (3.2.2.2.6, 3.3.2.2.3, and 3.4.2.2.2) and no parts of the responses are specific to LRA Section 3.3.2.2.3. Therefore, for the reasons discussed in SE Section 3.2.2.2.3, Item 2, in its review of components associated with AMR item 3.3.1-004, the staff finds the applicant's proposal acceptable, and this item is not applicable.

3.3.2.2.4 Loss of Material Due to Cladding Breach

LRA Section 3.3.2.2.4, associated with LRA Table 3.3-1, item 3.3.1-005, addresses loss of material due to a breach in the stainless steel cladding of steel pump casings exposed to treated, borated water. The applicant stated that this item is not applicable because pump casings in auxiliary systems exposed to treated, borated water are stainless steel and are not steel with stainless steel cladding. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.3.2.2.4 and finds it acceptable because the pump casings in the auxiliary systems are not constructed of steel with stainless steel cladding.

3.3.2.2.5 Loss of Material Due to Pitting and Crevice Corrosion

LRA Section 3.3.2.2.5, associated with LRA Table 3.3.1, item 3.3.1-006, addresses loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air, which will be managed by the External Surfaces Monitoring of Mechanical Components program. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.3.2.2.5.
In its review of components associated with AMR item 3.3.1-006, the staff determined the need for additional information about the scope of aging management for loss of material of stainless steel components exposed to outdoor air. The staff also determined the need for additional information about managing stress corrosion cracking of stainless steel components in cases where loss of material is being managed, which would involve similar halide concentrations. This resulted in the issuance of RAIs applicable to loss of material and stress corrosion cracking in the ESF systems, auxiliary systems, and steam and power conversion systems (LRA Further Evaluation Sections 3.2.2.2.3.2, 3.2.2.2.6, 3.3.2.2.3, 3.3.2.2.5, 3.4.2.2.2, and 3.4.2.2.3). The staff's requests and the applicant's responses are documented in letters dated July 27, 2023 (ML23208A193), and October 4, 2023 (ML23277A176).

Section 3.2.2.2.3, Item 2 of this SE details the applicant's responses applicable to all six LRA further evaluation sections listed above. With respect to LRA Section 3.3.2.2.5 specifically, in the response to RAI 3.2.2.2.3.2-1, the applicant (1) modified LRA Section 3.3.2.2.5 and LRA Table 3.3.2-4 to add the reactor makeup water storage tank vent piping using AMR item 3.3.1-006, which will be managed by the External Surfaces Monitoring of Mechanical Components program, and (2) modified LRA Table 3.3.2-4 to delete items after determining the components are in piping tunnels and not in an outdoor air environment. In the response to RAI 3.2.2.2.3.2-1a, the applicant modified LRA Table 3.3.2-7 to delete items in the fire protection system based on additional evaluations that determined the components were exposed to uncontrolled indoor air instead of outdoor air.

Section 3.2.2.2.3, Item 2 of this SE details the staff evaluation of the responses applicable to the six LRA further evaluation sections related to loss of material and stress corrosion cracking in outdoor air. In its evaluation of the applicant's responses specific to LRA Section 3.3.2.2.5, the staff finds the responses acceptable because (1) the applicant identified the components in the auxiliary systems that have the most potential for an unexpected accumulation of contaminants that could cause pitting or crevice corrosion in outdoor air, and (2) to manage aging due to pitting or crevice corrosion for those components, the applicant proposed an AMP that is identified in the SRP-LR as an acceptable method.

Based on the programs identified, the staff concludes that the applicant's programs meet the criteria in SRP-LR Section 3.3.2.2.5. For those AMR items associated with LRA Section 3.3.2.2.5, the staff concludes that the LRA is consistent with the GALL-LR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.6 Quality Assurance for Aging Management of Nonsafety-Related Components

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

3.3.2.2.7 Ongoing Review of Operating Experience

SE Section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of OE.

3.3.2.2.8 Loss of Material Due to Recurring Internal Corrosion

LRA Section 3.3.2.2.8, as modified by letter dated April 24, 2023 (ML23114A377), is associated with LRA Table 3.3-1, item 3.3.1-127, for loss of material due to recurring internal corrosion of metallic piping components and tanks exposed to several water environments. The applicant stated that, although corrosion in the service water system has caused loss of material meeting the criteria for the number of recurring instances, minimum wall thickness criteria for the associated piping were not exceeded. The applicant noted that wall thickness of service water system piping is monitored through the Open-Cycle Cooling Water System AMP at a frequency that effectively identifies any loss of material issues. The applicant also stated that the criteria for recurring internal corrosion had been met in a portion of the equipment and floor drainage system piping; however, the applicable portion of the system had been replaced in 2022 using weldless pipe technology, which effectively mitigated the localized corrosion sites at weld locations in the system. Based on the modification, the applicant did not consider recurring internal corrosion to be an applicable AERM for the system. The applicant further noted that aboveground carbon steel fire suppression piping also met the criteria for recurring internal corrosion. Consequently, the applicant provided an enhancement to perform volumetric examinations at susceptible locations in the system on a refueling outage frequency until the criteria for recurring internal corrosion were no longer met.

The staff reviewed the applicant's assessment of recurring internal corrosion against the criteria in SRP-LR Section 3.3.2.2.8 for the components associated with item 3.3.1-127. Regarding the service water system, the staff notes that the applicant's Open-Cycle Cooling Water System program activities are consistent with the applicant's response to NRC Generic Letter 89-13

(ML20006B700). The activities include periodic measuring and trending of service water pipe wall thicknesses in accordance with the site's Corrosion Monitoring Program. Regarding the equipment and floor drainage system piping, the staff considers the modification for replacing weld locations using weldless piping technology to reasonably address the noted recurring internal corrosion issues. Regarding the fire suppression piping, the staff's evaluation of the Fire Water System program enhancements to address recurring internal corrosion is document in SE Section 3.0.3.2.13. Based on the above, the staff determined that the applicant has adequately addressed recurring internal corrosion in auxiliary systems and finds that the applicant's approach will adequately manage this aging effect or mechanism.

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

The following subsections document the staff's review of those AMR results listed in LRA Tables 3.3.2-1 through 3.3.2-14 that are either not consistent with or not addressed in the GALL-LR 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 an SRP-LR Table 1 item, the subsections are organized by applicable AMR sections and then by material and environment combinations.

For component type, material, and environment combinations not evaluated in the GALL-LR Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended functions consistent with the CLB for the period of extended operation. There is OE that is documented in the GALL-SLR Report for component type, material, and environment combinations that are not evaluated in the GALL-LR Report. As discussed in the GALL-SLR Report, future applicants for initial LR (40–60 years) may use aging management guidance from SLR (60–80 years) in their applications. Following the GALL-SLR Report aging management recommendations for those component type, material, and environment combinations are acceptable because it aligned with the staff's current guidance for LR. The following sections document the staff's evaluation.

3.3.2.3.1 Component Cooling Water System—Aging Management Evaluation

Carbon Steel Closure Bolting and Stainless Steel Closure Bolting Exposed to Condensation (External). LRA Table 3.3.2-002 states that the Bolting Integrity AMP will manage loss of preload for carbon steel closure bolting and stainless steel closure bolting exposed to condensation (external). The AMR items cite generic note H, for which the applicant has identified loss of preload as an additional aging effect. The AMR items cite plant-specific note 1, as modified by Supplement 1 (ML23096A302), which states "Carbon steel and stainless steel closure bolting experiencing loss of preload in a condensation (external) environment is not present in NUREG-1801." OE within NUREG-2191 (VII.I.AP-124) indicates that metallic bolting in any environment can experience loss of preload, and the Bolting Integrity (B.2.3.9) program will address this aging effect.

The staff noted that the GALL-LR Report does not address loss of preload due to thermal effects, gasket creep, or self-loosening for the carbon steel and stainless steel bolting components subjected to a condensation environment. The staff finds the applicant's proposal to manage loss of preload acceptable because GALL-SLR Report item VII.I.AP-124 recommends aging management of loss of preload for metallic bolting exposed to any environment with GALL-SLR Report AMP XI.M18, "Bolting Integrity."

Nickel-Alloy Thermowells Exposed to Closed-Cycle Cooling Water. LRA Table 3.3.2-2 states that loss of material for nickel-alloy thermowells exposed to closed-cycle cooling water (internal) will be managed by the Closed Treated Water Systems program and cites generic note G. The AMR item also cites plant-specific note 2, which states that OE from the GALL-SLR Report (VII.C2.A-471) indicates that nickel-alloy components exposed to closed-cycle cooling water can experience loss of material and are appropriately managed by the Closed Treated Water Systems program.

The staff reviewed the associated item in the LRA and considered whether the aging effects proposed by the applicant constitute all the applicable aging effects for this component, material, and environment combination. Based on its review of the GALL-SLR Report, the staff noted that loss of material was the only aging effect cited for this combination and finds that the applicant has identified all applicable aging effects. The staff finds the applicant’s proposal to manage the effects of aging acceptable because use of the Closed Treated Water Systems program to manage loss of material in nickel-alloy components exposed to closed-cycle cooling water is consistent with the recommendations of the GALL-SLR Report.

3.3.2.3.2 Equipment and Floor Drainage System—Aging Management Evaluation

Stainless Steel Closure Bolting Exposed to Waste Water (External). LRA Table 3.3.2-006, states that loss of material and loss of preload for stainless steel closure bolting exposed to waste water (external) will be managed by the Bolting Integrity AMP. The AMR items, as modified by Supplement 1 (ML23096A302), cite generic note G. The AMR items cite plant-specific note 1, as modified by Supplement 1 (ML23096A302), which states “Stainless steel closure bolting experiencing loss of material and loss of preload in a waste water (external) environment is not present in NUREG-1801.” OE within NUREG-2191 shows that a wastewater environment for these components is addressed (VII.I.AP-124, VII.I.A-426, VII.I.A-423), and the Bolting Integrity (B.2.3.9) program will manage these aging effects.

The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by the applicant constitute all of the applicable aging effects for this component, material, and environment description. The staff noted that the applicant referenced GALL-SLR items VII.I.AP-124, VII.I.A-426, and VII.I.A-423 to address the loss of material and loss of preload, which represent all aging effects, in wastewater (external) for this component, material, and environment combination. Based on its review of the GALL-SLR Report, the staff noted that the applicant’s selection of items VII.I.AP-124, VII.I.A-426, and VII.I.A-423 for loss of material and loss of preload for stainless steel closure bolting are acceptable to manage the effects of aging for closure bolting exposed to wastewater (external) through its Bolting Integrity AMP B.2.3.9, because GALL-SLR Report items VII.I.AP-124, VII.I.A-426, VII.I.A-23 recommend management for loss of material and loss of preload for stainless steel closure bolting exposed to wastewater with GALL-SLR Report AMP XI.M18, “Bolting Integrity.”

3.3.2.3.3 Fire Protection—Aging Management Evaluation

Carbon Steel Closure Bolting Exposed to Raw Water (External). LRA Table 3.3.2-007 states that loss of material for carbon steel closure bolting exposed to raw water (external) will be managed by the Bolting Integrity AMP. The AMR item cites generic note H, for which the applicant has identified loss of material as an additional aging effect. The AMR item cites plant-specific note 6, which states “The submerged bolting components for the Fire Protection System [FPS] made of carbon steel subjected to a raw water environment with a loss of material aging effect is not found in NUREG-1801." OE found in NUREG-2191 (V.E.E-418) indicates that the Bolting Integrity (B.2.3.9) AMP is used to manage loss of material.

The staff noted that GALL-LR does not address the aging effect of loss of material due to general, pitting, crevice corrosion, or MIC for the carbon steel bolting components subjected to a raw water environment. The staff finds the applicant's proposal to manage loss of material acceptable because GALL-SLR Report item V.E.E-418 recommends management of loss of material for steel closure bolting exposed to raw water with GALL-SLR Report AMP XI.M18, "Bolting Integrity."

<u>Stainless Steel Spray Nozzles Exposed to Condensation (External)</u>. LRA Table 3.3.2-7 states that the External Surfaces Monitoring of Mechanical Components program will manage loss of material for stainless steel spray nozzles exposed to condensation. The AMR item cites generic note H, for which the applicant has identified loss of material as an additional aging effect. The AMR item cites plant-specific note 1, which states, "Consistent with the latest industry guidance, based on industry OE updates incorporated into NUREG-2191 (item VII.I.A-716, Table 3.3-1, 151)." The staff finds the applicant's proposal to manage loss of material acceptable because using the External Surfaces Monitoring of Mechanical Components program is consistent with NUREG-2191.

3.3.2.3.4 Spent Fuel Pool Cooling and Cleanup System—Aging Management Evaluation

<u>Stainless Steel Closure Bolting Exposed to Treated Borated Water (External)</u>. LRA Table 3.3.2-011 states that the Bolting Integrity AMP will manage loss of material for stainless steel closure bolting exposed to treated borated water (external). The AMR item cites generic note H, for which the applicant has identified loss of material as an additional aging effect. The AMR item cites plant-specific note 1, which states, "The submerged bolting components for the Spent Fuel Pool Cooling and Cleanup System [SFS] made of stainless steel subjected to a treated borated water environment with a loss of material aging effect is not found in NUREG-1801." OE found in NUREG-2191 (V.E.E-418) indicates that the Bolting Integrity (B.2.3.9) AMP is used to manage loss of material.

The staff noted that GALL-LR does not address the aging effect of loss of material due to general, pitting, crevice corrosion, or MIC for the stainless steel bolting components subjected to a treated borated water environment. The staff finds the applicant's proposal to manage loss of material acceptable because GALL-SLR Report item V.E.E-418 recommends management of loss of material for stainless steel closure bolting exposed to treated borated water with GALL-SLR Report AMP XI.M18, "Bolting Integrity."

3.3.2.3.5 Station Service Water System—Aging Management Evaluation

<u>Carbon Steel Closure Bolting and Stainless Steel Closure Bolting Exposed to Condensation (External)</u>. LRA Table 3.3.2-012 states that the Bolting Integrity AMP will manage loss of preload for carbon steel closure bolting and stainless steel closure bolting exposed to condensation (external). The AMR item cites generic note H, for which the applicant has identified loss of preload as an additional aging effect. The AMR item cites plant-specific note 1, as modified by Supplement 1 (ML23096A302), which states "Carbon and stainless steel closure bolting experiencing loss of preload in a condensation (external) environment is not present in NUREG-1801." OE in NUREG-2191 (VII.I.AP-124) indicates that metallic bolting in any environment can experience loss of preload, and the Bolting Integrity (B.2.3.9) program will address this aging effect.

The staff noted that GALL-LR does not address loss of preload due to thermal effects, gasket creep, or self-loosening for the carbon steel and stainless steel bolting components subjected to a condensation environment. The staff finds the applicant's proposal to manage loss of preload acceptable because GALL-SLR Report item VII.I.AP-124 recommends managing loss of preload for metallic bolting exposed to any environment with GALL-SLR Report AMP XI.M18, "Bolting Integrity."

3.3.2.3.6 Compressed Air and Gas Systems—Summary of Aging Management Evaluation

Elastomeric Flexible Hoses Exposed to Dry Air (Internal). LRA Table 3.3.2-3 states that elastomeric flexible hoses exposed to dry air (internal) do not have any applicable aging effects requiring management. The AMR item cites generic note G, with a plant-specific note, stating that the Compressed Air Monitoring program will ensure that the internal environment is maintained as dry air.

The staff reviewed the associated item in the LRA to confirm that there are no aging effects applicable for this component, material, and environment combination. The staff notes that this material-environment combination has not been addressed as part of more recent review guidance for SLR in the GALL-SLR Report. During its review, the staff noted that the GALL-LR Report, Table IX.C, "Materials," states that hardening and loss of strength can be induced in elastomers exposed to temperatures over about 95°F (35°C) or when exposed to additional aging factors (e.g., ozone, oxidation, radiation). The staff further noted that dry air (internal) has the potential of being in the temperature range for elastomer susceptibility to aging if the components are located relatively close to the air compressor outlet. The staff additionally noted the GALL-LR Report, item VII.F1.AP-103, indicates that elastomer seals and components are susceptible to loss of material due to wear when internally exposed to an uncontrolled indoor air environment. Therefore, the staff determined that potentially applicable aging effects for this component, material, and environment combination are hardening and loss of strength due to elevated temperature and exposure to aging factors (e.g., ozone, oxidation, radiation) and loss of material due to wear. Based on its review of the associated system description in LRA Section 2.3.3.3 "Compressed Air and Gas Systems," and its understanding of the system configuration, the staff concludes that the elastomeric flexible hoses are not exposed to the applicable high temperatures (greater than 95°F (35°C), aging factors (ozone, oxidation, radiation), or particulate that could potentially cause wear. The staff finds the applicant's proposal to manage the effects of aging using the Compressed Air Monitoring program acceptable because no aging effects are applicable for elastomeric flex hoses as a result of exposure to the system's internal dry air environment.

3.3.2.3.7 Control Room Area Ventilation System—Summary of Aging Management Evaluation

Fiberglass Flexible Connections Exposed to Air-Outdoor (Internal), Air-Indoor Uncontrolled (Internal), and Air-Indoor Uncontrolled (External). LRA Table 3.3.2-8b states that the External Surfaces Monitoring of Mechanical Components program will manage cracking, blistering, and loss of material for fiberglass flexible connections exposed to air-outdoor (internal), air-indoor uncontrolled (internal), and air-indoor uncontrolled (external). The AMR items cite generic note G and plant-specific note 5, which states, "Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (item VII.I.A-720, Table 3.3-1, 150)." The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by the applicant constitute all the applicable aging effects for this component, material, and environment description. Based on its review of NUREG-2191, which identifies cracking, blistering, loss of material due to exposure to ultraviolet light, ozone, radiation, temperature, or moisture as the aging effects requiring management, 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 using the External Surfaces Monitoring of Mechanical Components program is consistent with NUREG-2191.

Cooling Coils Exposed to Condensation (External). LRA Table 3.3.2-8b states that the External Surfaces Monitoring of Mechanical Components program will manage reduction of heat transfer for copper alloy cooling coils exposed to condensation (external). The AMR item cites generic note H, for which the applicant has identified reduction of heat transfer as an additional aging effect. The AMR item cites plant-specific note 1, which states, "Consistent with the latest industry guidance, based on industry OE updates incorporated into NUREG-2191 (Item VII.I.A-716, Table 3.3-1, 151)." The staff finds the applicant's proposal to manage reduction of heat transfer acceptable because using the External Surfaces Monitoring of Mechanical Components program is consistent with NUREG-2191.

3.3.2.3.8 Primary Plant Ventilation Systems—Summary of Aging Management Evaluation

Copper Alloy Fan Coil Units Exposed to Condensation (External). LRA Table 3.3.2-8d states that the External Surfaces Monitoring of Mechanical Components program will manage reduction of heat transfer for copper alloy fan coil units exposed to condensation (external). The AMR item cites generic note H, for which the applicant has identified reduction of heat transfer as an additional aging effect. The AMR item cites plant-specific note 4, which states, "Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (item VII.I.A-716, Table 3.3-1, 151)." The staff finds the applicant's proposal to manage reduction of heat transfer acceptable because using the External Surfaces Monitoring of Mechanical Components program is consistent with NUREG-2191.

Fiberglass Flexible Connections Exposed to Air-Outdoor (Internal), Air-Indoor Uncontrolled (Internal), and Air-Indoor Uncontrolled (External). LRA Tables 3.3.2-8d and 3.3.2-8c state that the External Surfaces Monitoring of Mechanical Components program will manage cracking, blistering, and loss of material for fiberglass flexible connections exposed to the air-outdoor (internal), air-indoor uncontrolled (internal), and air-indoor uncontrolled (external) environments. The AMR items cite generic note H, for which the applicant has identified cracking, blistering, and loss of material as additional aging effects. The AMR items cite plant-specific notes 5 and 7, which both state, "Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (item VII.I.A-720, Table 3.3-1, 150)." The staff finds the applicant's proposal to manage cracking, blistering, and loss of material acceptable because using the External Surfaces Monitoring of Mechanical Components program is consistent with NUREG-2191.

3.3.2.3.9 Miscellaneous Ventilation Systems—Summary of Aging Management Evaluation

Copper Alloy Cooling Coils and Fan Coil Units Exposed to Condensation (External). LRA Table 3.3.2-8c states that the External Surfaces Monitoring of Mechanical Components program will manage reduction of heat transfer for copper alloy cooling coils and fan coils exposed to condensation. The AMR items cite generic note H, for which the applicant has identified reduction of heat transfer as an additional aging effect. The AMR items cite plant-specific note 8, which states, "Consistent with the latest industry guidance, based on industry OE updates incorporated in NUREG-2191 (Item VII.I.A-716, Table 3.3-1, 151).” The staff finds the applicant’s proposal to manage reduction of heat transfer acceptable because using the External Surfaces Monitoring of Mechanical Components program is consistent with NUREG-2191.

Aluminum Fan Housings Exposed to Outdoor Air. LRA Table 3.3.2-8c states that aging effects for aluminum fan housings exposed to outdoor air are not applicable and no AMP is proposed. The AMR items cite generic note I. The staff reviewed the associated items in the LRA to confirm that aging effects are not applicable for this component, material, and environment combination. The staff determined the need for additional information on why loss of material due to pitting and crevice corrosion is not an applicable AERM for the subject components and issued RAI 3.3.2.8c-1 on June 14, 2023 (ML23167A023). These items, as modified by the applicant’s July 12, 2023, response (ML23193A846) to RAI 3.3.2.8c-1, are acceptable because they were revised to reflect that the External Surfaces Monitoring of Mechanical Components program will manage loss of material due to pitting and crevice corrosion, consistent with GALL-LR Report recommendations.

3.3.2.3.10 Emergency Diesel Generator and Auxiliary Systems—Summary of Aging Management Evaluation

Internally Coated Carbon Steel Heat Exchanger Shells Exposed to Air-Indoor Uncontrolled. LRA Table 3.3.2-5 states that the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program will manage loss of material and loss of coating integrity for internally coated carbon steel heat exchanger shells exposed to air-indoor uncontrolled. The AMR items cite generic note H.

During its review, the staff noted that SLR-ISG-2021-02-MECHANICAL (ML20181A434) added new AMR items to manage loss of material (item VII.D.A-414) and loss of coating integrity (item VII.D.A 416) for internally coated heat exchangers exposed to air environments using the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program. The staff also noted that, as discussed in the GALL-SLR Report, future applicants for initial LR (40–60 years) may use aging management guidance from SLR (60–80 years) in their applications. The staff finds the applicant’s proposal to manage the effects of aging using the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program acceptable because it is consistent with the GALL-SLR Report, as modified by SLR-ISG-2021-02-MECHANICAL.

3.4 Aging Management of Steam and Power Conversion Systems

3.4.1 Summary of Technical Information in the Application

LRA Section 3.4 provides AMR results for those components that the applicant identified in LRA Section 2.3.4, “Steam and Power Conversion Systems,” as being subject to an AMR. LRA Table 3.4-1, “Summary of Aging Management Programs for Steam and Power Conversion Systems,” gives a summary comparison of the applicant’s AMRs with those evaluated in the GALL-LR Report for the steam and power conversion components.

3.4.2 Staff Evaluation

SE Table 3.4-1, below, summarizes the staff’s evaluation of the component groups listed in LRA Section 3.4 and addressed in the GALL-LR Report.

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

Component Group (SRP-LR Item No.)	Staff Evaluation
3.4-1, 001	Consistent with the GALL-LR Report (see SE Section 3.4.2.2.1)
3.4-1, 002	Not applicable to CPNPP (see SE Section 3.4.2.2.2)
3.4-1, 003	Consistent with the GALL-LR Report (see SE Section 3.4.2.2.3)
3.4-1, 004	Consistent with the GALL-LR Report
3.4-1, 005	Consistent with the GALL-LR Report
3.4-1, 006	Not applicable to CPNPP
3.4-1, 007	Not applicable to CPNPP
3.4-1, 008	Consistent with the GALL-LR Report
3.4-1, 009	Not used (addressed by LRA Table 3.4-1, item 3.4-1, 008)
3.4-1, 010	Consistent with the GALL-LR Report
3.4-1, 011	Consistent with the GALL-LR Report
3.4-1, 012	Consistent with the GALL-LR Report
3.4-1, 013	Consistent with the GALL-LR Report
3.4-1, 014	Consistent with the GALL-LR Report
3.4-1, 015	Consistent with the GALL-LR Report
3.4-1, 016	Consistent with the GALL-LR Report
3.4-1, 017	Not applicable to CPNPP
3.4-1, 018	Consistent with the GALL-LR Report
3.4-1, 019	Not applicable to CPNPP
3.4-1, 020	Not applicable to CPNPP
3.4-1, 021	Not applicable to CPNPP
3.4-1, 022	Not applicable to CPNPP
3.4-1, 023	Not applicable to CPNPP
3.4-1, 024	Not applicable to CPNPP
3.4-1, 025	Not applicable to CPNPP
3.4-1, 026	Not used (addressed by LRA Table 3.3-1, item 3.3-1, 049)
3.4-1, 027	Not applicable to CPNPP
3.4-1, 028	Not applicable to CPNPP
3.4-1, 029	Not applicable to CPNPP
3.4-1, 030	Not applicable to CPNPP
3.4-1, 031	Not applicable to CPNPP
3.4-1, 032	Not applicable to CPNPP
3.4-1, 033	Consistent with the GALL-LR Report
3.4-1, 034	Consistent with the GALL-LR Report
3.4-1, 035	Not applicable to CPNPP
3.4-1, 036	Consistent with the GALL-LR Report
3.4-1, 037	Not applicable to CPNPP
3.4-1, 038	Consistent with the GALL-LR Report
3.4-1, 039	Not applicable to CPNPP
3.4-1, 040	Consistent with the GALL-LR Report
3.4-1, 041	Consistent with the GALL-LR Report
3.4-1, 042	Not applicable to CPNPP

Component Group (SRP-LR Item No.)	Staff Evaluation
3.4-1, 043	Not applicable to CPNPP
3.4-1, 044	Consistent with the GALL-LR Report
3.4-1, 045	Not applicable to CPNPP
3.4-1, 046	Consistent with the GALL-LR Report
3.4-1, 047	Not applicable to CPNPP
3.4-1, 048	Not applicable to CPNPP
3.4-1, 049	Not applicable to CPNPP
3.4-1, 050	Not applicable to CPNPP
3.4-1, 050.5	Not applicable to CPNPP
3.4-1, 051	Not applicable to CPNPP
3.4-1, 052	Not applicable to CPNPP
3.4-1, 053	Not applicable to CPNPP
3.4-1, 054	Not applicable to CPNPP
3.4-1, 055	Not applicable to CPNPP
3.4-1, 056	Not applicable to CPNPP
3.4-1, 057	Not applicable to CPNPP
3.4-1, 058	Consistent with the GALL-LR Report
3.4-1, 059	Consistent with the GALL-LR Report
3.4-1, 060	Consistent with the GALL-LR Report
3.4-1, 061	Not applicable to CPNPP
3.4-1, 062	Not applicable to CPNPP
3.4-1, 063	Consistent with the GALL-LR Report
3.4-1, 064	Not used (addressed by LRA Table 3.5.2-1)
3.4-1, 065	Not applicable to CPNPP
3.4-1, 066	Not applicable to CPNPP
3.4-1, 067	Not applicable to CPNPP
3.4-1, 068	Not applicable to CPNPP

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

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

(2) SE Section 3.4.2.2 discusses AMR results for which the GALL-LR Report and SRP-LR recommend further evaluation. The table above identifies these items as consistent with the GALL-LR Report and provides citations within SE Section 3.4.2.2 that provides additional information.

(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-LR Report. These AMR results typically are identified by generic notes F through J and plant-specific notes in the LRA.

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

The following subsections document the staff's review of AMR results listed in LRA Tables 3.4.2-1 through 3.4.2-4f that the applicant determined to be consistent with the GALL-LR Report. The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL-LR Report; however, the staff did verify that the material presented in the GALL-LR Report was applicable and that the applicant identified the appropriate GALL-LR Report AMRs. For those AMR items that the staff found to be consistent with the GALL-LR Report, and for which no additional evaluation or RAI applies, the staff's review and conclusions, as documented in the GALL-LR Report, are considered to be the basis for acceptability of the AMR items. The staff's conclusion of "Consistent with the GALL-LR Report" is documented in SE Table 3.4-1, and no separate writeup is required or provided.

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

For the AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in SE Sections 3.4.2.1.2 through 3.4.2.1.7 below.

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

For LRA Table 3.4-1, items 3.4-1, 002; 3.4-1, 006; 3.4-1, 007; 3.4-1, 017; 3.4-1, 019; 3.4-1, 020; 3.4-1, 021; 3.4-1, 022; 3.4-1, 023; 3.4-1, 024; 3.4-1, 025; 3.4-1, 027; 3.4-1, 028; 3.4-1, 029; 3.4-1, 030; 3.4-1, 031; 3.4-1, 032; 3.4-1, 035; 3.4-1, 037; 3.4-1, 039; 3.4-1, 042; 3.4-1, 043; 3.4-1, 045; 3.4-1, 047; 3.4-1, 048; 3.4-1, 049; 3.4-1, 050; 3.4-1, 050.5; 3.4-1, 051; 3.4-1, 052; 3.4-1, 053; 3.4-1, 054; 3.4-1, 055; 3.4-1, 056; 3.4-1, 057; 3.4-1, 061; 3.4-1, 062; 3.4-1, 065; 3.4-1, 066; 3.4-1, 067; and 3.4-1, 068, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable to CPNPP. The staff reviewed the LRA, description of the material and environment associated with each AMR item, and the associated AMP and plant-specific documents and has concluded that the applicant's claim is reasonable.

For the following LRA Table 3.4-1 items, the applicant claimed that the corresponding items in the GALL-LR Report are not used and are addressed by other LRA Table 1 AMR items: 3.4-1, 009 (addressed by 3.4-1, 008); 3.4-1, 026 (addressed by 3.4-1, 049); and 3.4-1, 064 (addressed by LRA Table 3.5.2-1). The staff reviewed the LRA and confirmed that the aging effects for each of these items will be addressed by other LRA Table 1 AMR items. Therefore, the staff finds the applicant's proposal to use alternate items acceptable.

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

LRA Table 3.4-1, AMR items 3.4.1-014 and 3.4.1-016 address loss of material due to general, pitting, and crevice corrosion for copper alloy, steel, stainless steel, nickel-alloy, and aluminum piping, piping components, piping elements, heat exchanger components and tubes, and PWR heat exchanger components exposed to treated water and steam. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Fire Water System program or Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage the aging effect.

In LRA Table 3.3.2-7, "Fire Protection – Summary of Aging Management Evaluation," item 3.4.1-014 addresses loss of material for cast iron fire hydrant, pump casing, and valve body, carbon steel piping, valve body, and strainer exposed to a treated water internal environment. As amended by letter dated April 6, 2023 (ML23096A302), item 3.4.1-016 addresses loss of material for copper alloy flexible hose and heat exchanger tubes exposed to a treated water internal environment. The AMR items cite plant-specific note 2, which states, “The Fire Water System (B.2.3.16) AMP is substituted for the Water Chemistry (B.2.3.2) and One-Time Inspection (B.2.3.19) AMP.”

Based on its review of components associated with AMR item 3.4.1-014 and 3.4.1-016, for which the applicant cited generic note E in LRA Table 3.3.2-007, the staff finds the licensee’s proposal to manage the effects of aging using the Fire Water System program acceptable because the associated periodic inspections are capable of detecting loss of material due to general, pitting, and crevice corrosion if it is occurring. In addition, for steel and for copper alloy, use of the Fire Water System program is consistent with item VII.G.A-33 (for steel) and item VII.G.AP-197 (for copper alloy) in the GALL-LR Report.

In LRA Table 3.3.2-014, “Waste Processing Systems—Summary of Aging Management Evaluation,” item 3.4.1-016 addresses loss of material for stainless steel steam trap, piping, and valve body exposed to a steam internal environment. The AMR item cites plant-specific note 2, which states, “The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP will be used to manage WPS [waste processing system] components exposed to steam.”

Based on its review of components associated with AMR item 3.4.1-016, for which the applicant cited generic note E in LRA Table 3.3.2-7, the staff finds the licensee’s proposal to manage the effects of aging using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because the associated periodic visual inspections are capable of detecting loss of material for these components if it is occurring.

3.4.2.1.3 Loss of Material Due to Pitting and Crevice Corrosion

LRA Table 3.4.1, AMR item 3.4.1-016, addresses loss of material due to pitting and crevice corrosion for copper alloy, stainless steel, nickel-alloy, and aluminum piping, piping components, piping elements, heat exchanger components and tubes, and PWR heat exchanger components exposed to treated water and steam. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage the aging effect for stainless steel piping, tubing, flexible hose, pump casing, strainer, valve body, and tank exposed to a treated water internal environment. Based on its review of components associated with AMR item 3.4.1-016 for which the licensee cited generic note E, the staff finds the licensee’s proposal to manage the effects of aging using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because the associated periodic visual inspections are capable of detecting loss of material for these components if it is occurring.

3.4.2.1.4 Loss of Material Due to Pitting and Crevice Corrosion and Stress Corrosion Cracking

LRA Table 3.5.1, AMR item 3.5.1-078, addresses loss of material due to pitting and crevice corrosion and cracking due to SCC for steel fuel pool liner material. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Water Chemistry and One-Time Inspection programs to manage the aging effects for the stainless steel fuel transfer tube and supports, fuel transfer upender, refueling canal liner, and RV permanent cavity seal ring exposed to treated borated water. The AMR item cites plant-specific note 5, which states that the components, “Will be managed by the Water Chemistry (B.2.3.2) and One-Time Inspection (B.2.3.19) AMP in accordance with LR-ISG-2011-01: Aging Management of Stainless Steel Structures and Components in Treated Borated Water, Revision 1."

Based on its review of components associated with AMR item 3.5.1-078 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Water Chemistry and One-Time Inspection programs acceptable because these specific components are not addressed in the GALL-LR Report or GALL-SLR Report, and use of the Water Chemistry and One-Time Inspection programs is consistent with the guidance in LR-ISG-2011-01, Revision 1, "Aging Management of Stainless Steel Structures and Components in Treated Borated Water," dated December 18, 2012 (ML12233A367), for managing loss of material due to pitting and crevice corrosion, and cracking due to SCC, for stainless steel components exposed to treated borated water.

3.4.2.1.5 Cracking Due to Stress Corrosion Cracking

LRA Table 3.4-1, AMR item 3.4-1, 011, addresses cracking due to SCC in the stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to steam or treated water with temperature higher than 140°F. For the LRA Table 2 AMR items that cite generic note E, plant-specific note 1, the LRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components to manage the aging effect for the stainless steel flexible hose, piping, and valve body exposed internally to treated water with temperature higher than 140°F. For the LRA Table 2 AMR items that cite generic note E, plant-specific note 2, the LRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage the aging effects for the stainless steel piping, steam trap, and valve body exposed to steam. SE Section 3.0.3.1.10 provides the NRC staff's review of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program.

Based on its review of components associated with AMR item 3.4-1, 011, for which the applicant cited generic note E, plant-specific note 1 or 2, the NRC staff finds the applicant's proposal to manage the effects of aging using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because (1) this program includes periodic inspection of internal surfaces of the stainless steel components by a visual or surface examination capable of detecting SCC and (2) the proposed visual or surface examination performed periodically provides reasonable assurance that any potential SCC in the components is detected before its loss of intended function, and this aging effect is adequately managed.

3.4.2.1.6 Loss of Material Due to General, Pitting, Crevice, and Galvanic Corrosion

As amended by letter dated April 6, 2023 (ML23096A302), LRA Table 3.4-1, AMR item 3.4-1, 015, addresses loss of material of steel heat exchanger components exposed to treated water. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Fire Water System program, in lieu of the Water Chemistry and One-Time Inspection programs, to manage loss of material for the carbon steel diesel-driven fire pump heat exchanger tubesheet and channel head exposed internally to treated water.

Based on its review of components associated with AMR item 3.4-1, 015, for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Fire Water System program acceptable because the applicant enhanced the program to require periodic visual inspections of the tubesheet and channel head that are capable of detecting loss of material before a loss of intended function. The staff notes that the Fire Water System program calls for periodically cleaning and inspecting the tubes of each fire pump diesel engine heat exchanger, which can identify any indication of fouling or corrosion of these components. The discussions of RAI B.2.3.16-1 and Enhancement 10 in SE section 3.0.3.2.13 contain additional information.

3.4.2.1.7 Reduction of Heat Transfer Due to Fouling

As amended by letter dated April 6, 2023 (ML23096A302), LRA Table 3.4-1, AMR item 3.4-1, 018, addresses loss of heat transfer due to fouling of copper alloy and stainless steel heat exchanger tubes exposed to treater water. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the Fire Water System program, in lieu of the Water Chemistry and One-Time Inspection programs, to manage reduction of heat transfer due to fouling for the copper alloy diesel-driven fire pump heat exchanger tubes exposed internally to treated water.

Based on its review of components associated with AMR item 3.4-1, 018, for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Fire Water System program acceptable because the component cleaning and periodic visual inspections required by the Fire Water System program are both capable of detecting a reduction of heat transfer before a loss of intended function. The discussion of RAI B.2.3.16-1 in SE Section 3.0.3.2.13 contains additional information

3.4.2.2 Aging Management Review Results for Which Further Evaluation Is Recommended by the GALL-LR Report

In LRA Section 3.4.2.2, the applicant further evaluates aging management for certain steam and power conversion components, as recommended by the GALL-LR Report, and provides information on how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria contained in SRP-LR Section 3.4.2.2. The following subsections document the staff's review.

3.4.2.2.1 Cumulative Fatigue Damage

LRA Section 3.4.2.2.1, associated with LRA Table 3.4-1, item 001, indicates 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) and is addressed in LRA Section 4.3.3. This is consistent with SRP-LR Section 3.4.2.2.1 and is, therefore, acceptable. The 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

LRA Section 3.4.2.2.2, associated with LRA Table 3.4-1, AMR item 3.4.1-002, addresses cracking due to stress corrosion cracking for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air. The applicant stated that this item is not applicable. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.4.2.2.2.

Section 3.2.2.2.3, Item 2 of this SE details the staff evaluation of the responses applicable to the six LRA further evaluation sections related to loss of material and stress corrosion cracking in outdoor air. With respect to stress corrosion cracking, the responses and staff evaluation are applicable to all three related LRA Sections (3.2.2.2.6, 3.3.2.2.3, and 3.4.2.2.2) and no parts of the responses are specific to LRA Section 3.4.2.2.2. Therefore, for the reasons discussed in SE Section 3.2.2.2.3, Item 2, in its review of components associated with AMR item 3.4.1-002, the staff finds the applicant's proposal acceptable, and this item is not applicable.

3.4.2.2.3 Loss of Material Due to Pitting and Crevice Corrosion

LRA Section 3.4.2.2.3, associated with LRA Table 3.4-1, AMR item 3.4.1-003, addresses loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air, which will be managed by the External Surfaces Monitoring of Mechanical Components program. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.4.2.2.3.

In its review of components associated with AMR item 3.4.1-003, the staff determined the need for additional information about the scope of aging management for loss of material of stainless steel components exposed to outdoor air. The staff also determined the need for additional information about managing stress corrosion cracking of stainless steel components in cases where loss of material is being managed, which would involve similar halide concentrations. This resulted in the issuance of RAIs applicable to loss of material and stress corrosion cracking in the ESF systems, auxiliary systems, and steam and power conversion systems (LRA Further Evaluation Sections 3.2.2.2.3.2, 3.2.2.2.6, 3.3.2.2.3, 3.3.2.2.5, 3.4.2.2.2, and 3.4.2.2.3). The staff's requests and the applicant's responses are documented in letters dated July 27, 2023 (ML23208A193), and October 4, 2023 (ML23277A176).

Section 3.2.2.2.3, Item 2 of this SE details the applicant's responses applicable to all six LRA further evaluation sections listed above. With respect to LRA Section 3.4.2.2.3 specifically, in the response to RAI 3.2.2.2.3.2-1, the applicant modified (1) LRA Section 3.4.2.2.3 and LRA Table 3.4.2-1 to add the condensate storage tank vent piping using AMR item 3.4.1-003, which will be managed by the External Surface Monitoring of Mechanical Components program, (2) LRA Table 3.4.2-1 to delete stainless steel and carbon steel items after determining the components are in piping tunnels and not in an outdoor air environment, and (3) Table 3.4-1, item 3.4.1-008, to add outdoor air as an environment for which loss of material is managed by the Bolting Integrity program.

Section 3.2.2.2.3, Item 2 of this SE details the staff evaluation of the responses applicable to the six LRA further evaluation sections related to loss of material and stress corrosion cracking in outdoor air. In its evaluation of the applicant's responses specific to LRA Section 3.4.2.2.3, the staff finds the responses acceptable because (1) the applicant identified the components in the steam and power conversion systems that have the most potential for an unexpected accumulation of contaminants that could cause pitting or crevice corrosion in outdoor air, (2) to manage aging due to pitting or crevice corrosion for those components, the applicant proposed an AMP that is identified in the SRP-LR as an acceptable method, and (3) the change to AMR item 3.4.1-008 is consistent with the Bolting Integrity program, which includes aging management for loss of material due to corrosion in outdoor air.

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

3.4.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

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

3.4.2.2.5 Ongoing Review of Operating Experience

SE Section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of OE.

3.4.2.2.6 Loss of Material Due to Recurring Internal Corrosion

LRA Section 3.4.2.2.6, as modified by letter dated April 24, 2023 (ML23114A377), is associated with LRA Table 3.4-1, item 3.4.1-061, for loss of material due to recurring internal corrosion in metallic components exposed to multiple water environments. In its revised discussion for this LRA section, the applicant stated that OE reviews had identified recurring internal corrosion only at piping welds exposed to treated water in the turbine plant cooling water system. The applicant stated that augmented inspections will be performed to address recurring internal corrosion in the piping welds of the associated system by using volumetric methods capable of detecting localized corrosion. The inspections will be conducted on a 20 percent sample (up to a maximum of 25) of the system's welds in each 10-year interval during the period of extended operation. These inspections are in addition to the opportunistic generic inspections of surfaces described in the Closed Treated Water Systems AMP. The revised LRA section also notes that inspection results with wall thickness reductions greater than 50 percent or below the minimum wall thickness values will be evaluated through the corrective action program.

The staff evaluated the applicant's approach against the criteria in SRP-LR Section 3.4.2.2.6 and finds it acceptable because the augmented inspections, as provided in an enhancement of the Closed Treated Water Systems AMP for volumetrically inspecting a sample of the system's piping welds, provides reasonable assurance that recurring internal corrosion in the turbine plant cooling water system will be adequately managed. The staff's evaluation of the enhancements to the Closed Treated Water System AMP is documented in SE Section 3.0.3.2.9. The staff notes that several of the further evaluation criteria are not applicable to this situation because none of the associated piping is buried or underground. The staff also notes that its independent review of plant-specific OE documentation, provided during the audit, did not identify instances of recurring internal corrosion in any other steam and power conversion systems.

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

The following subsections document the staff's review of those AMR results listed in LRA Tables 3.4.2-1 through 3.4.2-4f that are either not consistent with or not addressed in the GALL-LR 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 an SRP-LR Table 1 item, the subsections are organized by applicable AMR sections and then by material and environment combinations.

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

3.4.2.3.1 Turbine Plant Cooling Water System—Summary of Aging Management Evaluation

Carbon Steel Piping Exposed to Closed-Cycle Cooing Water. LRA Table 3.4.2-4f, as modified by LRA Supplement 2 (ML23114A377), states that the Closed Treated Water Systems AMP will manage loss of material for carbon steel piping exposed internally to closed-cycle cooling water. Although the initial LRA item cites generic note H, the supplement modified this item by citing item 3.4.1-061, which is associated with the further evaluation in LRA Section 3.4.2.2.6 for recurring internal corrosion for steam and power conversion systems. Consequently, the staff determined that generic note H is no longer considered applicable to this item, even though the application continues to cite note H. See SE Section 3.4.2.2.6 for the staff's evaluation of the recurring internal corrosion that was identified in the turbine plant cooling water system.

3.5 Aging Management of Containments, Structures, and Component Supports

3.5.1 Summary of Technical Information in the Application

LRA Section 3.5 provides AMR results for those components that the applicant identified in LRA Section 2.4, "Scoping and Screening Results: Structures," as being subject to an AMR. LRA Table 3.4-1, "Summary of Aging Management Programs for Containment Building and Internal Structural Components," gives a summary comparison of the applicant's AMRs with those evaluated in the GALL-LR Report for the containment, structure, and component support components.

3.5.2 Staff Evaluation

SE Table 3.5-1, below, summarizes the staff's evaluation of the component groups listed in LRA Section 3.5 and addressed in the GALL-LR Report.

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

Component Group (SRP-LR Item No.)	Staff Evaluation
3.5-1, 001	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.1.1)
3.5-1, 002	Not applicable to CPNPP (see SE Section 3.5.2.2.1.1)
3.5-1, 003	Not applicable to CPNPP (see SE Section 3.5.2.2.1.2)
3.5-1, 004	Not applicable to PWRs
3.5-1, 005	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.1.3, item 1)
3.5-1, 006	Not applicable to PWRs
3.5-1, 007	Not applicable to PWRs
3.5-1, 008	Not applicable to CPNPP (see SE Section 3.5.2.2.1.4)
3.5-1, 009	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.1.5)
3.5-1, 010	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.1.6)
3.5-1, 011	Not applicable to CPNPP (see SE Section 3.5.2.2.1.7)
3.5-1, 012	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.1.8)
3.5-1, 013	Not used (addressed by LRA Table 3.5-1, item 3.5-1, 014; see SE Section 3.5.2.2.1.9)
3.5-1, 014	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.1.9)
3.5-1, 015	Not used
3.5-1, 016	Not applicable to CPNPP

Component Group (SRP-LR Item No.)	Staff Evaluation
3.5-1, 017	Not applicable to PWRs
3.5-1, 018	Not applicable to CPNPP
3.5-1, 019	Consistent with the GALL-LR Report
3.5-1, 020	Consistent with the GALL-LR Report
3.5-1, 021	Consistent with the GALL-LR Report
3.5-1, 022	Not applicable to PWRs
3.5-1, 023	Not used (addressed by LRA Table 3.5-1, item 3.5-1, 025)
3.5-1, 024	Not applicable to CPNPP
3.5-1, 025	Consistent with the GALL-LR Report
3.5-1, 026	Consistent with the GALL-LR Report
3.5-1, 027	Consistent with the GALL-LR Report
3.5-1, 028	Consistent with the GALL-LR Report
3.5-1, 029	Consistent with the GALL-LR Report
3.5-1, 030	Consistent with the GALL-LR Report
3.5-1, 031	Consistent with the GALL-LR Report
3.5-1, 032	Not applicable to CPNPP
3.5-1, 033	Consistent with the GALL-LR Report
3.5-1, 034	Consistent with the GALL-LR Report
3.5-1, 035	Consistent with the GALL-LR Report
3.5-1, 036	Not applicable to PWRs
3.5-1, 037	Not applicable to PWRs
3.5-1, 038	Not applicable to PWRs
3.5-1, 039	Not applicable to PWRs
3.5-1, 040	Not applicable to PWRs
3.5-1, 041	Not applicable to PWRs
3.5-1, 042	Not applicable to CPNPP (see SE Section 3.5.2.2.2.1, item 1)
3.5-1, 043	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.2.1, item 2)
3.5-1, 044	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.2.1, item 3)
3.5-1, 045	Not applicable to PWRs
3.5-1, 046	Not applicable to CPNPP
3.5-1, 047	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.2.1, item 4)
3.5-1, 048	Not applicable to CPNPP (see SE Section 3.5.2.2.2.2)
3.5-1, 049	Not applicable to CPNPP (see SE Section 3.5.2.2.2.3, item 1)
3.5-1, 050	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.2.3, item 2)
3.5-1, 051	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.2.3, item 3)
3.5-1, 052	Not applicable to CPNPP (see SE Section 3.5.2.2.2.4)
3.5-1, 053	Not applicable to CPNPP (see SE Section 3.5.2.2.2.5)
3.5-1, 054	Consistent with the GALL-LR Report
3.5-1, 055	Consistent with the GALL-LR Report
3.5-1, 056	Consistent with the GALL-LR Report
3.5-1, 057	Consistent with the GALL-LR Report
3.5-1, 058	Consistent with the GALL-LR Report
3.5-1, 059	Consistent with the GALL-LR Report
3.5-1, 060	Not applicable to CPNPP (see SE Section 3.5.2.2.2.3, item 1)
3.5-1, 061	Consistent with the GALL-LR Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.5-1, 062	Not applicable to CPNPP
3.5-1, 063	Consistent with the GALL-LR Report
3.5-1, 064	Not applicable to CPNPP
3.5-1, 065	Consistent with the GALL-LR Report
3.5-1, 066	Consistent with the GALL-LR Report
3.5-1, 067	Consistent with the GALL-LR Report
3.5-1, 068	Not applicable to CPNPP
3.5-1, 069	Not applicable to CPNPP
3.5-1, 070	Consistent with the GALL-LR Report
3.5-1, 071	Not applicable to CPNPP
3.5-1, 072	Consistent with the GALL-LR Report
3.5-1, 073	Not used (addressed by LRA Table 3.5-1, item 3.5-1, 034)
3.5-1, 074	Not used (addressed by LRA Table 3.5-1, item 3.5-1, 075)
3.5-1, 075	Consistent with the GALL-LR Report
3.5-1, 076	Not used (addressed by LRA Table 3.5-1, item 3.5-1, 075)
3.5-1, 077	Consistent with the GALL-LR Report
3.5-1, 078	Consistent with the GALL-LR Report
3.5-1, 079	Not applicable to CPNPP
3.5-1, 080	Consistent with the GALL-LR Report
3.5-1, 081	Consistent with the GALL-LR Report
3.5-1, 082	Consistent with the GALL-LR Report
3.5-1, 083	Consistent with the GALL-LR Report
3.5-1, 084	Consistent with the GALL-LR Report
3.5-1, 085	Not used (addressed by LRA Table 3.5-1, item 3.5-1, 084)
3.5-1, 086	Consistent with the GALL-LR Report
3.5-1, 087	Consistent with the GALL-LR Report
3.5-1, 088	Consistent with the GALL-LR Report
3.5-1, 089	Consistent with the GALL-LR Report
3.5-1, 090	Consistent with the GALL-LR Report
3.5-1, 091	Consistent with the GALL-LR Report
3.5-1, 092	Consistent with the GALL-LR Report
3.5-1, 093	Consistent with the GALL-LR Report
3.5-1, 094	Not applicable to CPNPP
3.5-1, 095	Consistent with the GALL-LR Report

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

(1) SE Section 3.5.2.1 discusses AMR results for components that the applicant stated are either not applicable to CPNPP or are consistent with the GALL-LR 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’s conclusions. The remaining subsections in SE Section 3.5.2.1 document the review of components that required additional information or otherwise required explanation.

(2) SE Section 3.5.2.2 discusses AMR results for which the GALL-LR Report and SRP-LR recommend further evaluation. The table above identifies these items as consistent with the GALL-LR Report and provides citations within SE Section 3.5.2.2 that provides additional information.

(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-LR Report. These AMR results typically are identified by generic notes F through J and plant-specific notes in the LRA.

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

The following subsections document the staff's review of AMR results listed in LRA Tables 3.5.2-1 through 3.5.2-15 that the applicant determined to be consistent with the GALL-LR Report. The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL-LR Report; however, the staff did verify that the material presented in the GALL-LR Report was applicable and that the applicant identified the appropriate GALL-LR Report AMRs. For those AMR items that the staff found to be consistent with the GALL-LR Report, and for which no additional evaluation or RAI applies, the staff's review and conclusions, as documented in the GALL-LR Report, are considered the basis for acceptability of the AMR items. The staff's conclusion of "Consistent with the GALL-LR Report" is documented in SE Table 3.5-1, and no separate writeup is required or provided.

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

For the AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in SE Sections 3.5.2.1.2 through 3.5.2.1.10 below.

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

For LRA Table 3.5-1, items 3.5-1, 002; 3.5-1, 003; 3.5-1, 008; 3.5-1, 011; 3.5-1, 016; 3.5-1, 018; 3.5-1, 024; 3.5-1, 032; 3.5-1, 042; 3.5-1, 046; 3.5-1, 048; 3.5-1, 079; 3.5-1, 052; 3.5-1, 054; 3.5-1, 060; 3.5-1, 062; 3.5-1, 064; 3.5-1, 068; 3.5-1, 069; 3.5-1, 071; 3.5-1, 079; and 3.5-1, 094, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable to CPNPP. The staff reviewed the LRA, description of the material and environment associated with each AMR item, and the associated AMP and plant-specific documents and has concluded that the applicant's claim is reasonable.

For LRA Table 3.5-1, items 3.5-1, 013; 3.5-1, 015; 3.5-1, 023; 3.5-1, 073; 3.5-1, 074; 3.5-1, 076; and 3.5-1, 085, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable because the associated items are only applicable to BWRs. The staff reviewed the SRP-LR, confirmed that these items apply only to BWRs, and finds that these items are not applicable to CPNPP because it is a PWR.

For the following LRA Table 3.5-1 items, the applicant claimed that the corresponding items in the GALL-LR Report are not used and are addressed by other LRA Table 1 AMR items: 3.5-1, 013 (addressed by 3.5-1, 014); 3.5-1, 023 (addressed by 3.5-1, 025); 3.5-1, 073 (addressed by 3.5-1, 034); 3.5-1, 074 (addressed by 3.5-1, 075); 3.5-1, 076 (addressed by 3.5-1, 075); and 3.5-1, 085 (addressed by 3.5-1, 084). The staff reviewed the LRA and confirmed that the aging effects for each of these items will be addressed by other LRA Table 1 AMR items. Therefore, the staff finds the applicant's proposal to use alternate items acceptable.

LRA Table 3.5-1, item 3.5-1, 015, addresses the aging effects of an increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation for accessible concrete areas of the reactor building basemat. The applicant stated that this item is not used. The staff evaluated the applicant's claim and finds it acceptable because the reinforced concrete foundation/mat for the reactor building is completely below-grade and is not accessible.

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

LRA Table 3.5-1, AMR item 3.5-1, 028, addresses loss of material due to general, pitting and crevice corrosion for steel personnel airlock, equipment hatch, and control rod drive hatch exposed to air-indoor uncontrolled or air-outdoor environment. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the Structures Monitoring AMP to manage the aging effect for carbon steel equipment hatch missile shield (outer cover) exposed to outdoor air. The AMR item cites plant-specific note 4, which states, "The outer cover for the emergency hatch is not a pressure boundary component and will be managed by the Structures Monitoring (B.2.3.34) AMP instead of the ASME Section XI, Subsection IWE (B.2.3.29) AMP."

Based on its review of components associated with AMR item 3.5.1-28 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the LRA Structures Monitoring AMP acceptable because (1) the equipment hatch missile shield (outer cover) serves a missile barrier function and is not a pressure-retaining boundary component and (2) the periodic visual examinations at intervals not exceeding 5 years of the Structures Monitoring AMP is adequate for managing the aging effect.

LRA Table 3.5-1, AMR item 3.5-1, 083, addresses the aging effect of loss of material due to general, pitting, and crevice corrosion for steel structural supports for the ASME Class 3 components associated with Group 6 Water-Control Structures exposed to a raw water environment. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the ASME Section XI, Subsection IWF, program to manage the effects of aging for loss of material due to general, pitting, and crevice corrosion. The AMR item cites plant-specific note 8, which states, "supports of the ASME Class 3 Secondary Shield Wall (SSW) pumps in the Service Water Intake Structure (SWIS) intake bay."

Based on its review of components associated with AMR item 3.5.1-083 for which the applicant cited generic note E, as amended by LRA Supplement 1 (ML23096A302), the staff finds the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWF, program acceptable because (1) the ASME Section XI, Subsection IWF, program has no exceptions associated with steel structural supports for the ASME Class 3 components including structural bolting for the aging effect of loss of material due to general, pitting, and crevice corrosion exposed to any environment, (2) the ASME Section XI, Subsection IWF, program, with enhancements, will be consistent with one exception to program elements in the GALL-LR Report AMP XI.S3, "ASME Section XI, Subsection IWF," (3) the frequency of visual inspections of the ASME Section XI, Subsection IWF, program is comparable to that of the Inspection of Water-Control Structures Associated with Nuclear Power Plants program, which is identified by the GALL-LR Report to manage the effects of aging for Group 6 Water-Control Structures, and (4) the periodic visual inspections required by the ASME Section XI, Subsection IWF, program are capable of detecting the aging effect of loss of material due to general, pitting, and crevice corrosion for steel structural supports for the ASME Class 3 components.

LRA Table 3.5-1, AMR item 3.5-1, 083, also addresses the aging effect of loss of material due to general, pitting, and crevice corrosion for structural bolting, trash racks and traveling screens associated with Group 6 Water-Control Structures exposed to an air-outdoor or raw water environment. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Structures Monitoring program to manage the effects of aging for loss of material due to general, pitting, and crevice corrosion. The AMR items cite plant-specific note 11, which states, "The Structures Monitoring AMP is credited for managing loss of material associated with the traveling screens."

Based on its review of components associated with AMR item 3.5.1-083 for which the applicant cited generic note E, as amended by LRA Supplement 1 (ML23096A302), the staff finds the applicant's proposal to manage the effects of aging using the Structures Monitoring program acceptable because (1) the periodic visual inspections required by the Structures Monitoring program are capable of detecting the aging effect of loss of material due to general, pitting, and crevice corrosion for structural bolting, trash racks and traveling screens associated with Group 6 Water-Control Structures and (2) the frequency of visual inspections of the Structures Monitoring program is comparable to that of the Inspection of Water-Control Structures Associated with Nuclear Power Plants program, which is identified by the GALL-LR Report to manage the effects of aging for Group 6 Water-Control Structures.

3.5.2.1.3 Cracking Due to Expansion from Reaction with Aggregates

LRA Table 3.5-1, AMR item 3.5-1, 054, addresses the aging effect of cracking due to expansion from reaction with aggregates for accessible concrete areas exposed to any environment. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the Fire Protection program to manage the aging effect for concrete curbs. The AMR item cites plant-specific note 7, which states, "The Structures Monitoring AMP and Fire Protection AMP credit and communicate with each other."

Based on its review of components associated with AMR item 3.5-1, 054, as amended by the applicant's response to RAI B.2.3.15-2 (ML23208A193), for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Fire Protection program acceptable because periodic visual inspections required by the Fire Protection program are capable of detecting cracking before a loss of intended functions. The Structures Monitoring program is also credited to manage the aging effect of cracking due to expansion from reaction with aggregates for concrete curbs, which act as structural fire barriers. Managing the effects of aging for concrete structural fire barriers by both the Fire Protection program and the Structures Monitoring program is consistent with the GALL-LR Report. See SE Section 3.0.3.2.12 for additional information on the evaluation of the applicant's response to RAI B.2.3.15-2.

3.5.2.1.4 Loss of Material (Spalling, Scaling) and Cracking Due to Freeze-Thaw

LRA Table 3.5-1, AMR item 3.5-1, 060, addresses the aging effects of loss of material (spalling, scaling) and cracking due to freeze-thaw for accessible concrete areas in the water-control structures exposed to an air-outdoor environment. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Structures Monitoring program to manage the aging effects for the accessible above-grade exterior concrete components and removable concrete slabs for the hatch in the SWIS. The AMR item cites plant-specific note 14, which states "The Structures

Monitoring AMP is credited as it manages the foundation and the above ground structure associated with Service Water Intake Structures."

Based on its review of components associated with AMR item 3.5-1, 060, for which the applicant cited generic note E, as amended by LRA Supplement 1 (ML23096A302) and LRA Supplement 2 (ML23114A377), the staff finds the applicant's proposal to manage the effects of aging using the Structures Monitoring program acceptable because (1) the periodic visual inspections required by the Structures Monitoring program are capable of detecting loss of material (spalling, scaling) and cracking due to freeze-thaw for the accessible concrete components, and (2) the frequency of visual inspections of the Structures Monitoring program is comparable to that of the Inspection of Water-Control Structures Associated with Nuclear Power Plants program, which is identified by the GALL-LR Report to manage the effects of aging for Group 6 Water-Control Structures.

3.5.2.1.5 Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling) Due to Corrosion of Embedded Steel

LRA Table 3.5-1, AMR item 3.5-1, 066, addresses the aging effects of cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for accessible concrete areas in Group 1–5, 7, and 9 structures exposed to an air-indoor uncontrolled or air-outdoor environment. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the Fire Protection program to manage the aging effects for concrete curbs. The AMR item cites plant-specific note 7, which states, "The Structures Monitoring AMP and Fire Protection AMP credit and communicate with each other."

Based on its review of components associated with AMR item 3.5-1, 066, as amended by the applicant's response to RAI B.2.3.15-2 (ML23208A193), for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Fire Protection program acceptable because periodic visual inspections required by the Fire Protection program are capable of detecting cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel before a loss of intended functions, and the Structures Monitoring program is also credited to manage the aging effects of cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for concrete curbs, which act as structural fire barriers. Managing aging effects for concrete structural fire barriers by both the Fire Protection program and Structures Monitoring program is consistent with the GALL-LR Report. See SE Section 3.0.3.2.12 for additional information on the evaluation of the applicant's response to RAI B.2.3.15-2.

3.5.2.1.6 Increase in Porosity and Permeability, Cracking, and Loss of Material (Spalling, Scaling) Due to Aggressive Chemical Attack

LRA Table 3.5-1, AMR item 3.5-1, 067, addresses the aging effects of increased porosity and permeability, cracking, and loss of material (spalling, scaling) due to aggressive chemical attack for concrete components exposed to an air-indoor uncontrolled or air-outdoor environment. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the Fire Protection program to manage the aging effects for concrete curbs. The AMR item cites plant-specific note 7, which states, "The Structures Monitoring AMP and Fire Protection AMP credit and communicate with each other."

Based on its review of components associated with AMR item 3.5-1, 067, as amended by the applicant's response to RAI B.2.3.15-2 (ML23208A193), for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Fire Protection program acceptable because periodic visual inspections required by the Fire Protection program are capable of detecting increased porosity and permeability, cracking, and loss of material (spalling, scaling) due to aggressive chemical attack before a loss of intended functions. The Structures Monitoring program is also credited to manage the aging effects of increased porosity and permeability, cracking, and loss of material (spalling, scaling) due to aggressive chemical attack for concrete curbs, which act as structural fire barriers. Managing aging effects for concrete structural fire barriers by both the Fire Protection program and Structures Monitoring program is consistent with the GALL-LR Report. See SE Section 3.0.3.2.12 for additional information on the evaluation of the applicant's response to RAI B.2.3.15-2.

3.5.2.1.7 Cracking Due to Restraint Shrinkage, Creep, and Aggressive Environment

LRA Table 3.5-1, AMR item 3.5-1, 070, as amended by letter dated July 27, 2023 (ML23208A193), addresses cracking due to restraint shrinkage, creep, and aggressive environment for masonry walls exposed to indoor uncontrolled air and outdoor air. For the AMR items in LRA Table 2 that cite generic note E, the LRA credits the Fire Protection program to manage the aging effects for concrete block (removable) for opening and masonry block walls, floors, and ceilings that act as structural fire barriers. The AMR items cite plant-specific notes 1 and 3. Note 1 states the following:

> Removable concrete blocks for openings in certain walls to facilitate equipment removal and replacement; in areas where a removable concrete block opening exists in a fire wall, a fire hazards analysis evaluation justifies the as-built design, and the concrete blocks are installed in such a way that there are no through openings from one side of the barrier to the other. Furthermore, the Masonry Walls (B.2.3.33) AMP and Fire Protection (B.2.3.15) AMP credit and communicate with each other.

Note 3 states, "The Masonry Walls (B.2.3.33) AMP and Fire Protection (B.2.3.15) AMP credit and communicate with each other."

Based on its review of components associated with AMR items 3.5-1, 70, for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Fire Protection AMP acceptable because (1) the LRA confirms that the Masonry Walls AMP will continue to be used to manage cracking in the masonry block components described above, consistent with the GALL-LR recommendation, and (2) the masonry walls that are intended to perform a fire protection function are also managed by the Fire Protection AMP consistent with the OE reflected in SLR guidance GALL-SLR item VII.G.A-626.

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

LRA Table 3.5-1, AMR item 3.5-1, 080, addresses the aging effect of loss of material due to general, pitting, and crevice corrosion for structural bolting exposed to an air-indoor uncontrolled environment. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program to manage the aging effect for carbon steel structural bolting. The AMR item cites plant-specific note 1, which states, "The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling System AMP is supplemented by the Structures Monitoring AMP in managing the aging effect(s) applicable to this component type, material, and environment combination." Consistent with the OE reflected in NUREG-2191 (item VII.B.A 730) and NUREG-2192 (Table 3.3-1, item 199), the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP includes visual inspections of structural bolting associated with the cranes and hoists. The Structures Monitoring AMP provides for preventive measures to ensure structural bolting integrity.

Based on its review of components associated with AMR item 3.5-1, 080, for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program acceptable because (1) the periodic visual inspections required by the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program are capable of detecting loss of material due to general, pitting, and crevice corrosion for structural bolting, and (2) the frequency of visual inspections of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program is comparable to that of the Structures Monitoring program, which is identified by the GALL-LR Report to manage the effects of aging for structural bolting. As discussed in the GALL-SLR Report, future applicants for initial LR (40–60 years) may use aging management guidance from SLR (60–80 years) in their applications. This makes the applicant's use of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program consistent with the staff's current guidance for LR. SE Section 3.0.3.2.10 presents the staff's safety evaluation of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program.

LRA Table 3.5-1, AMR item 3.5-1, 082, addresses the aging effect of loss of material due to general, pitting, and crevice corrosion for structural bolting exposed to an air-outdoor environment. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program to manage the aging effect for carbon and galvanized steel structural bolting. The AMR items reference plant-specific note 1, which states the following:

> The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling System AMP is supplemented by the Structures Monitoring AMP in managing the aging effect(s) applicable to this component type, material, and environment combination. Consistent with the OE reflected in NUREG-2191 (item VII.B.A-730) and NUREG-2192 (Table 3.3-1, item 199), the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP includes visual inspections of structural bolting associated with the cranes and hoists. The Structures Monitoring AMP provides for preventive measures to ensure structural bolting integrity.

Based on its review of components associated with AMR item 3.5-1, 082, for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program acceptable because (1) the periodic visual inspections required by the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program are capable of detecting loss of material due to general, pitting, and crevice corrosion for carbon and galvanized steel structural bolting, (2) the frequency of visual inspections of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program is comparable to that of the Structures Monitoring program, which is identified by the GALL-LR Report to manage the effects of aging for structural bolting, and (3) the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling

System program is supplemented by the Structures Monitoring program, which provides preventive measures to ensure structural bolting integrity. As discussed in the GALL-SLR Report, future applicants for initial LR (40–60 years) may use aging management guidance from SLR (60–80 years) in their applications. This makes the applicant's use of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program consistent with the staff's current guidance for LR. SE Section 3.0.3.2.10 presents the staff's safety evaluation of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program.

3.5.2.1.9 Loss of Material Due to Pitting and Crevice Corrosion

LRA Table 3.5.1, AMR item 3.5.1-084, addresses loss of material due to pitting and crevice corrosion for stainless steel structural bolting in the refueling cavity exposed to treated borated water. For the two LRA Table 2 AMR items that cite generic note E, the LRA credits the Water Chemistry (B.2.3.2) and ASME Section XI, Subsection IWE (B.2.3.29) AMPs to manage the effects of aging for loss of material.

Both of these items have a structural support function and cite plant-specific note 10, which associates the stainless steel bolting with the fuel transfer tube and fuel transfer tube supports inside containment (refueling canal). In addition to plant-specific note 10, one of these items also cites plant-specific note 1, which extends the use of stainless steel bolting to ASME Class 2 and MC pressure-retaining components.

Based on its review of components associated with AMR item 3.5.1-084, for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the LRA AMP B.2.3.2, Water Chemistry, acceptable for the following reasons: (1) the LRA AMP B.2.3.2 has no exceptions associated with managing the effects of aging for loss of material to stainless steel structural bolting exposed to treated water that includes treated borated water, and (2) its "scope of program" program element, consistent with GALL-LR, Revision 2, AMP XI.M2, includes management of aging effects for metallic components exposed to a treated water or treated borated water environment. Likewise the staff finds LRA AMP B.2.3.29, ASME Section XI, Subsection IWE, acceptable to manage loss of material to stainless steel structural bolting for components and supports in the fuel canal for the following reasons: (1) LRA AMP B.2.3.29 has no exceptions associated with stainless steel structural bolting for loss of material, and (2) GALL-LR Report, Revision 2, AMP XI.S1, with which LRA AMP B.2.3.29 is consistent, includes in its scope examination of metallic shell and its integral attachments/components and bolting and has guidance for visual inspections similar to that in the ASME Section XI, Subsection IWF program recommended by the GALL-LR Report.

3.5.2.1.10 Loss of Preload Due to Self-Loosening

LRA Table 3.5-1, AMR item 3.5-1, 088, addresses the aging effect of loss of preload due to self-loosening for structural bolting exposed to any environment. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program to manage the aging effect for carbon steel structural bolting. The AMR items cite plant-specific note 1, which states the following:

> The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling System AMP is supplemented by the Structures Monitoring AMP in managing the aging effect(s) applicable to this component type, material, and

environment combination. Consistent with the OE reflected in NUREG-2191 (item VII.B.A-730) and NUREG-2192 (Table 3.3-1, item 199), the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP includes visual inspections of structural bolting associated with the cranes and hoists. The Structures Monitoring AMP provides preventive measures to ensure structural bolting integrity.

Based on its review of components associated with AMR item 3.5-1, 088, for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program acceptable because (1) the periodic visual inspections required by the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program are capable of detecting loss of preload due to self-loosening for carbon steel structural bolting, (2) the frequency of visual inspections of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program is comparable to that of the Structures Monitoring program, which is identified by the GALL-LR Report to manage the effects of aging for structural bolting, and (3) the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling System program is supplemented by the Structures Monitoring program, which provides preventive measures to ensure structural bolting integrity. As discussed in the GALL-SLR Report, future applicants for initial LR (40–60 years) may use aging management guidance from SLR (60–80 years) in their applications. This makes the applicant's use of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program consistent with the staff's current guidance for LR. SE Section 3.0.3.2.10 presents the staff's safety evaluation of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program.

3.5.2.2 Aging Management Review Results for Which Further Evaluation Is Recommended by the GALL-LR Report

In LRA Section 3.5.2.2, the applicant further evaluates aging management for certain containment, structure, and component support components as recommended by the GALL-LR Report and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria contained in SRP-LR Section 3.5.2.2. The following subsections document the staff's review.

3.5.2.2.1 Pressurized-Water Reactor and Boiling-Water Reactor Containments

3.5.2.2.1.1 Cracking and Distortion Due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, and Cracking Due to Differential Settlement and Erosion of Porous Concrete Subfoundations

LRA Section 3.5.2.2.1.1, associated with LRA Table 3.5.1 AMR items 3.5.1-001 and 3.5.1-002, addresses cracking and distortion due to increased stress levels from settlement for concrete dome; wall; basemat; ring girders; buttresses of the reactor containment building (RCB) exposed to soil and reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation for concrete foundation (subfoundation exposed to flowing water), which will be managed by the Structures Monitoring program. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.5.2.2.1.1.

For LRA Table 3.5.1, AMR item 3.5.1-001, the applicant stated that the associated concrete components are managed for cracking and distortion due to increased stress levels from settlement by the Structures Monitoring AMP. The applicant also stated that CPNPP does not rely on a dewatering system to control settlement. The applicant further stated that there has been no plant-specific OE indicating notable cracking or distortion due to settlement. In its review of the RCB concrete foundation/mat component associated with AMR item 3.51-001 for which the applicant cited generic note A, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program for the applicable concrete components is acceptable because (1) the use of periodic visual inspections under the Structures Monitoring AMP to detect cracking and distortion in the RCB SCs will allow for degradations to be detected and corrective action to be taken prior to a loss of intended function, (2) according to the CLB, a dewatering system is not relied on to control settlement so there is no need to verify the continued functionality of a dewatering system, and (3) the staff reviewed the plant-specific OE and did not find any history of significant cracking or distortion that could adversely affect intended function due to increased levels of settlement stress.

For LRA AMR item 3.5.1-002, as modified by LRA Supplement 1 (ML23096A302), the applicant noted that this item is not used. The applicant pointed to LRA AMR item 3.5.1-001 as an alternative to AMR item 3.5.1-002 and stated that the Structures Monitoring AMP will be used to manage reduction of foundation strength and cracking due to settlement. The applicant also stated that CPNPP does not rely on a dewatering system to control settlement. The applicant further stated that the RCB is not founded on a porous concrete subfoundation. In its review of the RCB concrete foundation/mat component associated with AMR item 3.51-001, as an alternative to AMR item 3.5.1-002, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable because (1) the Structures Monitoring program proposed to manage the aging effects due to settlement is consistent with the GALL-LR Report, (2) the staff verified that the CPNPP structures do not rely on a dewatering system to control settlement, so there is no need for the licensee to verify the continued functionality of a dewatering system, and (3) the staff confirmed from the FSAR and the LRA that the RCB is not founded on a porous concrete subfoundation, and therefore, erosion of a porous concrete subfoundation is unlikely to be an aging effect that could impact the intended function.

Based on the programs identified, the staff concludes that the applicant's program meets SRP-LR Section 3.5.2.2.1.1 criteria. For those AMR items associated with LRA Section 3.5.2.2.1.1, the staff concludes that the LRA is consistent with the GALL-LR 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 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

LRA Section 3.5.2.2.1.2, associated with LRA Table 3.5-1, AMR item 3.5-1, 003, addresses the aging effect of reduction of strength and modulus of elasticity due to elevated temperature in concrete components (e.g., dome, wall, basemat, ring girders, buttresses, containment, concrete fill-in annulus) of containment structures exposed to air-indoor uncontrolled or air-outdoor environment. The applicant stated that this AMR item is not applicable.

In its review of LRA Section 3.5.2.2.1.2, the staff noted that local area temperatures may be elevated above general area temperatures due to process piping carrying high-temperature fluids, and the RCB penetration and reactor coolant piping insulation contribute to keeping the local concrete temperatures of the RCB and primary shield wall below 200°F during normal plant operation. In addition, the staff reviewed the applicant's response to RAI 3.5.2.2.1.2-1 (ML23208A193) and finds it acceptable because (1) the stainless steel reflective thermal insulation is not exposed to an aggressive environment and does not experience aging requiring aging management, (2) the reflective metallic insulation is not expected to be vulnerable to increased heat transfer if it comes into contact with moisture, and (3) no unique aging effects for the component type of insulation have been identified for the reflective metallic insulation.

The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.5.2.2.1.2 and finds it acceptable because, based on its review of LRA Section 3.5.2.2.1.2, Table 2.4-1, and Table 3.5.2-1, general area temperatures inside the RCB will not result in concrete temperatures in excess of 150°F, and the RCB piping penetration stainless steel reflective (mirror) type thermal insulation and reactor coolant piping insulation contribute to keeping the local concrete temperatures of the RCB and primary shield wall below 200°F during normal plant operation. Thus, the temperatures of the concrete containment components are kept below the threshold limits of 150°F for general areas and 200°F for local areas as recommended in the GALL-LR Report. Therefore, concrete containment components are not exposed to the temperatures required for this aging effect to occur.

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

Item 1. LRA Section 3.5.2.2.1.3, associated with LRA Table 3.5.1, item 3.5-1, 004, addresses loss of material due to general, pitting, and crevice corrosion for steel elements of inaccessible areas for drywell shell, drywell head, and drywell shell of a BWR exposed to an environment of air-indoor, uncontrolled, or concrete. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.5.2.2.1.3, item 1, and finds it acceptable because this further evaluation item applies only to BWRs, and CPNPP is a PWR.

LRA Section 3.5.2.2.1.3, as amended by LRA Supplement 2, dated April 24, 2023 (ML23114A377), associated with LRA Table 3.5.1, AMR item 3.5-1, 005, addresses loss of material due to general, pitting, and crevice corrosion for steel elements of inaccessible areas for liner plate, liner plate anchors, and integral attachments exposed to an air-indoor uncontrolled environment. The ASME Section XI, Subsection IWE program and the 10 CFR Part 50, Appendix J, program will manage these effects. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.5.2.2.1.3, item 1.

In its review of components associated with AMR item 3.5-1, 005, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWE program and the 10 CFR Part 50, Appendix J, program is acceptable for the following reasons: (1) a review of plant OE and Subsection IWE inspection reports has not identified instances of liner corrosion beyond minor surface corrosion that was evaluated and corrected and has not identified any degradation that originated on the inaccessible side of the liner, and (2) the use of the ASME Section XI, Subsection IWE program and the 10 CFR Part 50, Appendix J, AMPs to manage the loss of material of steel elements of the containment, with inspection of accessible areas as the leading indicator for inaccessible areas, and evaluation of inaccessible areas based on conditions found in augmented accessible areas, will allow for degradations to be detected and corrective action to be taken prior to a loss of intended function.

Item 2. LRA Section 3.5.2.2.1.3, associated with LRA Table 3.5.1, item 3.5-1, 006, addresses loss of material due to general, pitting, and crevice corrosion for steel elements in the torus shell of Mark I containments exposed to an environment of air-indoor, uncontrolled, or treated water. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.5.2.2.1.3, item 2, and finds it acceptable because this further evaluation item applies only to BWRs with Mark I containments, and CPNPP is a PWR.

Item 3. LRA Section 3.5.2.2.1.3, associated with LRA Table 3.5.1, item 3.5-1, 007, addresses loss of material due to general, pitting, and crevice corrosion for steel torus ring girders and downcomers of Mark I containments, downcomers of Mark II containments, and the interior surface of the suppression chamber shell of Mark III containments exposed to an environment of air-indoor, uncontrolled, or treated water. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.5.2.2.1.3, item 3, and finds it acceptable because this further evaluation item applies only to BWRs with Mark I, Mark II, or Mark III containments, and CPNPP is a PWR.

3.5.2.2.1.4 Loss of Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature

LRA Section 3.5.2.2.1.4, associated with LRA Table 3.5.1, item 3.5.1-008, addresses loss of prestress forces due to relaxation, shrinkage, creep, and elevated temperature for prestressed concrete containment tendons. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.5.2.2.1.4 and finds it acceptable because the CPNPP containments are steel-lined, reinforced concrete structures that do not use prestressed tendons. Therefore, a TLAA for prestressed tendons is not necessary.

3.5.2.2.1.5 Cumulative Fatigue Damage

LRA Section 3.5.2.2.1.5, associated with LRA Table 3.5-1, item 3.5-1, 009, states that fatigue waiver TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1) and that the evaluation of this TLAA for fatigue damage of the containment liner plate and process piping (mechanical) penetrations of carbon steel material (no dissimilar materials) are addressed in LRA Sections 4.6.1 and 4.6.2, respectively. This is consistent with SRP-LR Section 3.5.2.2.1.5 and is therefore acceptable. The staff's evaluation regarding the TLAAs for carbon steel containment liner plate and carbon steel process piping penetrations is documented in SE Sections 4.6.1 and 4.6.2, respectively.

The staff notes that TLAAs do not exist in the CLB for equipment hatch, personnel airlocks, electrical penetrations, piping penetrations with stainless steel or DMWs, and fuel transfer tube sleeve. These components will be monitored for cracking due to cyclic loading by periodic supplemental surface examinations included in the LRA B.2.3.29 IWE AMP as stated in LR Commitment 31(c), as amended by Supplement 2 (ML23114A377).

3.5.2.2.1.6 Cracking Due to Stress Corrosion Cracking

LRA Section 3.5.2.2.1.6, associated with LRA Table 3.5-1, AMR item 3.5-1, 010, addresses cracking due to SCC in the containment penetration bellows, sleeves, and fuel transfer tubes made of stainless steels, DMWs, or both, and exposed to a temperature exceeding 140°F, which will be managed by the ASME Section XI, Subsection IWE and the 10 CFR Part 50, Appendix J, programs. The NRC staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.5.2.2.1.6.

SRP-LR Section 3.5.2.2.1.6 recommends further evaluation of additional appropriate examinations or evaluations implemented to detect the SCC aging effect for the containment penetration bellows, sleeves, and fuel transfer tubes made of stainless steels, DMWs, or both and exposed to temperatures exceeding 140°F. The existing ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J, programs rely on visual examinations and leakage testing to manage the SCC aging effect.

To meet the criteria in SRP-LR Section 3.5.2.2.1.6, the applicant proposed to implement a supplemental one-time inspection using a volumetric, surface, or enhanced visual (EVT-1) examination of a representative sample of the 22 containment penetration bellows, sleeves, and fuel transfer tubes made of stainless steels, DMWs, or both and exposed to a temperature higher than 140°F to confirm the absence of cracking due to the SCC. The supplemental one-time inspection is a part of the applicant's enhancement of the ASME Section XI, Subsection IWE program (i.e., LRA Section B.2.3.29 as amended by LRA Supplement 2 (ML23114A377)). Qualified personnel will perform the supplemental one-time inspection on at least four of the containment penetrations of each unit and one of the fuel transfer tubes of each unit within 5 years prior to the period of extended operation. If the supplemental one-time inspections identify cracking due to SCC, the applicant will conduct additional or periodic inspections in accordance with the site's corrective action process.

In its review of components associated with LRA Table 3.5-1, AMR item 3.5-1, 010, the NRC staff finds that the applicant has met the further evaluation criteria because the proposed one-time inspection can detect SCC if it is present in the stainless steels or DMWs of the containment penetrations and fuel transfer tubes and provides reasonable assurance that the SCC aging effect in the components is adequately managed. SE Sections 3.0.3.2.21 and 3.0.3.1.11 provide the NRC staff's review of the ASME Section XI, Subsection IWE and the 10 CFR Part 50, Appendix J, programs, respectively.

Based on the program identified, the NRC staff concludes that the applicant's program meets the SRP-LR Section 3.5.2.2.1.6 criteria. For those AMR items associated with LRA Section 3.5.2.2.1.6, the NRC staff concludes that the LRA is consistent with the GALL-LR 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 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

LRA Section 3.5.2.2.1.7, associated with LRA Table 3.5-1, item 3.5-1, 011, addresses the aging effects of loss of material (scaling, spalling) and cracking due to freeze-thaw in inaccessible areas of concrete components (e.g., dome, wall, basemat, ring girders, buttresses) of containment structures exposed to an air-outdoor or ground water/soil environment, which will be managed by the ASME Section XI, Subsection IWL program and the Structures Monitoring program. The staff reviewed the applicant's proposal, as amended by LRA Supplement 1 (ML23096A302), against the criteria in SRP-LR Section 3.5.2.2.1.7.

In its review of components associated with AMR item 3.5-1, 011, the staff finds that the applicant has met further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWL program and the Structures Monitoring program is acceptable for several reasons:

(1) The concrete mix designs contain an air-entraining admixture capable of entraining 2 to 5 percent air, which is slightly beyond the air content of 3 to 8 percent stated in SRP-LR Section 3.5.3.2.1.7. However, the concrete's air entrainment content conforms to the design requirements of ACI 211.1 and was determined by ASTM C231. Thus, the concrete mix design provides for low permeability and adequate air entrainment such that the concrete has good freeze-thaw resistance. Furthermore, plant OE has not identified any aging effects related to freeze-thaw in accessible areas. Therefore, a plant-specific program or plant-specific enhancements to the ASME Section XI, Subsection IWL program and the Structures Monitoring program are not needed;

(2) The absence of concrete loss of material and cracking due to freeze-thaw is confirmed under the ASME Section XI, Subsection IWL program and the Structures Monitoring program.

(3) The Structures Monitoring program will perform opportunistic inspections of normally inaccessible below-grade concrete when excavated for any other reason and will evaluate the acceptability of inaccessible areas when observed aging effects in accessible areas, which could indicate degradation in inaccessible areas.

Based on the program identified, the staff concludes that the applicant's program meets SRP-LR Section 3.5.2.2.1.7 criteria. For those AMR items associated with LRA Section 3.5.2.2.1.7, the staff concludes that the LRA is consistent with the GALL-LR 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 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

LRA Section 3.5.2.2.1.8, associated with LRA Table 3.5-1, item 3.5-1, 012, addresses the aging effect of cracking due to expansion from reaction with aggregates in inaccessible areas of concrete components (e.g., dome, wall, basemat, ring girder, buttresses) of containment structures exposed to any environment, which will be managed by the ASME Section XI, Subsection IWL program and the Structures Monitoring program. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.5.2.2.1.8.

In its review of components associated with item 3.5-1, 012, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWL program and the Structures Monitoring program is acceptable for the following reasons:

(1) CPNPP has no plant-specific OE related to cracking due to expansion from reaction of aggregates. Therefore, a plant-specific AMP is not needed.

(2) The ASME Section XI, Subsection IWL program and the enhanced Structures Monitoring program are capable of identifying the cracking associated with aggregate reactions such as "craze," "mapping" or "patterned" cracking to determine the presence of alkali-silica gel in the accessible concrete areas. The Structures Monitoring program requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas.

(3) The Structures Monitoring program will perform opportunistic inspections of normally inaccessible below-grade concrete when excavated for any other reasons.

Based on the program identified, the staff concludes that the applicant's program meets SRP-LR Section 3.5.2.2.1.8 criteria. For those AMR items associated with LRA Section 3.5.2.2.1.8, the staff concludes that the LRA is consistent with the GALL-LR 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 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

LRA Section 3.5.2.2.1.9, associated with LRA Table 3.5-1, item 3.5-1, 013, addresses the aging effects of an increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of concrete components (e.g., dome, wall, basemat) of containment structures exposed to a water-flowing environment. The applicant stated that this item is not used. The staff evaluated the applicant's claim and finds it acceptable because the aging effects of an increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation exposed to a water-flowing environment are managed by the ASME Section XI, Subsection IWL program and the Structures Monitoring program and addressed under AMR item 3.5-1, 014.

LRA Section 3.5.2.2.1.9, associated with LRA Table 3.5-1, item 3.5-1, 014, addresses the aging effects of an increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of concrete components (e.g., dome, wall, basemat, ring girder, buttresses) of containment structures exposed to a water-flowing environment, which will be managed by the ASME Section XI, Subsection IWL program and the Structures Monitoring program. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.5.2.2.1.9.

In its review of components associated with item 3.5-1, 014, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWL program and Structures Monitoring program is acceptable for the following reasons:

(1) There has been no plant-specific OE indicating leaching of calcium hydroxide or carbonation in accessible areas of the RCB. Therefore, a plant-specific program or plant-specific enhancements to the ASME Section XI, Subsection IWL program and the Structures Monitoring program are not needed.

(2) The ASME Section XI, Subsection IWL program and the Structures Monitoring program inspect for evidence of the aging effect in accessible areas (such as LRA AMR item 3.5-1, 020). The Structures Monitoring program requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas.

(3) The Structures Monitoring program will perform opportunistic inspections of normally inaccessible below-grade concrete when excavated for any other reasons.

Based on the program identified, the staff has determined that the applicant's programs meet SRP-LR Section 3.5.2.2.1.9 criteria. For those items associated with LRA Section 3.5.2.2.1.9, the staff concludes that the LRA is consistent with the GALL-LR 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 extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2 Non-Containment Plant Structures

3.5.2.2.2.1 Aging Management of Inaccessible Areas

Item 1. LRA Section 3.5.2.2.2.1, item 1, associated with LRA Table 3.5-1, AMR item 3.5-1, 042, addresses the aging effects of loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Group 1–3, 5, and 7–9 structures exposed to an air-outdoor or ground water/soil environment, which will be managed by the Structures Monitoring program. The staff reviewed the applicant's proposal, as amended by LRA Supplement 1 (ML23096A302), against the criteria in SRP-LR Section 3.5.2.2.2.1, item 1.

In its review of components associated with AMR item 3.5-1, 042, the staff finds that the applicant has met further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable for the following reasons:

(1) The concrete mix designs contain an air-entraining admixture capable of entraining 2 to 5 percent air, which is slightly beyond the air content of 3 to 8 percent stated in SRP-LR Section 3.5.3.2.2.1, item 1. However, the concrete's air entrainment content conforms to the design requirements of ACI 211.1 and was determined by ASTM C231; thus, the concrete mix design provides for low permeability and adequate air entrainment such that the concrete has good freeze-thaw resistance. Furthermore, plant OE has not identified any aging effects related to freeze-thaw in accessible areas. Therefore, a plant-specific AMP is not needed.

(2) The Structures Monitoring program inspects for evidence of the aging effect in the accessible concrete areas, and requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas.

(3) The Structures Monitoring program will perform opportunistic inspections of normally inaccessible below-grade concrete when excavated for any other reason.

Based on the program identified, the staff concludes that the applicant's program meets SRP-LR Section 3.5.2.2.2.1, item 1, criteria. For those AMR items associated with LRA Section 3.5.2.2.2.1, item 1, the staff concludes that the LRA is consistent with the GALL-LR 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 extended operation, as required by 10 CFR 54.21(a)(3).

Item 2. LRA Section 3.5.2.2.2.1, item 2, associated with LRA Table 3.5-1, AMR item 3.5-1, 043, addresses the aging effect of cracking due to expansion from reaction with aggregates in inaccessible concrete areas of Group 1–3, 5, and 7–9 structures exposed to any environment, which will be managed by the Structures Monitoring program. The staff noted that structures in

Group 2 and 9 are not applicable to CPNPP since the CPNPP containments are PWR designs. The staff reviewed the applicant's proposal, as modified by LRA Supplement 2 (ML23114A377), against the criteria in SRP-LR Section 3.5.2.2.2.1, item 2.

In its review of components associated with item 3.5-1, 043, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable for the following reasons:

(1) CPNPP has no plant-specific OE related to cracking due to expansion from reaction of aggregates. Therefore, a plant-specific AMP is not needed.

(2) The Structures Monitoring program is enhanced to identify the cracking associated with aggregate reactions such as "craze," "mapping," or "patterned" cracking to determine the presence of alkali-silica gel in the accessible concrete areas. The program requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas.

(3) The Structures Monitoring program will perform opportunistic inspections of normally inaccessible below-grade concrete when excavated for any other reasons.

Based on the program identified, the staff concludes that the applicant's program meets SRP-LR Section 3.5.2.2.2.1, item 2, criteria. For those AMR items associated with LRA Section 3.5.2.2.2.1, item 2, the staff concludes that the LRA is consistent with the GALL-LR 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 extended operation, as required by 10 CFR 54.21(a)(3).

<u>Item 3</u>. LRA Section 3.5.2.2.2.1, item 3, associated with (1) LRA Table 3.5-1, AMR item 3.5-1, 044, which addresses the aging effects of cracking and distortion due to increased stress levels from settlement in below-grade inaccessible areas of structures for all concrete structure groups exposed to a soil environment, which will be managed by the Structures Monitoring program, and (2) LRA Table 3.5-1 AMR item 3.5-1, 046, which addresses the aging effects of reduction in foundation strength, and cracking due to differential settlement and erosion of porous concrete subfoundations in below-grade inaccessible concrete areas of Group 1–3 and 5–9 structures exposed to a water-flowing environment. The staff noted that structures in Groups 2 and 9 are not applicable to CPNPP since the CPNPP containments are PWR designs. The staff reviewed the applicant's proposal, as modified by LRA Supplement 1 (ML23096A302), against the criteria in SRP-LR Section 3.5.2.2.2.1, item 3.

In its review of components associated with AMR items 3.5-1, 044, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable because the applicant does not credit a dewatering system that is relied on for settlement control at CPNPP.

LRA Table 3.5-1, item 3.5-1, 046, addresses the aging effects of reduction in foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundations in below-grade inaccessible concrete areas of structures in Groups 1, 3, and 5–8 exposed to a water-flowing environment. The applicant stated that the item is not used. The staff evaluated the applicant's claim and finds it acceptable because these aging effects are managed by the Structures Monitoring program and addressed under AMR item 3.5-1, 044.

Based on the program identified, the staff concludes that the applicant's program meets SRP-LR Section 3.5.2.2.2.1, item 3, criteria. For those AMR items associated with LRA Section 3.5.2.2.2.1, item 3, the staff concludes that the LRA is consistent with the GALL-LR 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 extended operation, as required by 10 CFR 54.21(a)(3).

Item 4. LRA Section 3.5.2.2.2.1, item 4, associated with LRA Table 3.5-1, AMR item 3.5-1, 047, addresses the aging effects of an increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of concrete components for Group 1–5 and 7–9 structures exposed to a water-flowing environment, which will be managed by the Structures Monitoring program. The staff noted that structures in Groups 2 and 9 are not applicable to CPNPP since the CPNPP containments are PWR designs. The staff reviewed the applicant's proposal, as modified by LRA Supplement 2 (ML23114A377) and LRA Annual Update (ML23290A273), against the criteria in SRP-LR Section 3.5.2.2.2.1, item 4.

In its review of components associated with item 3.5-1, 047, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable because (1) an engineering evaluation determined that the observed leaching of calcium hydroxide and carbonation in accessible areas has no impact on the intended function of the concrete structure; therefore, a plant-specific aging management program is not needed, (2) the Structures Monitoring program inspects for evidence of the aging effect in the accessible concrete areas and requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas, and (3) the Structures Monitoring program will perform opportunistic inspections of normally inaccessible below-grade concrete when excavated for any other reasons.

Based on the program identified, the staff concludes that the applicant's program meets SRP-LR Section 3.5.2.2.2.1, item 4 criteria. For those items associated with LRA Section 3.5.2.2.2.1, item 4, the staff concludes that the LRA is consistent with the GALL-LR 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 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

LRA Section 3.5.2.2.2.2, associated with LRA Table 3.5-1, item 3.5-1, 048, addresses the aging effect of reduction of strength and modulus of elasticity due to elevated temperature in Group 1–5 concrete structures exposed to an air-indoor uncontrolled environment. The staff noted that Group 2 structures are not applicable to CPNPP since the CPNPP containments are PWR designs. The staff also noted that aging management of Group 4 structures inside containment are addressed under AMR item 3.5-1, 013. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.5.2.2.2.2 and finds it acceptable because CPNPP's concrete temperatures for CPNPP Group 1, 3, and 5 structures are kept below the GALL-LR Report recommended threshold limits of 150°F for general areas and 200°F for local areas, and review of OE has not identified any issues related to elevated temperatures affecting concrete structures. Therefore, the concrete components are not exposed to the temperatures required for this aging effect to occur.

3.5.2.2.2.3 Aging Management of Inaccessible Areas for Group 6 Structures

Item 1. LRA Section 3.5.2.2.2.3, item 1, associated with LRA Table 3.5-1, AMR item 3.5-1, 049, addresses the aging effects of loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of water-control structures (Group 6) exposed to an air-outdoor or ground water/soil environment, which will be managed by the Structures Monitoring program. The staff reviewed the applicant's proposal, as amended by LRA Supplement 1 (ML23096A302) and LRA Supplement 2 (ML23114A377), against the criteria in SRP-LR Section 3.5.2.2.2.3, item 1.

In its review of components associated with AMR item 3.5-1, 049, the staff finds that the applicant has met further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable for the following reasons:

(1) The concrete mix designs contain an air-entraining admixture capable of entraining 2 to 5 percent air, which is slightly beyond the air content of 3 to 8 percent stated in SRP-LR Section 3.5.3.2.2.1, item 1. However, the concrete's air entrainment content conforms to the design requirements of ACI 211.1 and was determined by ASTM C231; thus, the concrete mix design provides for low permeability and adequate air entrainment such that the concrete has good freeze-thaw resistance. Furthermore, plant OE has not identified any aging effects related to freeze-thaw in accessible areas. Therefore, a plant-specific AMP is not needed;

(2) The Structures Monitoring program inspects for evidence of the aging effect in the accessible concrete areas and requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas.

(3) The Structures Monitoring program will opportunistically confirm the absence of aging effects by examining normally inaccessible structural components when excavated for any other reasons.

Based on the program identified, the staff concludes that the applicant's program meets SRP-LR Section 3.5.2.2.2.3, item 1, criteria. For those AMR items associated with LRA Section 3.5.2.2.2.3, item 1, the staff concludes that the LRA is consistent with the GALL-LR 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 extended operation, as required by 10 CFR 54.21(a)(3).

Item 2. LRA Section 3.5.2.2.2.3, item 2, associated with LRA Table 3.5-1, item 3.5-1, 050, addresses the aging effect of cracking due to expansion from reaction with aggregates in inaccessible concrete areas of water-control structures (Group 6) exposed to any environment, which will be managed by the Structures Monitoring program. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.5.2.2.2.3, item 2.

In its review of components associated with item 3.5-1, 050, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable for the following reasons:

(1) CPNPP has no plant-specific OE related to cracking due to expansion from reaction of aggregates. Therefore, a plant-specific AMP is not needed;

(2) The Structures Monitoring program is enhanced to identify the cracking associated with aggregate reactions such as "craze," "mapping," or "patterned" cracking to determine the presence of alkali-silica gel in the accessible concrete areas. The program requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas.

(3) The Structures Monitoring program will perform opportunistic inspections of normally inaccessible below-grade concrete when excavated for any other reason.

Based on the program identified, the staff concludes that the applicant's program meets SRP-LR Section 3.5.2.2.2.3, item 2, criteria. For those AMR items associated with LRA Section 3.5.2.2.2.3, item 2, the staff concludes that the LRA is consistent with the GALL-LR 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 extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. LRA Section 3.5.2.2.2.3, item 3, associated with LRA Table 3.5-1, item 3.5-1, 051, addresses increased porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of concrete components for water-control structures (Group 6) exposed to a water-flowing environment, which will be managed by the Structures Monitoring program. The staff reviewed the applicant's proposal, as amended by Supplement 2 (ML23114A377), against the criteria in SRP-LR Section 3.5.2.2.2.3, item 3.

In its review of components associated with item 3.5-1, 051, the staff finds that the applicant has met the further evaluation criteria. The applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable for the following reasons:

(1) An engineering evaluation determined that the observed leaching of calcium hydroxide and carbonation in accessible areas has no impact on the intended function of the concrete structure; therefore, a plant-specific aging management program is not needed.

(2) The Structures Monitoring program inspects for evidence of the aging effect in the accessible concrete areas. The program requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas.

(3) The Structures Monitoring program will perform opportunistic inspections of normally inaccessible below-grade concrete when excavated for any other reasons.

Based on the program identified, the staff concludes that the applicant's program meets SRP-LR Section 3.5.2.2.2.3, item 3, criteria. For those items associated with LRA Section 3.5.2.2.2.3, item 3, the staff concludes that the LRA is consistent with the GALL-LR

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 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

LRA Section 3.5.2.2.2.4, as amended by LRA Supplement 2 (ML23114A377), associated with LRA Table 3.5.1, item 3.5-1, 052, addresses cracking due to SCC and loss of material due to pitting and crevice corrosion for Group 7 and 8 stainless steel tank liners exposed to standing water. The applicant stated that this item is not used. The applicant pointed to LRA AMR items 3.2-1, 004, 3.3-1, 006, and 3.4-1, 003 as alternatives to AMR item 3.5.1, 052 and stated that it will use the External Surfaces Monitoring of Mechanical Components (B.2.3.22) AMP to manage loss of material at or above the waterline for the refueling water storage tank (RWST), reactor makeup water storage tank (RMWST), and condensate storage tank (CST) stainless steel tank liner. The applicant also stated that loss of material below the waterline is managed by the Water Chemistry (B.3.2.2) AMP, with effectiveness confirmed by the One-Time Inspection (B.3.2.19) AMP, as listed in item 3.2-1, 022, for the RWST liner and 3.4-1, 012 for the RMWST and CST stainless steel liners. The applicant further stated that SCC is not a concern for the stainless steel liner because air at CPNPP does not contain sufficient halides and the ambient temperature is less than 140°F inside the RWST, RMWST, and CST. In its review of the stainless tank liner components associated with AMR items 3.2-1, 004, 3.2-1, 022, 3.3-1, 006, 3.4-1, 003, and 3.4-1, 012, as alternatives to AMR item 3.5.1, 052, 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, the Water Chemistry, and the One-Time Inspection AMPs is acceptable for the following reasons:

(1) The External Surfaces Monitoring of Mechanical Components AMP proposed to manage loss of material due to pitting and crevice corrosion for tanks exposed to outdoor air is consistent with the GALL-LR Report.

(2) The Water Chemistry AMP and One-Time Inspection AMP proposed to manage loss of material due to pitting and crevice corrosion for tanks exposed to treated water (borated) is consistent with the GALL-LR Report.

(3) According to GALL-LR Chapter IX.D, SCC occurs very rarely in austenitic stainless steels below 140°F (60°C), and at ambient temperature, SCC will only occur in austenitic stainless steel in a harsh enough environment (i.e., significant contamination). Given that the air environment of the CPNPP is not harsh and ambient temperature is less than 140°F within the tanks, cracking due to SCC is unlikely to be an aging effect that could impact the intended function.

Based on the programs identified, the staff concludes that the applicant's program meet SRP-LR Section 3.5.2.2.2.4 criteria. For those AMR items associated with LRA Section 3.5.2.2.2.4, as amended, the staff concludes that the LRA is consistent with the GALL-LR 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 extended operation as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.5 Cumulative Fatigue Damage Due to Fatigue

LRA Section 3.5.2.2.2.5, associated with LRA Table 3.5-1, item 3.5-1, 053, addresses fatigue of support members, anchor bolts, and welds for Group B1.1, B1.2, and B1.3 component supports of steel exposed to an air-indoor uncontrolled environment, only if a CLB fatigue analysis exists. The applicant stated that this item is not applicable since CLB fatigue analyses do not exist for support members, anchor bolts, and welds for Group B1.1, B1.2, and B1.3 component supports at CPNPP.

The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.5.2.2.2.5 and finds it acceptable as follows. The staff confirmed through a review of the LRA and the FSAR that the applicant's CLB did not identify fatigue analyses for component support members, anchor bolts, and welds for Groups B1.1 and B1.2 that are required to be identified as TLAAs in accordance with 10 CFR 54.21(c)(1). Further, based on review of GALL-LR Report Table III, Group B1.3 component supports are associated with BWRs and therefore not applicable to CPNPP, which is a PWR.

3.5.2.2.3 Quality Assurance for Aging Management of Nonsafety-Related Components

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

3.5.2.2.4 Ongoing Review of Operating Experience

SE Section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of OE.

3.5.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL-LR Report

The following subsections document the staff's review of those AMR results listed in LRA Tables 3.5.2-1 through 3.5.2-15 that are either not consistent with or not addressed in the GALL-LR 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 an SRP-LR Table 1 item, the subsections are organized by applicable AMR sections and then by material and environment combinations.

For component type, material, and environment combinations not evaluated in the GALL-LR Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended functions consistent with the CLB for the period of extended operation. There is OE that is documented in the GALL-SLR Report for component type, material, and environment combinations that are not evaluated in the GALL-LR Report. As discussed in the GALL-SLR Report, future applicants for initial LR (40–60 years) may use aging management guidance from SLR (60–80 years) in their applications. Following the GALL-SLR Report aging management recommendations for those component type, material, and environment combinations are acceptable because it aligned with the staff's current guidance for LR. The following sections document the staff's evaluation.

3.5.2.3.1 Safe Shutdown Impoundment and Dam—Summary of Aging Management Evaluation

<u>Loss of Material or Loss of Form Due to Erosion, Settlement, Sedimentation, Frost Action, Waves, Currents, Surface Runoff, and Seepage</u>. LRA Table 3.5.2-7 states that loss of material or loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface

runoff, and seepage for earth and riprap earthen water-control structures exposed to an air-outdoor environment will be managed by the Inspection of Water-Control Structures Associated with Nuclear Power Plants program. These AMR items cite generic note G, for which the applicant has identified “air-outdoor environment” as an additional environment. The AMR items cite plant-specific note 1, which states, “Consistent with the OE reflected in NUREG-2192 (III.A6.T-22 / 3.5-1, 058), the air-outdoor environment (portions of the Safe Shutdown Impoundment, Dam, and Spillway) above the waterline are also included.”

The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by the applicant constitute all applicable aging effects for this component, material, and environment description. The staff noted that the applicant addressed the aging effect of loss of material or loss of form for this component, material, and environment combination in other AMR items (i.e., AMR item 3.5.1-058). Based on its review of LRA Table 3.5.2-7, which states the air-outdoor environment (portions of the safe shutdown impoundment, dam, and spillway) above the waterline are also included, 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 it demonstrates that the aging effect of loss of material or loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, and seepage for earth and riprap earthen water-control structures exposed to an air-outdoor environment will be managed by the Inspection of Water-Control Structures Associated with Nuclear Power Plants program in a manner that is consistent with the GALL-LR Report recommendations for the different material and environment combinations, so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

3.5.2.3.2 Service Water Intake Structure—Summary of Aging Management Evaluation

<u>Cracking due to expansion from reaction with aggregates</u>. LRA Table 3.5.2-8 states that cracking due to expansion from reaction with aggregates for accessible exterior above-grade concrete components in the SWIS exposed to an environment of water-flowing or standing will be managed by the Inspection of Water-Control Structures Associated with Nuclear Power Plants program. This AMR item cites generic note H, for which the applicant has identified NUREG-2191, AMR item III.A6.T-34/3.5-1, 096 as applicable to the SWIS. The AMR item cites plant-specific note 4, which states, “Consistent with the OE reflected in NUREG-2191 (III.A6.T-34 / 3.5-1, 096), cracking due to reaction with aggregates (ASR) in the SWIS intake bay will be managed by the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP (See also Section 3.5.2.2.2.3, item 3).” The staff noted that the referenced Section 3.5.2.2.2.3, item 3, is an error; the correct citation is Section 3.5.2.2.2.3, item 2.

The staff reviewed the associated item in the LRA and considered whether the aging effects proposed by the applicant constitute all applicable aging effects for this component, material, and environment description. The staff noted that the applicant addressed the aging effect of cracking due to expansion from reaction with aggregates for this component, material, and environment combination in other AMR items (i.e., AMR items 3.5-1, 012, 019, 043, 050, and 054). Based on its review of these LRA AMR items and NUREG-2191, AMR item III.A6.T-34/3.5-1, 096, which states that the effects of aging from cracking due to expansion from reaction with aggregates for accessible concrete components in Group 6 water-control structures exposed to any environment are managed by the Inspection of Water-Control Structures Associated with Nuclear Power Plants program and the component, material, and environment combination is the same, 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 it demonstrates that the aging effect of cracking due to expansion from reaction with aggregates for the accessible exterior above-grade concrete components in the SWIS will be managed by the Inspection of Water-Control Structures Associated with Nuclear Power Plants program in a manner that is consistent with the GALL-LR Report recommendations for these material and environment combinations, so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

3.5.2.3.3 Component Support Commodity Group—Summary of Aging Management Evaluation

<u>Copper Alloy >15%, Zn or >8% Al, Structural Support Bolting for ASME Class 3 Component Exposed to Raw Water</u>. LRA Table 3.5.2-13 states that loss of preload for structural support bolting for ASME Class 3 components with copper alloy, with greater than 15 percent zinc (Zn), or greater than 8 percent aluminum (Al), exposed to raw water, will be managed by LRA AMP B.2.2.31, ASME Section XI, Subsection IWF. The AMR item cites generic note F and plant-specific note 7, which states that structural bolting for the ASME Class 3 station service water pumps in the SWIS bay are of the same aluminum bronze material as the closure bolting for the pumps.

The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by the applicant constitute all of the applicable aging effects for this component, material, and environment description. The staff noted that the applicant referenced GALL-LR, Revision 2, items 3.5-1, 087 and III.B1.2.TP-229, to address the loss of preload in raw water for this component, material, and environment combination. The staff also noted that the applicant addressed loss of material for this component, material, and environment combination in other AMR items. Based on its review of GALL-LR Report, Revision 2, the staff noted that the applicant's selection of items 3.5-1, 087 and III.B1.2.TP-229 for loss of preload for copper alloy with greater than 15 percent Zn or greater than 8 percent Al is acceptable to manage the effects of aging for structures and component Class 2 and 3 structural bolting exposed to raw water through its ASME Section XI, Subsection IWF AMP B.2.3.31, because SRP-LR Report, Revision 2, item III.B1.2.TP-229, recommends management of loss of preload of structural bolting for any material and environment with GALL-LR Report, Revision 2, AMP XI.S3, "ASME Section XI, Subsection IWF," with which CPNPP AMP B.2.3.31 is consistent.

3.5.2.3.4 Crane/Hoist Commodity Group—Summary of Aging Management Evaluation

<u>Carbon Steel Girders and Rail Systems Exposed to Outdoor Air</u>. LRA Table 3.5.2-14, AMR item 3.3.1-052 addresses loss of material for steel exposed to an air–outdoor environment. For the LRA Table 2 AMR items that cite generic note G, the LRA credits the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP to manage the loss of material for the carbon steel girders and rail systems. The AMR items also cite plant-specific note 4, which states, "The Air - Outdoor environment is not in NUREG-1801 for this component and material. The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling System AMP is used to manage the aging effects for this component, material, and environment combination."

Based on its review of components associated with AMR item 3.3-1-052, for which the applicant cited generic note G, the staff finds the applicant's proposal to manage the effects of aging using the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling

Systems AMP acceptable because this AMP includes the inspection activities for the structural portions of load handling systems (i.e., bridge, rails, anchorages, and other parts). Preventive maintenance work orders schedule these inspections. Repairs are also completed using work orders as needed under the corrective action process. The CPNPP Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP consists of periodic visual inspections of crane SCs for evidence of deterioration or degradation, and the AMP is consistent with the GALL-LR Report recommendations. The inspection method and frequency are adequate to manage this aging effect in an outdoor air environment.

3.5.2.3.5 Containments, Structures, and Component Supports—Component Support Commodity Group—Summary of Aging Management Evaluation

Copper Alloy with Greater than 15 Percent Zn or 8 Percent Al Support Bolting Exposed to Raw Water. LRA Table 3.5.2-13 states that loss of material due to selective leaching for copper alloy with greater than 15 percent Zn or 8 percent Al support bolting exposed to raw water will be managed by the Selective Leaching program. The AMR item cites generic note F and plant-specific note 7, which states "[s]tructural bolting for the ASME Class 3 SSW pumps in the SWIS bay are the same aluminum bronze material as the closure bolting for the pumps."

The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by the applicant constitute all of the applicable aging effects for this component, material, and environment description. The staff noted that the applicant addressed loss of material (due to general, pitting, and crevice corrosion and MIC) and loss of preload for this component, material, and environment combination in other AMR items. Based on its review of the GALL-LR Report, 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 although the scope of GALL-LR Report AMP XI.M33, "Selective Leaching," is limited to piping, valve bodies and bonnets, pump casings, and heat exchanger components, structural bolting can also be effectively managed for loss of material due to selective leaching using the Selective Leaching program.

3.5.2.3.6 Fire Barrier Commodity Group—Summary of Aging Management Evaluation

Fire Barriers Exposed to Indoor Uncontrolled Air. As amended by letters dated April 24, 2023 (ML23114A377), and October 4, 2023 (ML23277A176), LRA Table 3.5.2-15 states that change in material properties, cracking, delamination, loss of material, and separation for silicate radiant energy shields, subliming compounds, and ceramic fiber/blanket insulation and wrap, and gypsum fire barrier walls, floors, and ceilings exposed to indoor uncontrolled air, will be managed by the Fire Protection program. The AMR items cite generic note F and plant-specific notes 2 and 4, which state the following:

2. This material is not addressed for fire barriers in NUREG-1801. Consistent with the OE [operating experience] reflected in SLR-ISG-2021-02-MECHANICAL (items VII.G.A-805 and VII.G.A-807 (subliming compounds, silicates); SRP items 3.3-1, 267 and 3.3-1, 269), aging of the component materials is managed by the Fire Protection (B.2.3.15) AMP.
4. Gypsum drywall (meeting ASTM C-36) is utilized throughout the plant to provide a fire barrier which is lightweight and where unit masonry or concrete is not feasible. This lightweight fire barrier material is not addressed in NUREG-1801; however, consistent with the OE [operating

experience] reflected in SLR-ISG-2021-02-MECHANICAL (item VII.G.A-806 (cementitious materials); SRP item 3.3-1, 268), aging is managed by the Fire Protection (B.2.3.15) AMP.

The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by the applicant constitute all the applicable aging effects for these components, material, and environment combinations. SLR-ISG-2021-02-MECHANICAL states the Fire Protection program manages loss of material, cracking/delamination, change in material properties, and separation for cementitious coating, silicate, and subliming compound fireproofing/fire barriers. In addition, SLR-ISG-2021-02-MECHANICAL states that the aging effects are consistent with Section 6, “Fire Barriers,” of Electric Power Research Institute (EPRI) 3002013084 and those effects cited by industry as part of SLRA lessons-learned activities and public comments on the draft AMR item. Therefore, the staff finds that the applicant has identified all applicable aging effects for these components, materials, and environment combinations.

The staff finds the applicant’s proposal to manage the effects of aging acceptable because the periodic visual inspections required by the Fire Protection program are capable of detecting the applicable aging effects before a loss of intended function for the components, materials, and environment combinations noted above. The discussions of RAI B.2.3.15-3 and Enhancement 5 in SE Section 3.0.3.2.12 contain additional information.

3.6 Aging Management of Electrical and Instrumentation and Controls

3.6.1 Summary of Technical Information in the Application

LRA Section 3.6 provides AMR results for those components that the applicant identified in LRA Section 2.5, “Scoping and Screening Results: Electrical,” as being subject to an AMR. LRA Table 3.6-1, “Summary of Aging Management Evaluations for Electrical Commodities,” gives a summary comparison of the applicant’s AMRs with those evaluated in the GALL-LR Report for the electrical components.

3.6.2 Staff Evaluation

SE Table 3.6-1, below, summarizes the staff’s evaluation of the component groups listed in LRA Section 3.6 and addressed in the GALL-LR Report.

Table 3.6-1 Staff Evaluation for Electrical and Instrumentation and Controls Components in the GALL-LR Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.6.1, 001	Consistent with the GALL-LR Report (see SE Section 3.6.2.2.1)
3.6.1, 002	Not applicable to CPNPP (see SE Sections 3.6.2.2.2 and 3.6.2.3.1)
3.6.1, 003	Not applicable to CPNPP (see SE Sections 3.6.2.2.2 and 3.6.2.3.1)
3.6.1, 004	Not applicable to CPNPP (see SE Sections 3.6.2.2.3 and 3.6.2.3.2)
3.6.1, 005	Not applicable to CPNPP (see SE Sections 3.6.2.2.3 and 3.6.2.3.2)
3.6.1, 006	Not applicable to CPNPP (see SE Sections 3.6.2.2.3 and 3.6.2.3.2)
3.6.1, 007	Not applicable to CPNPP (see SE Sections 3.6.2.2.3 and 3.6.2.3.2)
3.6.1, 008	Consistent with the GALL-LR Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.6.1, 009	Consistent with the GALL-LR Report
3.6.1, 010	Consistent with the GALL-LR Report
3.6.1, 011	Consistent with the GALL-LR Report
3.6.1, 012	Consistent with the GALL-LR Report
3.6.1, 013	Consistent with the GALL-LR Report
3.6.1, 014	Not applicable to CPNPP (See SE Section 3.6.2.1.1)
3.6.1, 015	Consistent with the GALL-LR Report
3.6.1, 016	Not applicable to CPNPP
3.6.1, 017	Not applicable to CPNPP
3.6.1, 018	Consistent with the GALL-LR Report
3.6.1, 019	Consistent with the GALL-LR Report
3.6.1, 020	Not applicable to CPNPP
3.6.1, 021	Consistent with the GALL-LR Report

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

(1) SE Section 3.6.2.1 discusses AMR results for components that the applicant stated are either not applicable to CPNPP or are consistent with the GALL-LR Report. Section 3.6.2.1.1 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 subsection in SE Section 3.6.2.1 documents the review of components that required additional information or otherwise required explanation.

(2) SE Section 3.6.2.2 discusses AMR results for which the GALL-LR Report and SRP-LR recommend further evaluation. The table above identifies these items as consistent with the GALL-LR Report and provides citations within SE Section 3.6.2.2 that provides additional information.

(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-LR Report. These AMR results typically are identified by generic notes F through J and plant-specific notes in the LRA.

3.6.2.1 Aging Management Review Results Consistent with the GALL-LR Report

The following subsections document the staff's review of AMR results listed in LRA Table 3.6.2-1 that the applicant determined to be consistent with the GALL-LR Report. The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL-LR Report; however, the staff did verify that the material presented in the GALL-LR Report was applicable and that the applicant identified the appropriate GALL-LR Report AMRs. For those AMR items that the staff found to be consistent with the GALL-LR Report, and for which no additional evaluation or RAI applies, the staff's review and conclusions, as documented in the GALL-LR Report, are considered to be the basis for acceptability of the AMR items. The staff's conclusion of "Consistent with the GALL-LR Report" is documented in SE Table 3.6-1, and no separate writeup is required or provided.

SE Section 3.6.2.1.1 documents the staff's review of AMR items that the applicant determined to be not applicable or not used.

For the AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in SE Section 3.6.2.1.2 below.

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

For LRA Table 3.6-1, AMR items 3.6-1, 014; 3.6-1, 016; 3.6-1, 017; and 3.6-1, 020, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable to CPNPP. The staff reviewed the LRA, description of the material and environment associated with each AMR item, and the associated AMP and plant-specific documents and has concluded that the applicant's claim is reasonable.

3.6.2.1.2 Loss of Material Due to Pitting, Crevice Corrosion

LRA Table 3.6-1, AMR item 3.6-1, 015, addresses loss of material due to pitting, crevice corrosion for aluminum metal enclosed bus: external surface of enclosure assemblies exposed to air-outdoor. The AMR item cites plant-specific note 8, which states the following:

> CPNPP metal enclosed bus, external enclosure assemblies within the scope of LR are composed of aluminum and are exposed to an air-indoor, controlled or uncontrolled environment. Aluminum in an air-indoor, uncontrolled environment has no credible aging effects. Although general corrosion of the metal enclosed bus [MEB] enclosure assembly is typically only an applicable stressor for MEB in an air-outdoor environment, any compromise in the enclosure assembly is highly undesirable as it may adversely impact the MEBs intended function. CPNPP will manage loss of material of the MEB external enclosure assembly.

While AMR item 3.6-1, 015, identifies loss of material due to pitting, crevice corrosion for aluminum metal enclosed bus: external surface of enclosure assemblies exposed to an air-outdoor environment, the applicant clarified that the only metal enclosed bus, external enclosure assemblies within the scope of LR are made of aluminum and are exposed to an air-indoor, controlled or uncontrolled environment. The applicant included these components under AMR item 3.6-1, 015. The staff reviewed LRA Section B.2.3.40 and LRA Table 3.6.2-1 to confirm that aging effects on aluminum metal enclosed bus: external surface of enclosure assemblies exposed to an air-indoor, controlled or uncontrolled environment are minimal. The staff noted that the in-scope metal enclosed bus at CPNPP is relatively new (20 years old), and the corrosion-causing chemicals from industrial pollution or natural phenomena such as salt in coastal areas are not a major factor at CPNPP. OE at CPNPP has not indicated any significant degradation of the metal enclosed bus. As a conservative measure, the applicant has proposed to manage loss of material due to pitting, crevice corrosion of the aluminum metal enclosed bus external enclosure assemblies exposed to an air-indoor, controlled or uncontrolled environment in AMP B.2.3.34, "Structures Monitoring." The staff finds that the new AMP will provide reasonable assurance that the effects of aging on metal enclosed bus within the scope of LR are adequately managed so that the intended function(s) are maintained consistent with the CLB for the period of extended operation. Based on its review of LRA Section B.2.3.40 and OE, no further evaluation is required. The staff's evaluation of LRA AMP B.2.3.34 is documented in SE Section 3.0.3.2.25.

3.6.2.2 Aging Management Review Results for Which Further Evaluation Is Recommended by the GALL-LR Report

In LRA Section 3.6.2.2, the applicant further evaluates aging management for certain electrical and instrumentation and controls system components as recommended by the GALL-LR Report and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria in SRP-LR Section 3.6.2.2. The following subsections document the staff's review.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

LRA Section 3.6.2.2.1, associated with LRA Table 3.6-1, AMR item 3.6-1, 001, states that TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1). The applicant's evaluation of this TLAA is addressed in Section 4.4, "Environmental Qualification (EQ) of Electrical Equipment," of the LRA. This is consistent with SRP-LR Section 3.6.2.2.1, which states that TLAAs, as defined in 10 CFR 54.3, are evaluated in accordance with 10 CFR 54.21(c)(1), and the evaluation is therefore acceptable. The 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 Presence of Any Salt Deposits and Surface Contamination, and Loss of Material Due to Mechanical Wear Caused by Wind Blowing on Transmission Conductors

LRA Section 3.6.2.2.2, associated with LRA Table 3.6-1, AMR items 3.6-1, 002 and 3.6-1, 003, addresses loss of material due to mechanical wear caused by wind blowing on transmission conductors for high-voltage insulators and reduced insulation resistance due to the presence of salt deposits or surface contamination composed of porcelain, malleable iron, aluminum, galvanized steel, or cement exposed to an air-outdoor environment. The criteria in SRP-LR Section 3.6.2.2.2 state that the GALL-LR 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 is provided below.

Loss of Material (Mechanical Wear). LRA Section 3.6.2.2.2 associated with LRA Table 3.6-1, AMR item 3.6-1, 002, addresses loss of material due to mechanical wear caused by wind blowing on transmission conductors for high-voltage insulators composed of porcelain, malleable iron, aluminum, galvanized steel, or cement exposed to an air-outdoor environment. The applicant stated that this AMR item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.6.2.2.2 and finds it acceptable as follows.

The staff reviewed AMR item 3.6-1, 002, against the criteria in SRP-LR Section 3.6.2.2.2 and using the guidance in Appendix A.1, "Aging Management Review—Generic (Branch Technical Position RLSB-1)," to the SRP-LR.

In the LRA, the applicant noted that high-voltage insulators are subject to AMR if they are necessary for restoration of offsite power following a station blackout event. Other CPNPP high-voltage insulators are not subject to AMR because they do not perform or support an LR intended function. In the LRA, the applicant stated that the high-voltage insulators evaluated for CPNPP LR are those used to support uninsulated, high-voltage electrical components such as transmission conductors and switchyard buses that are within the scope of LR.

In the LRA, the applicant stated that loss of material due to mechanical wear is an aging effect for strain and suspension insulators if they are subject to significant movement and that movement of the insulators can be caused by wind blowing the supported transmission conductor, causing it to swing from side to side. The applicant further stated that the transmission lines in the 138 kilovolt (kV) and 345 kV switchyards are equipped with wind spoilers, which considerably reduce the galloping motion in the transmission lines resulting in minimal mechanical wear of high-voltage insulators. In the LRA, the applicant noted that routine inspections of the switchyard have not indicated any wear and concluded that mechanical wear of high-voltage insulators caused by wind blowing on transmission lines or surface contamination is not an aging effect significant enough to cause a loss of intended function during the period of extended operation.

<u>Reduced Insulation Resistance</u>. LRA Section 3.6.2.2.2 associated with LRA Table 3.6-1, AMR item 3.6-1, 003, addresses reduced insulation resistance due to the presence of salt deposits or surface contamination for high-voltage insulators composed of porcelain, malleable iron, aluminum, galvanized steel, or cement exposed to an air-outdoor environment. The applicant stated that this AMR item is not applicable. The staff evaluated the applicant's claim against the criteria in the SRP-LR Section 3.6.2.2.2 and finds it acceptable as follows.

The staff reviewed AMR item 3.6-1, 003, using the guidance in GALL-LR Report Section VI.A, and Appendix A.1 to the SRP-LR.

In the LRA, the applicant noted that various airborne materials such as dust, salt, and industrial effluents can contaminate porcelain and polymer insulator surfaces leading to reduced insulation resistance. In the LRA, the applicant also noted that industrial pollution is not a factor for the high-voltage insulators as there are no major industries in the vicinity of the CPNPP. Surface contamination from salt spray or other airborne contaminant is not a concern as the major body of water needed for the plant's cooling system is a freshwater reservoir supplied by two rivers, the Paluxy and Brazos. In the LRA, the applicant also noted that the buildup of other surface contaminants is gradual and, in most cases, washed away by rain and concluded that the rate of contamination buildup on insulator surfaces is not significant enough to cause a loss of intended function during the period of extended operation.

LRA Section 3.6.2.2.2 also discussed the properties of polymer type high-voltage insulators installed at the CPNPP switchyards. In the LRA, the applicant stated that the hydrophobic properties of silicon rubber provide resistance to ultraviolet rays, electrical aging, and corona effect and minimize leakage currents on the surface of the insulator, which helps maintain the performance of polymer insulators in contaminated environments. On silicon rubber insulators, water forms into droplets. This feature prevents the insulator surface from having a thin layer of water that can allow leakage currents to flow under contaminated conditions. The feature increases the reliability of the insulators because it minimizes the risk of flashover caused by contaminated surfaces, and consequentially, the polymer type of insulators can withstand high levels of contamination, minimizing the potential aging effects.

The staff conducted an audit (ML23172A136) of the information provided in LRA Section 3.6.2.2.2 and the program basis documents, including reports provided to the staff during the audit. In the LRA, the applicant noted that the results of the periodic inspections and the absence of plant-specific OE have confirmed that this aging effect is not significant for porcelain and polymer high-voltage insulators associated with the offsite power system required for recovery from a station blackout event. As such, the applicant did not propose any updates to its existing maintenance programs or plant licensing documents. During the audit, the staff's search of plant-specific OE and plant-specific inspection results did not reveal any evidence that wind-related degradation or observable loss of material was occurring on the high-voltage insulators. Since CPNPP is not located near the seacoast or near other sources of airborne particles, the staff finds that reduced insulation resistance due to salt-laden moisture or industrial pollution is not having a significant aging effect for high-voltage insulators at CPNPP.

For the AMR items listed above, the staff finds that the applicant has demonstrated that the effects of aging on high-voltage insulators are not significant for the CPNPP units. Based on its review of LRA Section 3.6.2.2.2 and the results of the audit, the staff concludes that while the applicant is not proposing a plant-specific AMP, the applicant's existing high-voltage insulator maintenance program, which includes routine walkdowns of the 138 kV and 230 kV switchyards, will provide reasonable assurance of satisfactory operation of the high-voltage insulators for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2.3 Loss of Material Due to Wind-Induced Abrasion, Loss of Conductor Strength Due to Corrosion, and Increased Resistance of Connection Due to Oxidation or Loss of Preload

LRA Section 3.6.2.2.3, associated with LRA Table 3.6-1, AMR items 3.6-1, 004; 3.6-1, 005; 3.6-1-006; and 3.6-1-007, addresses loss of conductor strength due to corrosion, increased resistance of connection due to oxidation or loss of preload, and loss of material due to wind-induced abrasion in transmission conductors and transmission connections, as well as switchyard buses and connections. The criteria in SRP-LR Section 3.6.2.2.3 state that the GALL-LR Report recommends further evaluation of a plant-specific AMP to ensure that the aging effects are adequately managed. These AMR items are discussed below.

Transmission Conductors Composed of Aluminum, Steel Exposed to Air-Outdoor. LRA Section 3.6.2.2.3, associated with LRA Table 3.6-1, AMR item 3.6-1, 004, addresses loss of conductor strength due to corrosion for transmission conductors composed of aluminum and steel exposed to an air-outdoor environment. The applicant stated that this AMR item is not applicable. The staff evaluated the applicant's claim against criteria in SRP-LR Section 3.6.2.2.3 and Appendix A.1 to the SRP-LR, and finds it acceptable because CPNPP is located in a rural farm-ranch community, and air quality in the area surrounding the plant contains low concentrations of corrosion-causing suspended particles such as sulfur dioxide and salts, which minimizes the corrosion rate. Also, there are no major industries producing chemicals within the immediate vicinity of the plant. Hence, no additional actions are needed to consider conductor corrosion-related aging effects for transmission conductors and switchyard bus connections.

Transmission Connectors Composed of Aluminum and Steel Exposed to an Air-Outdoor Environment. LRA Section 3.6.2.2.3, associated with LRA Table 3.6-1, AMR item 3.6-1, 005, addresses increased resistance of connection due to oxidation or loss of preload for transmission connectors composed of aluminum and steel exposed to an air-outdoor environment. The applicant stated that this AMR item is not applicable. The staff evaluated the applicant's claim against criteria in SRP-LR Section 3.6.2.2.3 and Appendix A.1, "Aging Management Review—Generic (Branch Technical Position RLSB-1)," to the SRP-LR and finds it acceptable because the use of antioxidant compound on connections to prevent moisture intrusion and maintenance practices at CPNPP minimize the potential increase in surface oxidation and consequential increase in connection resistance due to general corrosion of switchyard connection metal surfaces. Therefore, increased connection resistance due to surface oxidation is not an aging effect requiring additional management.

Switchyard Bus and Connections Composed of Aluminum, Copper, Bronze, Stainless Steel, and Galvanized Steel Exposed to Air-Outdoor. LRA Section 3.6.2.2.3, associated with LRA Table 3.6-1, AMR item 3.6-1, 006, addresses loss of material due to wind-induced abrasion; increased resistance of connection due to oxidation or loss of preload due to switchyard bus and connections composed of aluminum, copper, bronze, stainless steel, and galvanized steel exposed to an air-outdoor environment. The applicant stated that this AMR item is not applicable. The staff evaluated the applicant's claim against criteria in SRP-LR Section 3.6.2.2.3 and Appendix A.1 to the SRP-LR and finds it acceptable because the configuration of the bolted connections using Belleville washers and current maintenance activities, which include periodic infrared inspections to verify integrity of connections, minimize the potential for increased resistance due to loss of preload. Hence, no additional actions are needed to consider aging effects related to increases in connection resistance due to loss of preload for transmission conductor and switchyard bus connections.

Transmission Conductors Composed of Aluminum and Steel Exposed to Air-Outdoor. LRA Section 3.6.2.2.3, associated with LRA Table 3.6-1, AMR item 3.6-1, 007, addresses loss of material due to wind-induced abrasion due to transmission conductors composed of aluminum and steel exposed to an air-outdoor environment. The applicant stated that this AMR item is not applicable. The staff evaluated the applicant's claim against criteria in SRP-LR Section 3.6.2.2.3 and Appendix A.1 to the SRP-LR and finds it acceptable because the transmission conductors at CPNPP are generally in good condition, the design of the transmission lines in-scope of review include methods to reduce conductor vibrations and galloping, and research studies indicate that the type of conductors used at CPNPP generally do not show significantly reduced conductor life because of vibration-induced fatigue. Hence, no additional actions are needed to consider aging effects related to loss of material in transmission conductors due to wind-induced abrasion.

Based on its audit and application review, the staff concludes that CPNPP has met the SRP-LR Section 3.6.2.2.3 criteria. For those AMR items that apply to LRA Section 3.6.2.2.3, the staff finds that the LRA is consistent with the GALL-LR Report and that CPNPP has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

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

3.6.2.2.5 Ongoing Review of Operating Experience

SE Section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of OE.

3.6.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL-LR Report

The following subsections document the staff's review of those AMR results listed in LRA Table 3.6.2-1 that are either not consistent with or not addressed in the GALL-LR 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 an SRP-LR Table 1 item, the subsections are organized by applicable AMR sections and then by material and environment combinations.

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

3.6.2.3.1 High-Voltage Insulators Composed of Porcelain, Malleable Iron, Aluminum, Galvanized Steel, Cement Exposed to Air-Outdoor

For LRA Table 3.6-1, AMR items 3.6-1, 002 and 3.6-1, 003, the applicant claims that the corresponding AMR items for CPNPP high-voltage electrical insulators (porcelain and polymer) in the GALL-LR Report are not applicable because the associated AMR items do not perform or support an LR-intended function. These AMR items for loss of material and reduced insulation resistance (porcelain) cited generic note I, which states that the aging effect in GALL-LR Report for this component, material, and environment combination is not applicable. The AMR items also cite plant-specific notes 2 and 3 which state:

> Plant-Specific Note 2: Based on CPNPP design and a review of OE, loss of material is not an applicable aging effect for CPNPP high-voltage insulators. CPNPP high-voltage insulators within the scope of LR are not subject to mechanical wear caused by wind blowing on transmission conductors. For more information see Section 3.6.2.2.2.
>
> Plant-Specific Note 3: Based on CPNPP design and a review of OE, reduced insulation resistance is not an applicable aging effect for CPNPP high-voltage insulators. CPNPP high-voltage insulators within the scope of LR are not subject to reduced insulation resistance due to the presence of salt deposits or surface contamination.

These AMR items for reduced insulation resistance (polymer) also cited generic note J, which states that neither the components nor the material and environment combination is evaluated in the GALL-LR Report.

The staff's evaluation of the applicant's claim regarding these LRA Table 3.6-1 AMR items is documented in SE Section 3.6.2.2.2.

3.6.2.3.2 Transmission Conductors Composed of Aluminum; Steel Exposed to Air-Outdoor; and Switchyard Bus and Connections Composed of Aluminum, Copper, Bronze, Stainless Steel, and Galvanized Steel Exposed to Air-Outdoor

For LRA Table 3.6-1, AMR items 3.6-1, 004, 3.6-1, 005, 3.6-1, 006, and 3.6-1, 007, the applicant claims that the corresponding AMR items for loss of material, increased resistance of connections, and loss of conductor strength for CPNPP switchyard bus and connections, transmission connectors, and conductors in the GALL-LR Report are not applicable because the aging effects are not applicable for these component, material, and environment combinations. These AMR items cite generic note I. The AMR items also cite plant-specific note 4 for switchyard bus and connections and plant-specific notes 5, 6, and 7 for transmission connectors and conductors. These notes are as follows:

Plant-Specific Note 4: Based on CPNPP design and a review of OE, loss of material and increased resistance of connection are not applicable aging effects for CPNPP switchyard bus and connections. CPNPP switchyard bus and connections within the scope of LR are not subject to wind-induced abrasion nor oxidation or loss of preload. For more information see Section 3.6.2.2.3.

Plant-Specific Note 5: Based on CPNPP design and a review of OE increased resistance of connection is not an applicable aging effect for CPNPP transmission connectors. CPNPP transmission connectors within the scope of LR are not subject to oxidation or loss of preload. For more information see Section 3.6.2.2.3.

Plant-Specific Note 6: Based on CPNPP design and a review of OE loss of conductor strength is not an applicable aging effect for CPNPP transmission conductors. CPNPP transmission conductors within the scope of LR are not subject to loss of conductor strength due to corrosion. For more information see Section 3.6.2.2.3.

Plant-Specific Note 7: Based on CPNPP design and a review of OE loss of material is not an applicable aging effect for CPNPP transmission conductors. CPNPP transmission conductors within the scope of LR are not subject to wind-induced abrasion. For more information see Section 3.6.2.2.3.

The staff's evaluation of the applicant's claim regarding these LRA Table 3.6-1 AMR items is documented in SE Section 3.6.2.2.3.

3.6.2.3.3 Electrical Commodities—Summary of Aging Management Evaluation

LRA Table 3.6.2-1 states that reduced insulation resistance for various organic polymers (EPR) on cable bus insulation material for electrical cables exposed to adverse localized environment caused by heat, radiation, or moisture will be managed by LRA AMP B.2.3.37, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." The AMR item cites generic note J.

The AMR item cites plant-specific note 1, which states the following:

Cable bus is comprised of a metallic cable tray enclosure that solely houses three-phase insulated power cables installed on insulated support blocks. Plant walkdown has verified that the CPNPP cable bus within the scope of LR consists of sections that connect the low side of startup transformers XST1 and XST2, and alternate startup transformers XST1A and XST2A to their respective safety-related 6.9 kV buses. The cable bus utilized in the power paths for startup transformers XST1 and XST2 consists of 1000 kcmil, 15 kV (Ethylene Propylene Rubber) EPR insulated cable with one, two or four conductors per phase. Plant walkdown has verified that the cables run through ductwork enclosures fabricated of aluminum, with solid top coverings and solid sides panels, with louvered (slotted) bottom coverings. The duct supports are fabricated of steel as confirmed by plant walkdown. The cable bus utilized in the power paths from startup transformers XST1 and XST2 was installed during original plant construction. Note: the 1000 kcmil, 15 kV EPR insulated cable off the X-winding of startup transformers XST1 is run in dedicated cable tray not cable bus. The cable bus utilized in the power paths from alternate startup transformers XST1A and XST2A was installed within the last 20 years to support the installation of the alternate startup transformers and consists of 1/C 1000 kcmil (4 per phase) 15 kV EPR insulated cable. Plant walkdown has verified that the cables run through ductwork enclosures fabricated of aluminum, with louvered (slotted) top and bottom coverings, with solid sides panels. The duct supports are fabricated of steel as confirmed by plant walkdown. CPNPP cable bus within the scope of LR is located in both indoor (Turbine, Switchgear and Safeguards Buildings) and outdoor areas. The service conditions for the cable bus are below the 60-year service limiting temperature and radiation thresholds for EPR insulated cable. The 1000 kcmil, 15 kV EPR insulated cables are purposely oversized for this cable bus application and are designed for worse case (vs steady state) loading. Cable blocks are designed to provide spacing of the single conductor cables and supply mechanical support. The cable blocks consist of either Permali sheets of laminate material (composite molding) or are constructed of polymer. Both materials are aptly suited for their benign service environments. In outdoor areas, moisture could enter the duct (via rain), but there is no pathway for moisture to collect on the insulated cable bus because it will simply drain out the slots at the bottom. Moisture is not a factor for the cable bus routed indoors because it is shielded from inclement weather by the structures themselves. Although cable bus design minimizes the potential for reduced insulation resistance, CPNPP will include cable bus in the Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.3.37) AMP to manage reduced insulation resistance due to adverse temperature, moisture, and radiation. The external cable bus ductwork enclosure (including external supports) will be visually inspected under the Structures Monitoring (B.2.3.34) program for loss of material. The Structures Monitoring (B.2.3.34) program will also inspect accessible external elastomers (e.g., gaskets, and sealants) for degradation including hardening, and loss of strength.

The staff reviewed the associated items in the LRA 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-LR Report AMP XI.E1, “Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements,” which states, “This AMP provides reasonable assurance the insulation material for electrical cables and connections will perform its intended function for the period of extended operation,” 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 reduced insulation resistance of cable bus insulation materials for electrical cables exposed to adverse localized environment caused by heat, radiation, or moisture is in accordance with the provisions of the applicant’s LRA AMP B.2.3.37 and is consistent with the GALL-LR Report.

<u>Porcelain, Malleable Iron, Aluminum, Galvanized Steel, and Cement High-Voltage Electrical Insulators (Porcelain) Exposed to Air-Outdoor</u>. LRA Table 3.6.2-1 states that for high-voltage electrical insulators (porcelain) composed of porcelain, malleable iron, aluminum, galvanized steel, or cement exposed to an air-outdoor environment, aging effects are not applicable and no

AMP is proposed. The AMR items cite generic note I. The AMR items also cite plant-specific notes 2 and 3, which state the following:

> Plant-Specific Note 2: Based on CPNPP design and a review of OE, loss of material is not an applicable aging effect for CPNPP high-voltage insulators. CPNPP high-voltage insulators within the scope of LR are not subject to mechanical wear caused by wind blowing on transmission conductors. For more information see Section 3.6.2.2.2.
>
> Plant-Specific Note 3: Based on CPNPP design and a review of OE, reduced insulation resistance is not an applicable aging effect for CPNPP high-voltage insulators. CPNPP high-voltage insulators within the scope of LR are not subject to reduced insulation resistance due to the presence of salt deposits or surface contamination. For more information see Section 3.6.2.2.2.

The staff reviewed the associated items in the LRA to confirm that these aging effects are not applicable for this component, material, and environment combination. The staff finds the applicant's proposal acceptable based on its review of information provided in the LRA that states that the level of environmental and industrial pollutants such as salt or sulfur dioxide is not significant enough to adversely impact porcelain insulators. The staff's audit of OE confirmed that aging effects due to wind-related loss of material and reduction in high-voltage insulator properties due to surface contamination are not applicable for this component, material, and environment combination. A detailed review of LRA Section 3.6.2.2.2 is provided in Section 3.6.2.2.2 of this SE and no further evaluation is required.

<u>High-Voltage Electrical Insulators (Polymers) Composed of Silicone Rubber, Fiberglass, Aluminum Alloy, Stainless Steel, or Galvanized Metals Exposed to Air-Outdoor</u>. LRA Table 3.6.2-1 states that for high-voltage insulators (polymers) composed of silicone rubber, fiberglass, aluminum alloy, stainless steel, or galvanized metals exposed to an air-outdoor environment, there is no aging effect, and no AMP is proposed. The AMR item cites generic note J. The AMR item also cites plant-specific note 3, which states the following:

> Based on CPNPP design and a review of OE, reduced insulation resistance is not an applicable aging effect for CPNPP high-voltage insulators. CPNPP high-voltage insulators within the scope of LR are not subject to reduced insulation resistance due to the presence of salt deposits or surface contamination. For more information see Section 3.6.2.2.2.

The staff reviewed the associated items in the LRA to confirm that the aging effect is not applicable for this component, material, and environment combination. The staff finds the applicant's proposal acceptable based on its review of information provided in the LRA that notes that the level of environmental and industrial pollutants, such as salt or sulfur dioxide, are not significant enough to adversely impact polymer insulators. The hydrophobic properties of polymer insulators preclude formation of thin films that can form a leakage current path, provide excellent resistance to aging effects related to ultraviolet rays and corona, and perform well in contaminated environments. Furthermore, the staff's audit of OE confirmed that aging effects due to wind-related loss of material and reduction in high-voltage insulator properties due to surface contamination are not applicable for this component, material, and environment combination. A detailed review of LRA Section 3.6.2.2.2 is provided in Section 3.6.2.2.2 of this SE and no further evaluation is required.

Aluminum, Copper, Stainless Steel, and Galvanized Steel Switchyard Bus and Connections Exposed to Air-Outdoor and Aluminum and Steel Transmission Connectors and Conductors Exposed to Air-Outdoor. LRA Table 3.6.2-1 states that for switchyard bus and connections (aluminum, copper, stainless steel, galvanized steel), transmission connectors (aluminum, steel) and transmission conductors (aluminum, steel) exposed to an air-outdoor environment, aging effects are not applicable and no AMP is proposed. The AMR items cite generic note I. The AMR items cite plant-specific note 4 for switchyard bus and connections and plant-specific notes 5, 6, and 7 for transmission conductors. These notes state the following:

> Plant-Specific Note 4: Based on CPNPP design and a review of OE, loss of material and increased resistance of connection are not applicable aging effects for CPNPP switchyard bus and connections. CPNPP switchyard bus and connections within the scope of LR are not subject to wind-induced abrasion nor oxidation or loss of preload. For more information see Section 3.6.2.2.3.
>
> Plant-Specific Note 5: Based on CPNPP design and a review of OE increased resistance of connection is not an applicable aging effect for CPNPP transmission connectors. CPNPP transmission connectors within the scope of LR are not subject to oxidation or loss of preload. For more information see Section 3.6.2.2.3.
>
> Plant-Specific Note 6: Based on CPNPP design and a review of OE loss of conductor strength is not an applicable aging effect for CPNPP transmission conductors. CPNPP transmission conductors within the scope of LR are not subject to loss of conductor strength due to corrosion. For more information see Section 3.6.2.2.3.
>
> Plant-Specific Note 7: Based on CPNPP design and a review of OE loss of material is not an applicable aging effect for CPNPP transmission conductors. CPNPP transmission conductors within the scope of LR are not subject to wind-induced abrasion. For more information see Section 3.6.2.2.3.

The staff reviewed the associated items in the LRA to confirm that these aging effects are not applicable for these components, materials, and environment combinations. The staff finds the applicant’s proposal acceptable based on its review of an Ontario Hydroelectric research report showing that there is little evidence of reduced conductor life because of vibration-induced fatigue. Also, the design of transmission conductors at CPNPP includes vibration and galloping dampers, pollutants that could degrade and corrode switchyard and transmission components around the CPNPP are at lower levels, and the applicant’s maintenance practices include periodic visual inspections to monitor the condition of these components. Additional information can be found in Section 3.6.2.2.3 of this SE.

3.7 Conclusion for Aging Management Review Results

The staff reviewed LRA Section 3, “Aging Management Review Results,” and LRA Appendix B, “Aging Management Programs,” as supplemented. Based on the audit and the review of the applicant’s AMR 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 period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicant’s applicable FSAR supplement program summaries and concludes that, as required by 10 CFR 54.21(d), the FSAR supplement adequately describes the AMPs and activities credited for managing aging at Comanche Peak.

With regard to these matters, the staff concludes that actions have been identified and have been or will be taken such that there is reasonable assurance that the activities authorized by renewed operating licenses for Comanche Peak Units 1 and 2, if issued, will continue to be conducted in accordance with the CLB, and that any changes made to the CLB to comply with 10 CFR Part 54 are in accordance with the Atomic Energy Act of 1954, as amended, and the NRC's regulations.

SECTION 4 - TIME-LIMITED AGING ANALYSES

4.1 Identification of Time-Limited Aging Analyses

This section of the safety evaluation (SE) provides the U.S. Nuclear Regulatory Commission (NRC) staff's evaluation of the applicant's basis for identifying those time-limited aging analyses (TLAAs) and plant-specific exemptions, granted pursuant to 10 CFR 50.12, "Specific Exemptions" and in effect that are based on TLAAs.

The regulation in 10 CFR 54.3, "Definitions," defines TLAAs as those licensee calculations and analyses (henceforth referred to as "analysis" or "analyses") that:

(1) Involve systems, structures, and components within the scope of license renewal, as delineated in 10 CFR 54.4(a)
(2) Consider the effects of aging
(3) Involve time-limited assumptions defined by the current operating term, for example, 40 years (for initial license renewal)
(4) Were determined to be relevant by the licensee in making a safety determination;
(5) Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in 10 CFR 54.4(b) and
(6) Are contained or incorporated by reference in the current licensing basis (CLB)

The regulation in 10 CFR 54.21(c)(1) requires an applicant for license renewal to provide a list of TLAAs, as defined in 10 CFR 54.3, and demonstrate the following:

(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 applicant for license renewal must provide a list of plant-specific exemptions granted under 10 CFR 50.12, "Specific exemptions," and in effect that are based on TLAAs. For any such exemptions, the applicant must also provide an evaluation that justifies the continuation of the exemptions for the period of extended operation.

4.1.1 Summary of Technical Information in the Application

License renewal application (LRA) Section 4.1 describes the process the applicant used to identify the TLAAs within the applicant's CLB and design-basis documentation. The applicant identified the CLB and design-basis documentation that it reviewed and searched to identify potential TLAAs. The applicant identified TLAAs using methods consistent with NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plant," NEI 95-10, "Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule," and 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

In addition, the applicant stated that it reviewed the Comanche Peak CLB as required by 10 CFR 54.21(c)(2) to identify all plant-specific exemptions granted under 10 CFR 50.12 and in effect that are based on TLAAs. The applicant stated that there are no exemptions granted pursuant to 10 CFR 50.12 and in effect that are based on TLAAs.

4.1.2 Staff Evaluation

The NRC staff reviewed LRA Section 4.1 in accordance with the guidance provided in SRP-LR Section 4.1, “Identification of Time-Limiting Aging Analyses and Exemptions.” Specifically, SRP-LR Section 4.1.1 summarizes the areas of review. In addition, SRP-LR Section 4.1.2 summarizes the staff’s acceptance criteria for performing TLAA and LRA exemption identification reviews, and Section 4.1.3 summarizes the staff’s review procedures for performing the TLAA and LRA exemption identification reviews.

SRP-LR Table 4.1-1 provides a sample process for identifying potential TLAAs. SRP-LR Table 4.1-2 provides a list of generic TLAAs. SRP-LR Table 4.1-3 provides examples of potential plant-specific TLAAs that license renewal applicants have identified. The staff used the SRP-LR tables to determine whether the applicant identified all applicable calculations and analyses in its CLB as TLAAs in its LRA.

The LRA states that the applicant searched the CLB and design-basis documentation to identify potential TLAAs. The documentation that the applicant searched included the following: final safety analysis report (FSAR), technical specifications (TS) and bases (TSB), technical requirements manual (TRM) and bases (TRMB), facility operating license, calculations and design reports referenced in the FSAR, TSs, TSB, TRM, TRMB, and facility operating licenses, fire protection report, offsite dose calculation manual, process control program, inservice testing and inservice inspection program plans, core operating limits report, pressure-temperature limits report, NRC SERs, docketed licensing correspondence and design-basis documents.

During the audit (ML23172A136), the staff confirmed that the applicant performed a search of its CLB and design-basis documentation to identify potential TLAAs. The staff noted that the applicant used a list of specific key words during this search to identify potential TLAAs. The staff also confirmed that each potential TLAA identified during this search was reviewed by the applicant against the six criteria of 10 CFR 54.3(a) and that those potential TLAAs that met all six criteria were identified as TLAAs that require evaluation for the period of extended operation.

During its audit, the staff also confirmed that the applicant performed a search of docketed licensing correspondence, the operating license, and the FSAR to identify exemptions granted pursuant to 10 CFR 50.12 that are currently in effect. The staff also confirmed that the applicant reviewed these exemptions to determine whether the exemption was based on a TLAA, and that no 10 CFR 50.12 exemptions involve a TLAA as defined in 10 CFR 54.3.

During its review, the staff performed an independent search of the FSAR and a sample of docketed licensing correspondence and NRC SEs and safety evaluation reports (SERs) to identify potential TLAAs. Based on this independent search, the staff did not identify TLAAs that the applicant had not already identified in its LRA. Additionally, the staff did not identify any active exemptions granted pursuant to 10 CFR 50.12 and based on a TLAA, as defined in 10 CFR 54.3.

4.1.3 Conclusion

Based on its review and independent search, the staff concludes that the systematic approach the applicant took to search its CLB and design-basis documentation identified the analyses that meet all six criteria of a TLAA, in accordance with 10 CFR 54.21(c)(1). In addition, based on its review and independent search, the staff concludes that the systematic approach taken by the applicant to search its CLB for exemptions that were based on a TLAA is acceptable and no TLAAs were required to be identified in accordance with 10 CFR 54.21(c)(2).

4.2 Reactor Vessel Neutron Embrittlement Analysis

4.2.1 Neutron Fluence Projections

4.2.1.1 Summary of Technical Information in the Application

LRA Section 4.2.1, as modified by Attachment W1 to Supplement 2 (ML23114A377), 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)(ii) by projecting fluence analyses to the end of the period of extended operation.

The applicant projected the expected neutron fluence values for the RPV to 60 years. The applicant's projected neutron fluence values are for 56 effective full-power years (EFPY) based on the conservative assumption of a 100-percent capacity factor for the 20-year period of extended operation. Updated neutron fluence evaluations were documented in Attachment W1 to Supplement 2 (ML23114A377). RPV beltline and extended beltline fast neutron fluences (E > 1.0 MeV) were calculated. The applicant stated that the analysis methodologies used to calculate the Comanche Peak 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" (ML010890301) and are consistent with the NRC-approved methodology described in WCAP-18124-NP-A, Revision 0, "Fluence Determination with RAPTOR-M3G and FERRET" (ML18204A010) and WCAP-18124-NP-A, Revision 0, Supplement 1 NP-A (ML22203A024).

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)(ii), consistent with the review procedures in SRP-LR Section 4.2.3.1.1.2 and the acceptance criteria in SRP-LR Section 4.2.2.1.1.2. Specifically, the staff reviewed whether the applicant adequately reevaluated its RPV neutron fluence analysis for the period of extended operation. As part of the review, NRC staff considered whether the applicant (a) identified the neutron fluence for each beltline material at the end of the period of extended operation, (b) used a staff-approved methodology to calculate the neutron fluence, and (c) applied the methodology consistently with the guidance in RG 1.190.

The applicant stated that the neutron transport methodology used to generate neutron fluences are consistent with the NRC-approved methodology in WCAP-18124-NP-A, Revision 0, "Fluence Determination with RAPTOR-M3G and FERRET" (ML18204A010) and WCAP-18124-NP-A, Revision 0, Supplement 1 NP-A (ML22203A024). The applicant documented plant-specific calculation results in Attachment W1 to Supplement 2 (ML23114A377). The staff's review results are summarized below.

The transmittal of WCAP-18124-NP-A, Revision 0, states, "the NRC staff has found that WCAP-18124-NP-A, Revision 0, 'Fluence Determination with RAPTOR-M3G and FERRET,' is acceptable for referencing in licensing applications provided that the limitations and conditions stipulated in Section 4.0 and the applicability defined in the enclosed NRC final SE are met along with the proper documentation." Section 4.0 stipulates the following limitations and conditions:

1. Applicability of WCAP-18124-NP, Revision 0, is limited to the RPV region near the active height of the core based on the uncertainty analysis performed and measurement data provided. Additional justification should be provided via additional benchmarking, fluence sensitivity analysis to response parameters of interest (e.g., sure-temperature [P-T] limits, material stress/strain), margin assessment, or a combination thereof, for applications of the method to components including, but not limited to, the RPV upper circumferential weld and reactor coolant system inlet and outlet nozzles and reactor vessel internal components.
2. Least-squares adjustment is acceptable if the adjustments to the [measurement to calculation] M/C ratios and to the calculated spectra values are within the assigned uncertainties of the calculated spectra, the dosimetry measured reaction rates, and the dosimetry reaction cross sections. Should this not be the case, the user should re-examine both measured and calculated values for possible errors. If errors cannot be found, the particular values causing the inconsistency should be disqualified.

In addition, the NRC staff approved WCAP-18124-NP-A, Supplement 1P-A in a letter dated April 20, 2022. Section 3.3 of the NRC SE for this topical report states the following:

> Based on the considerations discussed above, the NRC staff determined that Westinghouse has provided appropriate modeling techniques and adequate qualification, via additional benchmarking, to apply RAPTOR-M3G to determine neutron fluence in the reactor vessel extended beltline. The modeling techniques adhere to the guidance in RG 1.190, as appropriate, and exceed it when necessary. Based on the consistency with RG 1.190, the NRC staff determined that RAPTOR-M3G fluence estimates for the extended beltline will conform to the requirements of GDCs 14, 30, and 31.
>
> When referencing WCAP-18124-NP-A and this supplement together in a licensing request, therefore, NRC licensees need not provide additional justification for application of RAPTOR-M3G to reactor vessel components that would be considered in the extended beltline as described in this SE, which would include the RPV upper circumferential weld and the RCS inlet and outlet nozzles (i.e., nozzle forgings and welds) referenced above.

In its audit and review, the staff reviewed the applicant's methodologies used for calculation of fluence in the extended beltline region and confirmed that they are consistent with WCAP-18124-NP-A, Supplement 1P-A. Therefore, the NRC staff finds that additional justification is not required to apply RAPTOR-M3G to RPV components considered in the extended beltline, and limitation and condition 1 of WCAP-18124-NP-A is met.

In its response to RAI 4.2.1-1 (ML23208A193), the applicant confirmed that reactor vessel neutron embrittlement TLAAs performed in support of the Comanche Peak LRA did not include any least-squares adjustment, which makes limitation and condition 2 not applicable for Comanche Peak. Therefore, the NRC staff finds that limitation and condition 2 of WCAP-18124-NP-A is not applicable.

In performing the fast neutron exposure evaluations for the Comanche Peak Units 1 and 2 reactor vessels, the applicant conducted a series of fuel-cycle-specific forward transport calculations using the RAPTOR-M3G three-dimensional discrete ordinates methodology as documented in Attachment W1 to Supplement 2. The applicant used the BUGLE-96 cross-section library, treated anisotropic scattering with a P_3 Legendre expansion and used a S_{16} order of angular quadrature. The staff determined that the use of the discrete ordinate transport code, cross-section library, cross-section angular quadrature and anisotropic scattering treatment is in conformance with RG 1.190, and is, therefore, acceptable.

For the Comanche Peak Units 1 and 2 transport calculations, the reactor models were constructed to include the necessary reactor vessel details, as described in Section 2.0 of Attachment W1 to Supplement 2. The model included representation of the surveillance capsules, RPV cladding, insulation located external to the RPV, RPV supports and various cutouts in the bioshield. The geometric mesh consisted of 233 radial intervals and 469 axial intervals, and 185 or 186 azimuthal intervals for the single- or double-surveillance capsule geometry, respectively. The inner iteration convergence criterion was set to 0.001. The staff finds that the plant representation, spatial mesh, and the pointwise inner iteration flux convergence criterion, as used with these reactor models for Attachment W1 to Supplement 2, are in conformance with RG 1.190 and are, therefore, acceptable.

The applicant provided an evaluation of the dosimetry sensor sets from the in-vessel surveillance capsules and ex-vessel neutron dosimetry withdrawn from both Comanche Peak Units 1 and 2. The NRC staff finds that the calculated reaction rates for the ex-vessel sensor sets located at the core midplane and in-vessel sensor sets agree with measurements to within the 20 percent acceptance criterion specified in RG 1.190. The NRC staff finds that cavity dosimetry calculations provided for Unit 1 agree with measurements within the 30 percent criterion specified for cavity dosimetry in RG 1.190. Predictions at the bottom of the Unit 2 fuel stack differ from measurements by more than 30 percent, however, the applicant noted that an installation error for the dosimeters negatively impacted the measurement-to-calculation comparison. RG 1.190 states that deviations between calculated and measured cavity dosimetry reaction rates exceeding 30 percent should be investigated and, when the cause of the deviation is determined to be an error in the calculation, the calculations must be modified. Because the discrepancy was investigated and attributed to an error in the measurement, the NRC staff finds this to have been dispositioned consistent with RG 1.190.

Consistent with Section 4.2.3.1.1.2 of NUREG-1800, the applicant identified the locations and projected (E > 1 MeV) fluence values of beltline materials[1]. The applicant identified the intermediate shell plates, lower shell plates, intermediate and lower shell longitudinal welds, and intermediate to lower shell girth welds as beltline materials. In addition, the applicant identified the upper shell plates, upper shell longitudinal welds, and upper shell to intermediate shell girth weld as extended beltline materials. The applicant also identified the welds inlet nozzle to nozzle belt forging weld, outlet nozzle to nozzle belt forging weld, and lower shell to lower head circumferential weld as non-beltline materials, as the projected neutron fluence is less than 1×10^{17} n/cm^2 (E > 1 MeV). Because the projected fluence does not exceed this threshold, the

[1] As noted in NRC Regulatory Issue Summary (RIS) 2014-11, "Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components" (ML14149A165), the term "beltline" is applicable to all reactor vessel ferritic materials with projected neutron fluence values greater than 1×10^{17} neutrons per square centimeter (n/cm^2) (E > 1 MeV). In this SE, the phrase "extended beltline" is intended to refer to those beltline regions that are further away from the active fuel region of the core.

effects of neutron radiation need not be considered when developing pressure-temperature (P-T) limits.

Based on the radiation transport calculation results and the beltline and extended beltline materials information, the staff confirmed that the applicant had tabulated and transmitted the fast neutron (E > 1.0 MeV) fluence projections to 56 EFPYs, equivalent to 60 years of operation, for both beltline and extended beltline materials of Comanche Peak Unit 1 and Unit 2 in LRA Table 4.2.1-1.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(ii) that the analyses for the neutron fluences at reactor vessel locations have been projected to the end of the period of extended operation. In addition, it meets the acceptance criteria in SRP-LR Section 4.2.2.1.1.2 because the methods used to calculate the neutron fluence are consistent with an NRC-approved methodology (WCAP-18124-NP-A) where the methodology and plant-specific calculations adhere to the guidance of RG 1.190, as summarized above, and the applicant provided the neutron fluence projections for each beltline and extended beltline material at the end of the period of extended operation.

4.2.1.3 FSAR Supplement

LRA Section A.3.2.1 provides the FSAR supplement summarizing the applicant's TLAA for neutron fluence projections. The staff reviewed LRA Section A.3.2.1 consistent with the review procedures in SRP-LR Section 4.2.3.2.

Based on its review, the staff finds that the FSAR supplement, as amended by letter dated July 27, 2023, meets the acceptance criteria in SRP-LR 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 applicant's TLAA for neutron fluence projections, as required by 10 CFR 54.21(d).

4.2.1.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis for the RPV beltline and extended beltline materials have been projected to the end of the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, 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

LRA Section 4.2.2 describes the applicant's TLAA for pressurized thermal shock (PTS). The applicant stated that all of the beltline reactor vessel materials for Comanche Peak Units 1 and 2 are projected to remain below the reference temperature for pressurized thermal shock (RT_{PTS}) screening criteria values of 270°F for plates, forgings, and longitudinal welds, and 300°F for circumferentially-oriented welds (per 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events") through the period of extended operation when considering neutron fluence values for 60 years (56 EFPY).

The applicant dispositioned the TLAA for PTS of the RPV beltline materials in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the period of extended operation.

4.2.2.2 Staff Evaluation

The staff reviewed the applicant's TLAA for PTS of the RPV beltline materials and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-LR Section 4.2.3.1.2.2.

During its audit (ML23172A136), the staff assessed the material property values (e.g., initial RT_{NDT}, weight percent copper, weight percent nickel) for the "beltline" materials in LRA tables 4.2.2-1 and 4.2.2-2 to confirm (1) these values were consistent with the CLB or (2) revisions to the CLB values are justified and appropriate. Through its examination of the FSAR, license amendments associated with power uprates, and Pressure-Temperature Limits Reports, the staff confirmed that the material property values are consistent with the applicant's CLB and therefore appropriate for use in determining RT_{PTS} values for the end of the period of extended operation. Additionally, based on this confirmation, the staff finds that appropriate margin values, consistent with 10 CFR 50.61, were applied for each Comanche Peak Unit 1 and 2 RPV "beltline" material for the purposes of addressing PTS.

During its audit and review, the staff also assessed the material property values (e.g., initial RT_{NDT}, weight percent copper, weight percent nickel) for the extended beltline materials in LRA Tables 4.2.2-1 and 4.2.2-2 to (1) confirm these values were consistent with the CLB, (2) confirm the revisions to the CLB values are justified and appropriate, or (3) determine if these values are justified and appropriate if the RPV materials were not previously addressed in the CLB. Based on its review of the applicant's material information that was based on information from certified material test reports, fabrication records, and/or databases containing RPV material information for the specific material, the staff confirmed that the values in the LRA tables are consistent with the CLB. Based on its review, the staff finds the material property values for the "extended beltline" materials are acceptable and appropriate for use in determining RT_{PTS} values for the end of the period of extended operation. Additionally, based on this verification, the staff finds that appropriate margin values, consistent with 10 CFR 50.61, were applied for each Comanche Peak Unit 1 and 2 RPV "extended beltline" material for the purposes of addressing PTS.

The staff noted that the applicant assessed relevant surveillance data to determine its credibility per the criteria in 10 CFR 50.61 and RG 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," and potential consideration as to its use when calculating RT_{PTS} values. Specifically, the applicant indicated that RT_{PTS} values for the following RPV materials in LRA Tables 4.2.2-1 and 4.2.2-2 were determined based on credible surveillance data (as defined in 10 CFR 50.61(c)(2)(i)):

- Comanche Peak Unit 1
    - Lower Shell Plate R-1108-2
    - Beltline Region Weld Metal (Heat # 88112)
    - Upper Shell Longitudinal Weld Seams 101-122 A, B, and C (Heat # 4P6052)

- Comanche Peak Unit 2
    - Intermediate and Lower Shell Longitudinal Welds (Heat # 89833)
    - Intermediate to Lower Shell Girth Weld (Heat # 89833)

  - Upper Shell to Intermediate Shell Girth Weld Seam 103-121 (Heat # 3P7317)

The staff reviewed Section 4, "Surveillance Data," Section 5, "Chemistry Factor," and Appendix B, "Comanche Peak Units 1 and 2 Surveillance Program Credibility Evaluation," of WCAP-18630-NP, Revision 0, "Comanche Peak Units 1 and 2 Time-Limited Aging Analysis on Reactor Vessel Integrity," and noted that it provides the applicant's assessment of surveillance data. Based on its audit and review, the staff verified that the applicant's use and assessment of its credible surveillance data for the evaluation of PTS and RT_{PTS} values is appropriate and consistent with 10 CFR 50.61 and RG 1.99, Revision 2.

The staff noted that LRA Section 4.2.2, identifies the consideration of noncredible surveillance data for the Comanche Peak Unit 2 Intermediate Shell Plate R-3807-2, which is the limiting material with respect to the PTS evaluation for Unit 2. The staff noted that the applicant provided its assessment of the noncredible surveillance data for the Unit 2 Intermediate Shell Plate R-3807-2 for completeness and not for demonstration that PTS is addressed in accordance with 10 CFR 50.61 through the period of extended operation, as discussed below. Additionally, since the use of the noncredible surveillance data would have provided lower estimates of RT_{PTS}, the consideration of this data was not considered relevant to the staff's evaluation of PTS and compliance with 10 CFR 50.61 through the period of extended operation.

The applicant stated that the limiting RT_{PTS} value at 56 EFPY for each unit are as listed below:

- base metal or longitudinal weld materials:
  - 102.6°F for Comanche Peak Unit 1, which corresponds to Intermediate Shell Plate R-1107-1
  - 92.8°F for Comanche Peak Unit 2, which corresponds to Intermediate Shell Plate R-3807-2
- circumferentially-oriented weld materials:
  - -24.2°F for Comanche Peak Unit 1, which corresponds to the beltline region weld metal with credible surveillance data
  - 32.1°F for Comanche Peak Unit 2, which corresponds to the Intermediate to Lower Shell Girth weld (Heat #89833).

Based on its review, as described above related to material property information and surveillance data, the staff verified that the projected RT_{PTS} values were calculated in accordance with 10 CFR 50.61; as such, the staff finds that the limiting materials for PTS identified by the applicant for (1) base metal or longitudinal weld materials and (2) circumferentially-oriented weld materials are appropriate and the associated RT_{PTS} values are less than the screening criteria specified in 10 CFR 50.61.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for PTS of the RPV materials have been projected to the end of the period of extended operation. Additionally, the TLAA meets the acceptance criteria in SRP-LR Section 4.2.2.1.2.2 because the PTS analyses were reevaluated consistent with 10 CFR 50.61 when considering the neutron fluence values for 60 years (56 EFPY), and the applicant has demonstrated that the PTS screening criteria were not exceeded.

4.2.2.3 FSAR Supplement

LRA Section A.3.2.2 provides the FSAR supplement summarizing the TLAA related to PTS of the RPV for Comanche Peak Units 1 and 2. The staff reviewed this section consistent with the acceptance criteria in SRP-LR Section 4.2.2.2 and the review procedures in SRP-LR Section 4.2.3.2.

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-LR 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 PTS event of the RPVs, as required by 10 CFR 54.21(d).

4.2.2.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for PTS of the RPV have been projected to the end of the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation for the period of extended operation, as required by 10 CFR 54.21(d).

4.2.3 Upper-Shelf Energy

4.2.3.1 Summary of Technical Information in the Application

LRA Section 4.2.3 describes the applicant’s TLAA for upper-shelf energy (USE) for the RPVs. The applicant stated that the Comanche Peak Units 1 and 2 reactor vessel beltline materials are projected to remain above the 10 CFR Part 50, Appendix G, “Fracture Toughness Requirements,” upper-shelf energy screening criterion of 50 ft-lb through the period of extended operation.

The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the period of extended operation.

4.2.3.2 Staff Evaluation

The staff reviewed the applicant’s TLAA for USE of the RPVs and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the acceptance criteria in SRP-LR Section 4.2.2.1.1.2 and the review procedures in SRP-LR Section 4.2.3.1.1.2.

During its audit (ML23172A136) and review, the staff assessed the material property values (e.g., initial upper-shelf energy, weight percent copper, weight percent nickel) for the “beltline” materials in LRA Tables 4.2.3-1 and 4.2.3-2 to confirm (1) these values were consistent with the CLB or (2) revisions to the CLB values are justified and appropriate. Through its examination of the FSAR, license amendments associated with power uprates, and Pressure-Temperature Limits Reports, the staff confirmed that the material property values are consistent with the applicant’s CLB and therefore appropriate for use in determining upper-shelf energy values for the end of the period of extended operation.

During its audit and review, the staff also assessed the material property values (e.g., initial USE, weight percent copper, weight percent nickel) for the “extended beltline” materials in LRA Tables 4.2.3-1 and 4.2.3-2 to (1) confirm these values were consistent with the CLB, (2) confirm revisions to the CLB values are justified and appropriate, or (3) determine if these values are justified and appropriate if the RPV materials were not previously addressed in the CLB. Based on its review of the applicant’s material information that was based on information from certified material test reports, fabrication records, and/or databases containing RPV material information for the specific material, the staff confirmed that the values in the LRA tables are consistent with the CLB. Based on its review, the staff finds the material property values for the “extended beltline” materials are acceptable and appropriate for use in determining upper-shelf energy values for the end of the period of extended operation.

The staff noted that the applicant assessed relevant surveillance data to determine its credibility per the criteria in RG 1.99, Revision 2, and potential consideration as to whether it is appropriate to use the surveillance data when calculating upper-shelf energy values. Specifically, the applicant indicated that upper-shelf energy values for the following RPV materials in LRA Tables 4.2.3-1 through 4.2.3-2 were determined based on surveillance data:

- Comanche Peak Unit 1
    - Lower Shell Plate R-1108-2
    - Beltline Region Weld Metal (Heat # 88112)
- Comanche Peak Unit 2
    - Intermediate and Lower Shell Longitudinal Welds (Heat # 89833)
    - Intermediate to Lower Shell Girth Weld (Heat # 89833)

The staff reviewed Section 4, “Surveillance Data,” Section 5, “Chemistry Factor,” and Appendix B, “Comanche Peak Units 1 and 2 Surveillance Program Credibility Evaluation,” of WCAP-18630-NP, Revision 0, and noted that it provides the applicant’s assessment of surveillance data. Based on its review, the staff verified the applicant’s use and assessment of its credible surveillance data for the evaluation of upper-shelf energy values is appropriate and consistent with RG 1.99, Revision 2.

The applicant stated that the limiting upper-shelf energy value at 56 EFPY for Comanche Peak Units 1 and 2 is 65 ft-lb for the Lower Shell Plate R-1108-1, and 69 ft-lb for the Upper Shell Plate R-3806-1, respectively. Based on its review, as described above related to the material property information and surveillance data, the staff verified that the applicant calculated the projected upper-shelf energy values, including those that took into consideration credible surveillance data, in accordance with RG 1.99, Revision 2. Therefore, the staff finds that the limiting materials for upper-shelf energy identified by the applicant are appropriate and the associated upper-shelf energy values are greater than the screening criterion of 50 ft-lb per Appendix G of 10 CFR Part 50 through the period of extended operation.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for upper-shelf energy of the RPV has been projected to the end of the period of extended operation. Additionally, the TLAA for upper-shelf energy of the RPV meets the acceptance criteria in SRP-LR Section 4.2.2.1.1.2 because the upper-shelf energy analyses were reevaluated consistent with RG 1.99, Revision 2, when considering the neutron fluence values for 60 years (56 EFPY). Also, the applicant has demonstrated that the requirement of 50 ft-lb per Appendix G, “Fracture Toughness Requirements,” of 10 CFR Part 50 was met.

4.2.3.3 FSAR Supplement

LRA Section A.3.2.3 provides the FSAR supplement summarizing the TLAA related to upper-shelf energy of the RPV for Comanche Peak Units 1 and 2. The staff reviewed this section consistent with the acceptance criteria in SRP-LR Section 4.2.2.2 and the review procedures in SRP-LR Section 4.2.3.2.

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-LR Section 4.2.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the TLAA for upper-shelf energy, as required by 10 CFR 54.21(d).

4.2.3.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the USE analyses for the RPV beltline and extended beltline materials for Comanche Peak Unit 1 and Unit 2 have been projected to the end of the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation for the 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

LRA Section 4.2.4 describes the applicant's TLAA for adjusted reference temperature (ART) for the RPV shell materials to account for irradiation effects on fracture toughness and the P-T limit curves.

The applicant dispositioned the TLAA for ART for the RPV shell materials in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the period of extended operation.

4.2.4.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the ART for the RPV shell materials and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii) consistent with the review procedures in SRP-LR Section 4.7.3.1.2.

During its audit (ML23172A136) and review, which are described in SE Section 4.2.2.2, the staff confirmed that the material property values (e.g., initial RT_{NDT}, percent copper, percent nickel) for the "beltline" materials in LRA Tables 4.2.4-1 through 4.2.4-4 are consistent with the applicant's CLB and are therefore appropriate for use in determining ART values at the 1/4 T and 3/4 T (T = the wall thickness of the RPV beltline region) location through the end of the period of extended operation. Additionally, based on this confirmation, the staff finds that the applicant applied the appropriate margin values consistent with RG 1.99, Revision 2, for each Unit 1 and 2 RPV "beltline" material for the purposes of addressing ART.

During its audit and review, which are described in SE Section 4.2.2.2, the staff also verified that the material information (e.g., initial RT_{NDT}, weight percent copper, weight percent nickel) for the "extended beltline" materials for Units 1 and 2 contained in LRA Tables 4.2.4-1 through 4.2.4-4 were based on information from certified material test reports, fabrication records, and/or databases containing RPV material information for the specific material. Based on its review, the staff finds the material property values are acceptable and appropriate for use in determining ART values at the 1/4 T and 3/4 T location, as appropriate, at the end of the period of extended operation. Based on its review and verification, the staff finds that the applicant applied the appropriate margin values consistent with RG 1.99, Revision 2, for each Unit 1 and 2 RPV "extended beltline" material for the purposes of addressing ART. Additionally, for the Unit

2 hot-leg nozzle materials, the staff noted that the applicant conservatively considered the maximum surface neutron fluence when calculating ART values, rather than considering the attenuation of radiation embrittlement through the thickness of the material.

The staff noted that the applicant assessed relevant surveillance data to determine its credibility per the criteria in RG 1.99, Revision 2, and potential consideration as to whether it is appropriate to use the surveillance data when calculating ART values. Specifically, the applicant indicated that ART values for the following RPV vessel materials in LRA Tables 4.2.4-1 through 4.2.4-4 that were determined based on credible surveillance data:

- Comanche Peak Unit 1
  - Lower Shell Plate R-1108-2
  - Beltline Region Weld Metal (Heat # 88112)
  - Upper Shell Longitudinal Weld Seams 101-122 A, B, and C (Heat # 4P6052)
- Comanche Peak Unit 2
  - Intermediate and Lower Shell Longitudinal Welds (Heat # 89833)
  - Intermediate to Lower Shell Girth Weld (Heat # 89833)
  - Upper Shell to Intermediate Shell Girth Weld Seam 103-121 (Heat # 3P7317)

During its audit and review, which are described in SE Section 4.2.2.2, the staff noted that Sections 4, “Surveillance Data,” Section 5, “Chemistry Factor,” and Appendix B, “Comanche Peak Units 1 and 2 Surveillance Program Credibility Evaluation,” of WCAP-18630-NP, Revision 0, provide the applicant’s assessment of surveillance data. Based on its audit and review, the staff verified the applicant’s use and assessment of its credible surveillance data for the evaluation of ART values is appropriate and consistent with RG 1.99, Revision 2.

The staff noted that LRA Section 4.2.2 identifies the consideration of noncredible surveillance data for the Unit 2 Intermediate Shell Plate R-3807-2. The staff noted that the applicant provided its assessment of the noncredible surveillance data for the Comanche Peak Unit 2 Intermediate Shell Plate R-3807-2 for completeness and its assessment did not impact the applicant’s determination that the Unit 1 Intermediate Shell Plate R1107-1 material has the limiting ART value at 56 EFPY for Comanche Peak Units 1 and 2. Additionally, the applicant explained in LRA Section 4.2.5 that the limiting ART value from Comanche Peak Unit 1 (i.e., Intermediate Shell Plate R1107-1) is used in the generation of the Units 1 and 2 reactor vessel P-T limit curves.

Based on its review described above, the staff verified that the projected adjusted reference temperature values were calculated in accordance with RG 1.99, Revision 2, and therefore, the staff finds the limiting ART value at 56 EFPY identified by the applicant is appropriate. The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for ART of the RPV shell material has been projected to the end of the period of extended operation. Additionally, the TLAA meets the acceptance criteria in SRP-LR Section 4.7.2 because the ART analyses were reevaluated consistent with RG 1.99, Revision 2 when considering the neutron fluence values for 60 years (56 EFPY). The staff noted that ART of the limiting RPV material for Comanche Peak Units 1 and 2 (i.e., Unit 1 Intermediate Shell Plate R1107-1) is used to adjust the beltline P-T limit curves to account for irradiation effects, which are evaluated in SE Section 4.2.5.

4.2.4.3 FSAR Supplement

LRA Section A.3.2.4 provides the FSAR supplement summarizing the TLAA for ART for Comanche Peak Units 1 and 2. The staff reviewed this section consistent with the acceptance criteria in SRP-LR Section 4.2.2.2 and the review procedures in SRP-LR Section 4.7.3.2.

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-LR Section 4.2.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the TLAA for ART, as required by 10 CFR 54.21(d).

4.2.4.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for ART have been projected to the end of the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation for the period of extended operation, as required by 10 CFR 54.21(d).

4.2.5 Pressure-Temperature Limits Including Low Temperature Over Pressure Protection Analysis

4.2.5.1 Summary of Technical Information in the Application

LRA Section 4.2.5, as supplemented by letter dated April 6, 2023 (ML23096A302), describes the applicant's TLAA for P-T limits including low temperature overpressure protection (LTOP) analysis.

The applicant dispositioned the TLAA, as supplemented by letter dated April 6, 2023, for P-T limits including LTOP analysis in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of irradiation embrittlement of the RPV and the P-T limits will be adequately managed by the Administrative Controls Process for the Pressure-Temperature Limits Report (PTLR) described in Technical Specification Section 5.6.6 through the period of extended operation.

4.2.5.2 Staff Evaluation

The staff reviewed the applicant's TLAA for P-T limits including LTOP for the Comanche Peak Units 1 and 2 RPVs and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.2.3.1.3.3.

SRP-LR Section 4.2.2.1.3.3 specifies that the 10 CFR 50.90 process for P-T limits located in the limiting conditions of operations or the Administrative Controls Process for P-T limits that are administratively amended through a PTLR process can be considered adequate aging management programs within the scope of 10 CFR 54.21(c)(1)(iii), such that P-T limits will be maintained through the period of extended operation.

The current P-T limits for Units 1 and 2 are contained in PTLR, ERX-07-003, Revision 6 (ML21075A112), which has a period of applicability through 36 EFPY. The staff noted that Revision 0 of Comanche Peak's PTLR was submitted to the staff in support of Operating License Amendment 132. The staff issued Amendment No. 132 to Facility Operating License

No. NPF-87 and Amendment No. 132 to Facility Operating License No. NPF-89 for Comanche Peak Steam Electric Station, Units 1 and 2, respectively, by letter dated February 22, 2007 (ML070320825). The applicant explained that the LTOP system pressurizer pressure-operation relief valve setpoint and other operational requirements were developed to protect the steady-state isothermal P-T limits. Further, the applicant indicated that the LTOP requirements will need to be updated when new P-T curves are generated through the period of extended operation and/or if plant changes are made that affect the LTOP system transients or mitigation capabilities. Based on its review, the staff noted that the Administrative Controls Process for the PTRL, as described in the applicant's Technical Specifications Section 5.6.6, requires that updates to the P-T limits, including LTOP analysis, will be submitted for staff review and approval prior to the expiration of the period of applicability for the P-T limits.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of irradiation embrittlement on the RPVs will be adequately managed for the period of extended operation. Additionally, the TLAA meets the acceptance criteria in SRP-LR Section 4.2.2.1.3.3 because, as discussed above, the P-T limits including LTOP analysis will be updated and submitted to the staff in accordance with the Administrative Controls Process for the PTLR described in Technical Specification Section 5.6.6 prior to the expiration of the period of applicability for the P-T limits.

4.2.5.3 FSAR Supplement

LRA Section A.3.2.5 provides the FSAR supplement summarizing the TLAA for P-T limits including LTOP Analysis for Comanche Peak Units 1 and 2. The staff reviewed this section consistent with the review procedures in SRP-LR Section 4.2.3.2.

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-LR Section 4.2.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the TLAA for P-T limits including LTOP analysis, as required by 10 CFR 54.21(d).

4.2.5.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of neutron irradiation on the intended functions of the Comanche Peak Units 1 and 2 RPVs and the associated P-T limits including LTOP analysis will be updated and submitted to the NRC prior to exceeding the current terms of applicability by the Administrative Controls Process for the PTLR described in Technical Specification Section 5.6.6. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation for the period of extended operation, as required by 10 CFR 54.21(d).

4.3 Metal Fatigue

LRA Section 4.3 states that fatigue analyses are required on components designed to ASME Code Section III, Class 1. Other codes require a fatigue analysis or assume a stated number of full-range thermal and displacement transient cycles, such as ASME Code Section III, Class 2 and 3; USA Standard (USAS) B31.7 (currently known as American National Standards Institute or ANSI), "Nuclear Power Piping" Class 1; USAS (ANSI) B31.1, "Power Piping", as allowed per USAS (ANSI) B31.7, Class 2 and 3; and ASME Code Section VIII, "Rules for Construction of Pressure Vessels," Division 2.

The applicant has identified the following analyses as fatigue TLAAs or support a fatigue TLAA:

- “Transient Cycle Projections for 60 Years” (LRA Section 4.3.1)
- “ASME Section III, Class 1 Fatigue Analysis of Piping, Piping Components, and Equipment” (LRA Section 4.3.2)
- “ASME Section III, Class 2 and 3 Allowable Stress Analyses” (LRA Section 4.3.3)
- “Environmentally Assisted Fatigue” (LRA Section 4.3.4)
- “Reactor Vessel Internals Fatigue Analyses” (LRA Section 4.3.5)
- “High-Energy Line Break Analyses” (LRA Section 4.3.6)

4.3.1 Transient Cycle Projections for 60 Years

4.3.1.1 Summary of Technical Information in the Application

LRA Section 4.3.1, as supplemented by the letter dated April 6, 2023, and October 17, 2023 (ML23096A302 and ML23290A273, respectively), describes the 60-year transient cycle projections. Two cycle projection methods are used to determine the 60-year projected cycles for each transient based on the accumulated cycles up to December 31, 2018. The first method calculates the 60-year cycles based on an extrapolation of the cycles accumulated from the start of the reactor operation. The second method uses the cycle accumulation over the recent 11.75 years of operation. The bounding (higher) cycles of the two methods are conservatively determined to be the 60-year projected cycles.

The applicant dispositioned the TLAA on 60-year cycle projections in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the period of extended operation.

4.3.1.2 Staff Evaluation

The staff reviewed the applicant’s TLAA on transient cycle projections for 60-year operation and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-LR Sections 4.3.3.1.1.2 and 4.3.3.1.2.2 (Class 1 and non-Class 1 piping respectively) and the acceptance criteria in SRP-LR Sections 4.3.2.1.1.2 and 4.3.2.1.2.2 (Class 1 and non-Class 1 piping respectively).

In the 60-year cycle projections for fatigue TLAAs, the applicant used two methods with the accumulated cycles up to December 31, 2018. The first method calculates the 60-year cycle projections based on an extrapolation of the cycles accumulated from the start of the reactor operation. The second method calculates the 60-year cycle projections based on cycle accumulation over the recent 11.75 years of operation. In addition, the applicant conservatively determined the bounding (higher) result of the two methods to be the final 60-year projected cycles for each of Comanche Peak Units 1 and 2.

The staff reviewed the applicant’s methodologies to determine the 60-year cycles projections and finds the cycle projections acceptable because the applicant used the actual cycle accumulation data in the projections and the applicant also selected conservative cycles between the projections (1) based on the cycle accumulation since the start of the operation and (2) based on the cycle accumulation for the recent 11.75 years. The applicant will also use the Fatigue Monitoring AMP (LRA Section B.2.2.1) to manage the effect of cumulative fatigue damage that is associated with the fatigue TLAAs (LRA Sections 4.3.2 through 4.3.6), as documented in SE Sections 4.3.2 through 4.3.6.

As discussed above, the staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(ii) that the TLAA on transient cycle projections for 60-year operation has been projected to the end of the period of extended operation. Additionally, it meets the acceptance criteria in SRP-LR Sections 4.3.2.1.1.2 and 4.3.2.1.2.2 (Class 1 and non-Class 1 piping, respectively) because the applicant calculated the 60-year projected cycles based on the actual cycle accumulation data to be used in the fatigue TLAAs for the period of extended operation, consistent with the guidance in SRP-LR Sections 4.3.2.1.1.2 and 4.3.2.1.2.2 (Class 1 and non-Class 1 piping respectively). The staff's evaluations of fatigue TLAAs are documented in SE Sections 4.3.2 through 4.3.6.

4.3.1.3 FSAR Supplement

LRA Section A.3.3.1 provides the FSAR supplement summarizing the TLAA on transient cycle projections for 60 years of operation. The staff reviewed the LRA Section A.3.3.1 consistent with the review procedures in SRP-LR Section 4.3.3.2. Based on its review of the FSAR supplement, the staff finds that it meets the acceptance criteria in SRP-LR Section 4.3.2.2 and is, therefore, acceptable. Additionally, the staff finds that the applicant provided an adequate summary description to address the TLAA on transient cycle projections for 60-year operation, as required by 10 CFR 54.21(d).

4.3.1.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration pursuant to 10 CFR 54.21(c)(1)(ii) that the analysis has been projected to the end of the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2 ASME Section III, Class 1 Fatigue Analysis of Piping, Piping Components, and Equipment

4.3.2.1 Summary of Technical Information in the Application

LRA Section 4.3.2, as supplemented by letters on April 6, 2023, and July 12, 2023 (ML23096A302 and ML23193A846, respectively), describes the applicant's fatigue TLAA for ASME Code Section III, Class 1 equipment, piping, and piping components. The fatigue analysis is based upon explicit numbers and amplitudes of thermal, pressure and seismic transients described in the design specifications. The fatigue analyses include reactor vessels, control rod drive mechanisms, pressurizers, steam generators, reactor coolant pumps, heat exchangers and valves. The existing fatigue analysis for 40 years of operation demonstrates that the cumulative usage factor (CUF) values do not exceed the design limit of 1.0.

The applicant dispositioned the fatigue TLAA in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of cumulative fatigue damage on the intended functions of the Class 1 equipment, piping and piping components will be adequately managed by the Fatigue Monitoring AMP for the period of extended operation. The Fatigue Monitoring AMP will be used to ensure that the CUF values meet the design limit of 1.0.

4.3.2.2 Staff Evaluation

The staff reviewed the applicant's fatigue TLAA for ASME Code Section III, Class 1 equipment, piping and piping components and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.3.3.1.1.3 and the acceptance criteria in SRP-LR Section 4.3.2.1.1.3.

The applicant indicated that the Class 1 fatigue TLAA includes the reactor coolant system and the following equipment associated with the reactor coolant system: (1) reactor vessels, (2) control rod drive mechanisms, (3) pressurizers, (4) steam generators, (5) reactor coolant pumps, (6) heat exchangers, and (7) valves.

The fatigue TLAA also includes the Class 1 portions of the following auxiliary piping systems: (1) residual heat removal system, (2) safety injection system, (3) emergency core cooling system, (4) accumulator system, (5) loop drain system, (6) reactor coolant pump seal water system, (7) normal letdown system, (8) alternate charging system, (9) pressurizer surge line, (10) normal charging system, (11) excess letdown system, and (12) pressurizer safety and relief system.

The LRA explains that the existing fatigue analysis for 40 years of operation demonstrates that the CUF values for Class 1 equipment, piping and piping components meet the fatigue design limit of 1.0. The applicant also projected the 60-year cycles of design transients in LRA Section 4.3.1, as supplemented by letter on April 6, 2023 (ML23096A302). Specifically, LRA Table 4.3.1-2 describes the 60-year projected cycles for the reactor coolant system and LRA Table 4.3.1-3 describes the 60-year projected cycles for the Class 1 portions of the auxiliary piping systems such as residual heat removal, safety injection and accumulator piping systems. In its supplement dated April 6, 2023, the applicant also revised the title of LRA Table 4.3.1-3 to clarify that the table describes the cycle projections for the Class 1 portions of the auxiliary piping systems rather than non-Class 1 portions.

LRA Tables 4.3.1-2 and 4.3.1-3 indicate that the 60-year projected cycles for Class 1 piping systems are bounded by (less than) the 40-year design cycles, except for the "letdown flow shutoff with prompt return to service" transient of Comanche Peak Unit 1. LRA Section 4.3.3 also indicates that the applicant evaluated the potential effect of this transient on the 60-year projected CUF. The LRA section further explains that the evaluation confirms that the 60-year projected cycles of the Unit 1 "letdown flow shutoff with prompt return to service" transient do not cause CUF to exceed the fatigue design limit of 1.0.

The staff noted that the 60-year projected environmentally adjusted CUF (CUF_{en}) values are less than 1.0, as described in LRA Section 4.3.4. These CUF_{en} values indicate that the 60-year projected CUF values are less the design limit (1.0) because the CUF_{en} values are bounding for the CUF values. In addition, the applicant will use the Fatigue Monitoring AMP (LRA Section B.2.2.1) to ensure that the CUF values do not exceed the design limit for the period of extended operation.

The staff finds that there is reasonable assurance that the CUF values can continue to meet the fatigue design limit of 1.0 for the period of extended operation because (1) the design cycles are bounding for the 60-year projected cycles, except for the Unit 1 "letdown flow shutoff with prompt return to service" transient, (2) the 60-year projected cycles of the Unit 1 "letdown flow shutoff with prompt return to service" transient do not cause the CUF value to exceed the fatigue design limit of 1.0 and (3) the Fatigue Monitoring AMP will monitor the design transient cycles and will take corrective actions as needed to ensure that the CUF values do not exceed the fatigue design limit (1.0).

In addition, LRA Section 4.3.2, as supplemented by LRA Supplement 1 dated April 6, 2023 (ML23096A302), indicates that the reactor coolant pump and steam generator locations conform to the waiver of fatigue requirements of ASME Code, Section III, NB-3222.4(d). In the supplement, the applicant also clarified that the Comanche Peak Unit 1 "letdown flow shutoff with prompt return to service" transient, which has a 60-year projected cycles than the original design cycles, is not applicable to the fatigue waiver evaluation and, therefore, does not affect the fatigue waiver evaluation. In its response (ML23193A846) to RAI 4.3.2-1, the applicant further described the specific components of the reactor coolant pump and steam generators that are subject to the existing fatigue waiver evaluation (e.g., reactor coolant pump seal leakoff nozzles and steam generator tube plugs). The staff's evaluation of the fatigue waiver TLAA for these components is further described below.

As discussed in LRA Section 4.3.2, the applicant determined that there is reasonable assurance that the existing fatigue waiver evaluation remains valid for 60 years of operation because the original design cycles used in the fatigue waiver evaluation are bounding for the 60-year projected cycles. Additionally, the Fatigue Monitoring AMP will monitor the design transients to ensure that the actual cycles do not exceed the transient cycles that are used in the fatigue waiver evaluation.

In its review, the staff finds that the fatigue TLAA, including the fatigue waiver evaluation, for the ASME Code Section III, Class 1 equipment, piping and piping components are acceptable because (1) the 60-year projected transient cycles are less than the design cycles, except for the Unit 1 "letdown flow shutoff with prompt return to service" transient, (2) the 60-year projected cycles of the Unit 1 "letdown flow shutoff with prompt return to service" transient do not cause the CUF values to exceed the design limit of 1.0 and do not affect the validity of the existing fatigue wavier evaluation; and (3) the Fatigue Monitoring AMP will monitor the actual transient cycles and perform corrective actions as needed (e.g., repair/replacement of components and refinement of fatigue analysis) to ensure that the CUF values do not exceed the design limit of 1.0 and the fatigue waiver evaluation remain valid for the period of extended operation.

For the ASME Code Section III, Class 1 equipment, piping and piping components, the staff finds the applicant has 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 period of extended operation. Additionally, it meets the acceptance criteria in SRP-LR 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, consistent with the guidance. As previously noted, the staff's evaluation of the Fatigue Monitoring AMP is documented in SE Section 3.0.3.2.1.

4.3.2.3 FSAR Supplement

LRA Section A.3.3.2 provides the FSAR supplement summarizing the metal fatigue TLAA for ASME Code Section III, Class 1 equipment, piping, and piping components. The staff reviewed LRA Section A.3.3.2 consistent with the review procedures in SRP-LR Section 4.3.3.2. Based on its review of the FSAR supplement, the staff finds that it meets the acceptance criteria in SRP-LR 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 fatigue TLAA for the ASME Code Section III, Class 1 equipment, piping, and piping components, as required by 10 CFR 54.21(d).

4.3.2.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of cumulative fatigue damage on the intended functions of the ASME Code Section III, Class 1 equipment, piping, and piping components will be adequately managed by the Fatigue Monitoring AMP for the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.3 ASME Section III, Class 2 and 3 Allowable Stress Analysis

4.3.3.1 Summary of Technical Information in the Application

LRA Section 4.3.3, as supplemented by letter on April 6, 2023, and July 27, 2023, and October 17, 2023 (ML23096A302, ML23208A193, and ML23290A273 respectively), describes the applicant's TLAA on allowable stresses for ASME Code Section III, Class 2 and 3 and ANSI B31.1 piping systems (i.e., non-Class 1 piping systems). The piping systems are not required to have an explicit analysis of cumulative fatigue usage (CUF) but cyclic loading is considered in a simplified manner in the design process to determine if a stress reduction factor is required.

The applicant dispositioned the TLAA on allowable stresses for non-Class 1 piping systems 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 piping systems will be adequately managed by the Fatigue Monitoring AMP for the period of extended operation.

4.3.3.2 Staff Evaluation

The staff reviewed the applicant's TLAA on allowable stresses for non-Class 1 piping systems and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.3.3.1.2.3 and the acceptance criteria in SRP-LR Section 4.3.2.1.2.3.

LRA Section 4.3.3 states that Comanche Peak Units 1 and 2 have piping systems that were designed in accordance with the ASME Code Section III Class 2 and 3 and ANSI B31.1 design rules. These non-Class 1 piping systems are not required to have an explicit fatigue analysis that involves calculations of CUF values in accordance with the provisions of ASME Code Section III for Class 1 piping systems. Instead, implicit fatigue analyses are performed based on the number of equivalent full temperature cycles and corresponding stress range reduction factors.

If the total number of temperature cycles is 7000 or fewer, a stress range reduction factor of 1.0 is applied to the allowable stress range, which means the allowable stress range does not need to be reduced because of cyclic loading and, therefore, the existing stress analyses for non-Class 1 piping systems will continue to be valid for 60 years of operation. If the total number of temperature cycles is more than 7000, a stress range reduction factor less than 1.0 is applied to the allowable stress range depending on the temperature cycles.

The applicant explained that the TLAA on allowable stresses was performed to demonstrate that the applicable cycles for 60 years of operation for the non-Class 1 piping systems continue to be below the 7000-cycle limit. In the 60-year cycle projections, the applicant considered the transient cycles that are specific to non-Class 1 piping systems and the transient cycles of the reactor coolant system (RCS) as applicable to non-Class 1 piping systems. The RCS transient cycles are not included in the cycle projections for the non-Class 1 piping systems that are separated from the reactor coolant system and, therefore, are not subject to reactor coolant system transients (e.g., liquid waste processing piping).

The applicant also explained that the 60-year cycle projections considered the plant design information, transient definitions, plant operation data, plant procedures, operator interviews, and licensee event reports for the plant. In addition, the applicant conservatively determined the total RCS cycles by summing the 60-year projected cycles of normal, upset, and test condition transients for each unit that are described in LRA Table 4.3.1-1.

In the 60-year cycle projections for the non-Class 1 piping systems, the applicant used two methods with the accumulated cycles up to December 31, 2018. The first method calculates the cycle projections based on an extrapolation of the cycles accumulated from the start of the reactor operation. The second method calculates the cycle projections based on cycle accumulation over the recent 11.75 years of operation. The applicant conservatively determined the bounding (higher) result of the two methods to be the final 60-year projected cycles for each of Comanche Peak Units 1 and 2

In its review of the information described above, the staff finds that the 60-year cycle estimates in LRA Table 4.3.1-4 are acceptable because (1) the applicant calculated the 60-year cycles based on the relevant information such as piping design information, transient definitions, plant operation data, operation procedures, test requirements and specific system-level knowledge and (2) the applicant's 60-year cycle projections included the RCS transient cycles, which are applicable to the non-Class 1 piping systems, and the piping line specific cycles. The applicant also confirmed that each of the non-Class 1 piping systems remain bounded by the 7,000-cycle limit as described in LRA Table 4.3.1-4 and, therefore, the maximum allowable stress range values used in the existing stress analysis remain valid for the non-Class 1 piping systems.

In addition, the Fatigue Monitoring AMP will monitor transient cycles to ensure the numbers of transients analyzed in the fatigue analyses of the non-Class 1 piping systems do not exceed the 7000-cycle limit for the period of extended operation. The staff's evaluation of the Fatigue Monitoring AMP is documented in SE Section 3.0.3.2.1.

As discussed above, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of cumulative fatigue damage on the intended functions of the non-Class 1 piping systems will be adequately managed for the period of extended operation. Additionally, it meets the acceptance criteria in SRP-LR Section 4.3.2.1.2.3 because the applicant proposes the Fatigue Monitoring AMP to manage the effects of cumulative fatigue damage, consistent with the guidance in SRP-LR Section 4.3.3.1.2.3.

4.3.3.3 FSAR Supplement

LRA Section A.3.3.3, as supplemented by the letter dated July 27, 2023 (ML23208A193), provides the FSAR supplement summarizing the allowable stress analyses of the non-Class 1 piping systems. The staff reviewed LRA Section A.3.3.3 consistent with the review procedures in SRP-LR Section 4.3.3.2. Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-LR 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 allowable stress TLAA for the non-Class 1 piping systems, as required by 10 CFR 54.21(d).

4.3.3.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of cumulative fatigue damage on the allowable stresses and the intended functions of the non-Class 1 piping systems will be adequately managed for the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, 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

LRA Section 4.3.4, as supplemented by letters on April 6, 2023, and July 12, 2023 (ML23096A302 and ML23193A846, respectively), describes the applicant's TLAA on the environmentally assisted fatigue (EAF) in reactor coolant pressure boundary components and piping. The EAF analysis considers the EAF locations described in NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components" and additional plant-specific locations that could be more limiting than the NUREG/CR-6260 locations. In the analysis, the environmental cumulative usage factor (CUF_{en}) values are calculated by applying the environmental fatigue correction factor (F_{en}) in accordance with NUREG/CR-6909, Revision 1, "Effect of LWR Water Environments on the Fatigue Life of Reactor Materials."

The applicant dispositioned the EAF TLAA in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of EAF on the intended functions of the reactor coolant pressure boundary components and piping will be adequately managed by the Fatigue Monitoring AMP and Steam Generators AMP (LRA Sections B.2.2.1 and B.2.3.10).

4.3.4.2 Staff Evaluation

The staff reviewed the EAF TLAA for the reactor coolant pressure boundary components and piping and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.3.3.1.3 and the acceptance criteria in SRP-LR Section 4.3.2.1.3.

The applicant performed an EAF analysis on the following reactor coolant pressure boundary components: (1) reactor vessels, (2) control element drive mechanisms, (3) pressurizers, (4) reactor coolant pumps and (5) steam generators. In the analysis, the component locations are also called equipment locations. In addition, the applicant performed an EAF analysis on the reactor coolant line and the auxiliary piping systems such as residual heat removal (RHR), emergency core cooling system (ECCS) injection, accumulator, pressurizer surge, pressurizer spray, pressurizer safety and relief, normal charging, and loop drain piping systems.

LRA Section 4.3.4 states that the EAF analysis includes the following NUREG/CR-6260 locations applicable to Comanche Peak, a newer vintage Westinghouse plant: (1) reactor vessel shell and lower head, (2) reactor vessel inlet and outlet nozzles, (3) RCS pressurizer surge line, (4) RCS charging nozzle, (5) RCS safety injection nozzle, and (6) RHR system Class 1 piping. The staff finds that the applicant adequately included the NUREG/CR-6260 locations in the evaluation of EAF, consistent with the guidance in SRP-LR Section 4.3.2.1.3.

The applicant also performed an EAF screening evaluation to identify plant-specific locations that may be more limiting than the NUREG/CR-6260 locations. In the screening evaluation, the applicant considered the components and piping that are in contact with the reactor coolant. The applicant determined the transient sections for the piping systems and components that are included in the screening evaluation. In the evaluation, a transient section is defined as a group of subcomponents and locations that experience the same thermal and pressure transients such that the limiting locations (also called sentinel locations) are adequately determined in each transient section. The applicant developed these transient sections based on the knowledge of the system functions in relation to plant transients, system layouts and flow paths, and equipment configurations.

Based upon its review of the information as described above, the staff finds that the applicant's use of the transient sections is acceptable for the screening evaluation because each transient section is exposed to the same thermal and pressure transients such that the EAF locations of each transient section can be compared in a consistent and comprehensive manner for the determination of the limiting EAF locations.

In the screening evaluation, the applicant calculated the environmental fatigue correction factor (F_{en}) to determine the environmental effect of the reactor coolant on the fatigue in accordance with NUREG/CR-6909, Revision 1. For each material type of nickel alloy, stainless steel, and carbon and low alloy steels, the applicant conservatively determined the F_{en} values based on bounding values for dissolved oxygen content of reactor coolant chemistry, sulfur content of carbon and low alloy steels, strain rate, and temperature.

SRP-LR Section 4.3.2.1.3 indicates that a staff-approved method can be used to evaluate the environmental effects on fatigue. The staff has approved the CUF_{en} calculation method in NUREG/CR-6909, Revision 1, as documented in Regulatory Guide 1.207, Revision 1, "Guidelines for Evaluating the Effects of Light-water Reactor Water Environments in Fatigue Analyses of Metal Components." Therefore, the staff finds that the applicant's use of the method in NUREG/CR-6909, Revision 1 is consistent with the guidance in SRP-LR Section 4.3.2.1.3. In addition, the staff finds that the applicant's use of the guidance in NUREG/CR-6909, Revision 1 is consistent with SRP-LR Section 4.3.2.1.2 because the SRP-LR section refers to RG 1.207, Revision 1 as the relevant guidance for the evaluation of environmental effects on fatigue.

In the determination of the limiting locations, the applicant also considered the technical rigor of stress analysis methods and the level of conservatism related to the stress analysis methods. In its response dated July 12, 2023 (ML23193A846) to RAI 4.3.4-1, the applicant provided additional information on how the applicant used the level of the conservatism associated with the stress analysis methods in the EAF screening evaluation. The applicant explained that an EAF location is removed from the limiting location list only if both the screening CUF_{en} value is lower and the stress analysis method involves the same or less level of conservatism compared to a more limiting location. The RAI response also indicates that the standard ASME Code Section III NB-3600 fatigue analysis is less rigorous (more conservative) than the NB-3600 analysis with finite element stress quantities used in the stress formulas. The RAI response further indicates that the NB-3600 analysis with finite element stress quantities is less rigorous (more conservative) than the NB-3200 fatigue analysis. The staff finds this approach to be acceptable because it considers the level of technical rigor of fatigue analyses and the associated conservatism as well as the screening CUF_{en} values to reasonably compare different EAF locations in the screening process for determining the limiting location in each transient section.

As discussed above, the staff finds that the screening evaluation to determine the limiting locations are acceptable because of the following: (1) the screening process organizes the component and piping locations into transient sections that are defined as groups of locations that experience the same transients, (2) the screening process compares the locations within each transient section to identify the limiting EAF locations, (3) the screening process considers each material (e.g., carbon steel, stainless steel, and nickel alloy) in the calculation of the screening CUF_{en}, (4) the F_{en} values, which consider the environmental effect on fatigue, are calculated in accordance with NUREG/CR-6909, Revision 1, and (5) the calculated screening CUF_{en} values are conservatively estimated (e.g., using the bounding strain rate and oxygen content of the reactor coolant).

The applicant also performed the more detailed EAF analysis for the NUREG/CR-6260 locations in accordance with NUREG/CR-6909, Revision 1. The results are described in LRA Table 4.3.4-1 (component locations) and Table 4.3.4-2 (piping locations). The applicant also explained that, in some cases, the CUF_{en} calculations were refined (1) by using the modified rate approach described in Section 4.4 of NUREG/CR-6909, Revision 1, based on the more realistic strain rates of transients as a function of operating temperature or (2) by performing detailed evaluations such as redefinition of transient time histories based on actual plant operations.

The staff finds the overall approach of the detailed EAF analysis is reasonable because (1) the detailed analysis uses the guidance in NUREG/CR-6909, Revision 1 and (2) the CUF_{en} calculations are refined based on the more realistic strain rates of transients or actual transient time histories. As discussed above, the staff-approved the CUF_{en} calculation method of NUREG/CR-6909, Revision 1 in RG 1.207, Revision 1 and, therefore, the applicant’s approach is consistent with SRP-LR Section 4.3.2.1.3, which discusses the acceptance of a staff-approved approach for CUF_{en} calculations, as well as SRP-LR Section 4.3.2.1.2, which refers to RG 1.207, Revision 1 as the relevant guidance. Additional aspects of the EAF analysis are further evaluated below.

As discussed above, the screening evaluation for EAF determined the plant-specific limiting locations that may be more limiting than the NUREG/CR-6260 locations. These additional limiting locations are described in LRA Tables 4.3.4-1 (component locations) and 4.3.4-2 (piping locations). The applicant will calculate the 60-year projected CUF_{en} values for these additional limiting locations other than the NUREG/CR-6260 locations as part of Enhancement 1 of the Fatigue Monitoring AMP (LRA Section B.2.2.1). The Fatigue Monitoring AMP will also ensure that the actual CUF_{en} values do not exceed the fatigue design limit of 1.0 for the period of extended operation (SE Section 3.0.3.2.1).

The staff finds that the aging management approach for the additional limiting locations, which may be more limiting than the NUREG/CR-6260 locations, is acceptable because of the following: (1) the applicant’s screening evaluation identified the additional locations, as described in LRA Tables 4.3.4-1 (component locations) and 4.3.4-2 (piping locations); (2) the applicant will calculate the CUF_{en} values prior to entering the period of extended operation, as part of Enhancement 1 of the Fatigue Monitoring AMP; and (3) the Fatigue Monitoring AMP will monitor the design transients and take corrective actions (e.g., refinement of CUF_{en} calculations and repair/replacement of components) as needed to ensure that the CUF_{en} values meet the design limit of 1.0, consistent with SRP-LR Section 4.3.2.1.3.

The staff reviewed the overall aging management approach for EAF as follows: The applicant indicated that the effects of fatigue on the intended functions of the reactor coolant pressure boundary components and piping will be managed by the Fatigue Monitoring AMP. As previously discussed, the Fatigue Monitoring AMP monitors the actual transient cycles to ensure that the actual cycles do not exceed the transient cycles, which are used as the inputs to the EAF analysis, such that the CUF_{en} values will not exceed the design limit of 1.0. The staff finds that the applicant's use of the Fatigue Monitoring AMP is adequate to manage the effects of EAF because the program monitors the transient cycles to ensure that the CUF_{en} values meet the design limit (1.0), consistent with the guidance in GALL-LR Report AMP X.M1. "Fatigue Monitoring" and SRP-LR Section 4.3.2.1.3. The staff's evaluation of the Fatigue Monitoring AMP is documented in SE Section 3.0.3.2.1.

The applicant also proposed the use of the Steam Generators AMP to manage the effects of EAF for steam generator tubes. The Steam Generators AMP performs periodic inspections on the steam generator tubes to ensure the integrity of the tubes. The staff finds that the applicant's use of the Steam Generators program is adequate to manage the effects of EAF because (1) the program performs periodic inspections to ensure that the integrity of steam generator tubes is maintained for the period of extended operation and (2) the program takes corrective actions as need to address the potential degradation due to EAF in the steam generator tubes (e.g., by performing plugging or repair of flawed tubes). The staff's evaluation of the Steam Generators AMP is documented in SE Section 3.0.3.2.7.

For the reactor coolant pressure boundary components and piping, the staff finds that the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(iii) that the effects of EAF on the intended functions of the components and piping will be adequately managed for the period of extended operation. Additionally, it meets the acceptance criteria in SRP-LR Section 4.3.2.1.3 because the applicant proposed to use the Fatigue Monitoring Program AMP and Steam Generators AMP to manage the effects of EAF, consistent with the guidance.

4.3.4.3 FSAR Supplement

LRA Section A.3.3.4, as supplemented by the letter on July 12, 2023 (ML23193A846), provides the FSAR supplement summarizing the EAF analysis for the reactor coolant pressure boundary components and piping. The staff reviewed LRA Section A.3.3.4, consistent with the review procedures in SRP-LR Section 4.3.3.2. Based on its review of the FSAR supplement, the staff finds that it meets the acceptance criteria in SRP-LR Section 4.3.2.2, and is, therefore, acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its action to address the EAF TLAA for the reactor coolant pressure boundary components and piping, as required by 10 CFR 54.21(d).

4.3.4.4 Conclusion

Based on its review, the staff concludes the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of EAF on the intended functions of the reactor coolant pressure boundary components and piping will be adequately managed by the Fatigue Monitoring AMP and Steam Generators AMP for the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.5 Reactor Vessel Internals Fatigue Analyses

4.3.5.1 Summary of Technical Information in the Application

LRA Section 4.3.5, as supplemented by letters on April 6, 2023, and July 12, 2023 (ML23096A302 and ML23193A846, respectively), describes the applicant's fatigue TLAA for reactor vessel internal (RVI) components. The existing fatigue analysis for RVI components is based on the design transient cycles, which are bounding for the 60-year projected cycles. Therefore, the applicant concluded that the fatigue analysis will continue to meet the fatigue design limit (i.e., CUF of 1.0) for the period of extended operation.

The applicant dispositioned the fatigue TLAA in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of cumulative fatigue damage on the intended functions of the RVI components will be adequately managed by the Fatigue Monitoring AMP (LRA Section B.2.2.1) for the period of extended operation. The Fatigue Monitoring AMP will be used to ensure that the CUF values meet the design limit of 1.0.

4.3.5.2 Staff Evaluation

The staff reviewed the applicant's fatigue TLAA for the RVI components and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.3.3.1.1.3 and the acceptance criteria in SRP-LR Section 4.3.2.1.1.3.

The applicant explained that the RVI components were designed and built prior to the implementation of ASME Code Section III, Subsection NG, and that subsequent analyses were performed to ensure that the RVI components meet the intent of the ASME Code, such as the CUF limit of 1.0. The applicant also indicated that the existing fatigue analyses for the RVI components demonstrate that the CUF values do not exceed 1.0 based on the maximum alternating stresses resulting from the design transient cycles and ASME Code fatigue design curves.

In addition, the applicant indicated that WCAP-16840-NP, Revision 0, "CPNPP Stretch Power Uprate Licensing Report," (ML072490310 and ML072490358) includes the most recent fatigue evaluations for the RVI components in the CLB. The staff's approval of the stretch power uprate, including the fatigue analysis for the RVI components, is documented in the license amendment that the staff approved on June 27, 2008 (ML081510173).

The applicant further explained that the CUF analyses for the RVI components are based on the design transient cycles for the RCS described in LRA Table 4.3.1-2. Since the original design cycles are bounding for the 60-year projected cycles, as indicated in LRA Table 4.3.1-2, the applicant determined that there is reasonable assurance that the CUF values for the RVI components will continue to meet the fatigue design limit (1.0) for the period of extended operation. However, the staff identified the following items for additional clarification as evaluated below.

In its response (ML23193A846) to RAI 4.3.5-1, the applicant addressed a potential inconsistency noted by the staff between the design transients described in the LRA and the WCAP-16840-NP licensing report. The applicant clarified that the “split flow bypass valve” transient in LRA Table 4.3.1-2 is the same as the “bypass line tempering valve” transient in WCAP-16840-NP, Table 2.2.6-1. The staff finds the RAI response acceptable because the applicant’s clarification demonstrated there is no inconsistency between the design transients described in LRA Table 4.3.1-2 and WCAP-16840-NP.

In its response to RAI 4.3.5-1, the applicant also provided clarification on the bounding nature of the design transient cycles, explaining that the 60-year projected cycles of Unit 1 “letdown flow shutoff with prompt return to service” transient, which are greater than the original design cycles, are not applicable to the fatigue analysis of the RVI components and, therefore, do not affect or increase the existing CUF values of the RVI components. In addition, the applicant indicated that the Fatigue Monitoring AMP (LRA Section B.2.2.1) will monitor transient cycles and severities and will require action as needed to ensure that the CUF values of RVI components meet the fatigue design limit of 1.0. The potential corrective action of the AMP includes the refinement of CUF analyses and replacement/repair activities of components (SE Section 3.0.3.2.1).

In its review, the staff finds reasonable assurance that the fatigue TLAA for the RVI components will continue to be valid because (1) the 60-year projected transient cycles are less than the design cycles except for the Comanche Peak Unit 1 “letdown flow shutoff with prompt return to service” transient, (2) the Unit 1 “letdown flow shutoff with prompt return to service” transient is not applicable to the fatigue analysis of the RVI components and, therefore, does not cause the CUF values of the RVI components to increase; and (3) the Fatigue Monitoring AMP will monitor the actual transient cycles to ensure that the CUF values of the RVI components do not exceed the design limit of 1.0 by performing corrective action as needed (e.g., refinement of fatigue analysis or repair/replacement of components).

For the RVI components, the staff finds the applicant has 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 period of extended operation. Additionally, it meets the acceptance criteria in SRP-LR 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, consistent with the guidance. As previously noted, the staff’s evaluation of the Fatigue Monitoring AMP is documented in SE Section 3.0.3.2.1.

4.3.5.3 FSAR Supplement

LRA Section A.3.3.5 provides the FSAR supplement summarizing the fatigue TLAA for the RVI components. The staff reviewed LRA Section A.3.3.5, consistent with the review procedures in SRP-LR Section 4.3.3.2. Based on its review of the FSAR supplement, the staff finds that it meets the acceptance criteria in SRP-LR Section 4.3.2.2, and is, therefore, acceptable. Additionally, the staff also finds that the applicant provided an adequate summary description of its actions to address the fatigue TLAA for the RVI components, as required by 10 CFR 54.21(d).

4.3.5.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of cumulative fatigue damage on the RVI fatigue analyses and the intended functions of the RVI components will be adequately managed by the Fatigue Monitoring AMP for the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.6 High-Energy Line Break Analyses

4.3.6.1 Summary of Technical Information in the Application

LRA Section 4.3.6, as supplemented by letters on April 6, 2023, and July 12, 2023 (ML23096A302 and ML23193A846, respectively), describes the applicant's TLAA on high-energy line break (HELB) analyses. As described in FSAR Section 3.6B.2, high-energy piping lines require analyses for the consequences of postulated pipe break. In these analyses, the postulation of HELB locations includes a screening criterion of CUF that is the time-limited aspect of the HELB analyses. Therefore, the HELB analyses are identified as TLAAs.

The applicant dispositioned the HELB 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 high-energy piping lines will be adequately managed by the Fatigue Monitoring AMP for the period of extended operation. The Fatigue Monitoring AMP (LRA Section B.2.2.1) will monitor transient cycles and severities and will require actions as needed to ensure that the HELB analyses, including the postulation of HELB locations, continue to be valid for the period of extended operation.

4.3.6.2 Staff Evaluation

The staff reviewed the applicant's HELB 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-LR Sections 4.3.3.1.1.3 and 4.3.3.1.2.3 (Class 1 and non-Class 1 piping, respectively) and the acceptance criteria in SRP-LR Sections 4.3.2.1.1.3 and 4.3.2.1.2.3 (Class 1 and non-Class 1 piping, respectively).

The applicant explained that, as described in FSAR Section 3.6B.2, high-energy piping lines require analyses for the consequences of pipe break. In these HELB analyses, pipe breaks are postulated to evaluate the effect of pipe whip, jet impingement, and environment associated with the pipe breaks. FSAR Section 3.6B.2 also indicates that the HELB postulation and the related HELB analyses follow the guidance in NRC Branch Technical Position MEB 3-1 ("Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment," July 1981, ML052340555). The applicant also explained that the time-limited aspect of the HELB analyses includes a CUF screening criterion of 0.1 for the postulation of HELB locations.

The applicant indicated that the Fatigue Monitoring AMP will monitor the design transient cycles and their severities and will take actions as needed (e.g., refined CUF analyses or repair/replacement of components) to ensure that the existing HELB analyses, including break location postulation, continue to be valid for the period of extended operation. The staff finds the applicant's approach to use the Fatigue Monitoring AMP is consistent with the guidance in SRP-LR Section 4.3.2.1.1.3 for the Class 1 piping.

In its response to RAI B.2.2.1-1, the applicant explained that the corrective actions of the Fatigue Monitoring AMP (Enhancement 6) will consider the impact on the HELB location postulation for non-Class 1 piping as well as Class 1 piping (ML23193A846). The staff finds the RAI response acceptable because (1) the applicant confirmed that both Class 1 and non-Class 1 locations are included in the corrective actions that address the potential impact of transient cycles on the HELB postulation and analyses and (2) the applicant revised LRA Section B.2.2.1 and Table A-3, consistent with the RAI response, to clarify that the corrective actions of the Fatigue Monitoring AMP will ensure that the HELB analyses continue to be valid for both Class 1 and non-Class 1 piping lines.

As discussed above, the applicant indicated that the effects of cumulative fatigue damage on the intended functions of the high-energy piping lines will be managed by the Fatigue Monitoring AMP (SE Section 3.0.3.2.1). The Fatigue Monitoring AMP monitors the actual transient cycles to ensure that the actual cycles do not exceed the transient cycles, which are used as the inputs to the HELB analyses, such that the HELB analyses continue to be valid. Based upon its review of the Fatigue Monitoring AMP, the staff finds that the applicant's use of this program is adequate to manage the effects of cumulative fatigue damage because the program monitors the transient cycles and performs corrective actions as needed (e.g., refinement of CUF calculations or repair/replacement of components) to ensure that the HELB location postulation and the associated HELB analyses for Class 1 and non-Class 1 piping lines continue to be valid for the period of extended operation.

As discussed above, the staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(iii) that the effects of cumulative fatigue damage on the intended functions of the high-energy piping lines will be adequately managed for the period of extended operation. Additionally, it meets the acceptance criteria in SRP-LR Sections 4.3.2.1.1.3 and 4.3.2.1.2.3 (Class 1 and non-Class 1 piping, respectively) because the applicant proposed to use the Fatigue Monitoring Program AMP to manage the effects of cumulative fatigue damage, consistent with the guidance.

4.3.6.3 FSAR Supplement

LRA Section A.3.3.6 provides the FSAR supplement summarizing the HELB TLAA. The staff reviewed LRA Section A.3.3.6, consistent with the review procedures in SRP-LR Section 4.3.3.2. Based on its review of the FSAR supplement, the staff finds that it meets the acceptance criteria in SRP-LR Section 4.3.2.2, and is, therefore, acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its action to address the HELB TLAA, as required by 10 CFR 54.21(d).

4.3.6.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration pursuant to 10 CFR 54.21(c)(1)(iii) that the effects of cumulative fatigue damage on the HELB analyses and the intended functions of the high-energy piping lines will be adequately managed by the Fatigue Monitoring AMP for the period of extended operation. In addition, the staff concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.4 Environmental Qualification of Electrical Equipment

4.4.1 Summary of Technical Information in the Application

LRA Section 4.4 describes the applicant's TLAA for evaluation of environmental qualification of electric equipment for the period of extended operation. Thermal, radiation, and cyclical aging analyses of plant electrical and instrumentation components located in harsh environments, developed to meet 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants," requirements, have been identified as TLAAs. The applicant dispositioned the TLAA for the environmental qualification (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 Environmental Qualification of Electric Components AMP described in LRA Section B.2.2.2 for the period of extended operation.

4.4.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the EQ of electric equipment and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.4.3.1.3.

The EQ requirements established by 10 CFR 50.49 require each applicant to establish a program to qualify electrical equipment so that such equipment, in its end-of-life condition, will meet its performance specifications during and following design-basis accidents. An EQ of electric equipment important to safety, in accordance with the requirements of 10 CFR 50.49, is considered an adequate AMP for the purposes of license renewal. Electric components in the applicant's EQ program identified as having a qualified life equal to, or greater than, the current operating term (i.e., 40 years) are considered a TLAA for license renewal.

The staff reviewed LRA 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 per the requirements of 10 CFR 54.21(c)(1)(iii) to show that components evaluated under the applicant's TLAA evaluation are adequately managed during the 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 period of extended operation.

The staff also conducted an audit of the information provided in LRA Section B.2.2.2 and the program basis documents, including reports provided to the staff during the audit. Based on the staff review of LRA Section B.2.2.2 and the results of the audit, the staff concludes that applicant's EQ program elements are consistent with the GALL-LR Report AMP X.E1. The staff's evaluation of the applicant's EQ of Electric Components AMP is documented in SE Section 3.0.3.2.2.

The staff also reviewed the applicant's EQ program reanalysis attributes evaluation and concludes that it is consistent with SRP-LR Section 4.4.3.1.3 and SRP-LR Table 4.4-1. Reanalysis of an aging evaluation addresses attributes of analytical methods, data collection and reduction method, underlying assumptions, acceptance criteria, ongoing qualification, and corrective action (if acceptance criteria are not met). The applicant noted that EQ components not qualified for the current license term are to be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of thermal, radiation, and cyclical aging of plant electrical and instrumentation 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 period of extended operation. The applicant's EQ program manages the effects of thermal, radiation, and cyclic aging using aging evaluation based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49(e)(5), EQ components are refurbished, replaced, or their qualification is extended prior to reaching the aging limit established in the evaluation.

Additionally, it meets the acceptance criteria in SRP-LR Section 4.4.2.1.3 because the EQ program is capable of programmatically managing the qualified life of components within the scope of program for license renewal, that 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 period of extended operation consistent with the requirements of 10 CFR 54.21(c)(1)(iii).

4.4.3 FSAR Supplement

LRA Section A.2.1.2 provides the FSAR supplement summarizing the EQ of electric components. The staff reviewed LRA Section A.2.1.2 consistent with the review procedures in SRP-LR Section 4.4.3.2.

The staff also noted that the applicant committed (Commitment No. 2) to continue the existing Environmental Qualification of Electric Components AMP, including an enhancement to implement Revision 1 of Regulatory Guide 1.89 (June 1984), which provides additional guidance for the application of the Institute of Electrical and Electronics Engineers (IEEE) Standard 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations," that was not available in the original issuance of RG 1.89, no later than 6 months prior to the period of extended operation (i.e., August 8, 2029 for Comanche Peak Unit 1 and August 2, 2032 for Comanche Peak Unit 2) or no later than the last refueling outage prior to the period of extended operation.

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-LR Section 4.4.3.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address EQ of electric equipment, as required by 10 CFR 54.21(d).

4.4.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of thermal, radiation, and cyclic aging on the intended functions of the EQ electric equipment will be adequately managed by the EQ of Electric Components AMP for the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.5 Concrete Containment Tendon Prestress Analysis

LRA Section 4.5 describes the applicant's disposition for the concrete containment tendon prestress forces for the period of extended operation. The applicant stated that the Comanche

Peak containments use a steel-lined, reinforced concrete design without prestressed tendons, and that loss of prestress is not applicable for the containment design. Therefore, there is no loss of prestress TLAA. The staff reviewed FSAR Appendix 1A(N) and verified that this TLAA is not applicable to the Comanche Peak containments because the containments do not use tendons. Therefore, the staff finds that the applicant does not need to identify or evaluate this type of TLAA in the LRA.

4.6 Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analyses

4.6.1 Containment Liner Plate

4.6.1.1 Summary of Technical Information in the Application

LRA Section 4.6.1, as amended by LRA Supplement 2 dated April 24, 2023 (ML23114A377), describes the applicant's TLAA for fatigue of the carbon steel containment liner plate. The applicant dispositioned the TLAA for the containment liner in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the fatigue waiver analysis for the containment liner plate remains valid for the period of extended operation.

4.6.1.2 Staff Evaluation

The staff reviewed the applicant's TLAA, as modified by Supplement 2, for the containment liner plate and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-LR Section 4.6.3.1.1.1 and the acceptance criteria in SRP-LR Section 4.6.2.1.1.1.

During the audit (ML23172A136), the staff reviewed the calculation-of-record and license renewal TLAA evaluation report with regard to the containment liner plate and verified that an original fatigue waiver analysis exists in the CLB that demonstrated that the six fatigue waiver conditions of the ASME Code, Section III, Division 1, paragraph NB-3222.4(d) "Components not requiring analysis for cyclic operation" were satisfied for the carbon steel containment liner plate in accordance with NE-3131(d) and NB-3222.4. The six fatigue waiver criteria evaluated fatigue cycles and satisfied ASME Code acceptance criteria for the following: (1) Atmospheric-to-Operating Pressure Cycles, (2) Normal Operation Pressure Fluctuations, (3) Temperature Difference – Startup and Shutdown, (4) Temperature Difference – Normal Operation, (5) Temperature Difference – Dissimilar Materials, (6) Mechanical Loads. The staff noted that there were no dissimilar materials used for the containment liner plate, and, therefore, criteria 5 did not require evaluation.

The staff reviewed the LRA, as amended, and noted that the original fatigue waiver analysis inputs assumed 200 cycles for plant startup (heatup) and shutdown (cooldown), 600 operating basis earthquake (OBE) cycles, and 120 safe shutdown earthquake (SSE) cycles. The staff further noted that the pressure and temperature conditions have not been redefined or changed, and the projected cycles for heatup and cooldown to the end of the period of extended operation (60 years) is 155 (for Comanche Peak Unit 1) and 161 (for Comanche Peak Unit 2), which are bounded by the 200 cycles considered in the original analysis. The staff also verified that the projected heatup and cooldown cycles are consistent with the corresponding projected transients in LRA Table 4.3.1-2. The staff also noted from the LRA that no OBE or SSE events have occurred at Comanche Peak site thus far; therefore, the 600 OBE cycles and 120 SSE cycles considered in the original evaluation is bounding for the period of extended operation.

The staff thus concludes that the existing containment liner plate fatigue waiver analysis remains valid for the period of extended operation because the transient cycles considered in the original TLAA analysis remain bounding of the expected cycles to the end of the period of extended operation.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i), that the existing fatigue waiver analysis for the containment liner plate remains valid for the period of extended operation. Additionally, it meets the acceptance criteria in SRP-LR Section 4.6.2.1.1.1 because the number of assumed cycles of cyclic loads considered in the existing fatigue waiver analysis will not be exceeded during the period of extended operation.

4.6.1.3 FSAR Supplement

LRA Section A.3.5.1, as modified by Supplement 2, provides the FSAR supplement summarizing the containment liner plate fatigue analysis. The staff reviewed LRA Section A.3.5.1 consistent with the review procedures in SRP-LR Section 4.6.3.2.

Based on its review, the staff finds that the FSAR supplement, as amended by Supplement 2, meets the acceptance criteria in SRP-LR 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 the containment liner plate fatigue analysis, as required by 10 CFR 54.21(d).

4.6.1.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the analysis for containment liner plate fatigue remains valid for the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6.2 Containment Penetrations

4.6.2.1 Summary of Technical Information in the Application

LRA Section 4.6.2, as amended by LRA Supplement 2 dated April 24, 2023 (ML23114A377), describes the applicant’s TLAA for fatigue of the Class MC carbon steel process piping (mechanical) penetrations. This TLAA is based on evaluation of high temperature main steam, feedwater, and steam generator blowdown piping penetrations, which were considered in the CLB evaluation to also be bounding of the lower temperature carbon steel mechanical penetrations. The applicant dispositioned the TLAA for these containment process piping penetrations in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the fatigue waiver analysis for the bounding containment hot piping penetrations remains valid for the period of extended operation.

4.6.2.2 Staff Evaluation

The staff reviewed the applicant’s TLAA, as modified by LRA Supplement 2, for the containment high temperature carbon steel piping penetrations (main steam, feedwater, and steam generator blowdown) and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-LR Section 4.6.3.1.1.1 and the acceptance criteria in SRP-LR Section 4.6.2.1.1.1.

During the audit (ML23172A136), the staff reviewed the calculation-of-record and license renewal TLAA evaluation report with regard to the high temperature main steam, feedwater and steam generator blowdown piping penetrations, and verified that an original fatigue waiver analysis exists in the CLB that demonstrated that the six fatigue waiver conditions of the ASME Code, Section III, Division 1, paragraph NB-3222.4(d) “Components not requiring analysis for cyclic operation” were satisfied for these carbon steel high temperature penetrations in accordance with NE-3131(d) and NB-3222.4. The six fatigue waiver criteria evaluated fatigue cycles and satisfied ASME Code acceptance criteria for the following: (1) Atmospheric-to-Operating Pressure Cycles, (2) Normal Operation Pressure Fluctuations, (3) Temperature Difference – Startup and Shutdown; (4) Temperature Difference – Normal Operation, (5) Temperature Difference – Dissimilar Materials, (6) Mechanical Loads. The staff noted that there were no dissimilar materials used in the evaluated mechanical penetrations and, therefore, criteria 5 did not require evaluation.

The staff reviewed the LRA, as amended, and noted that the original fatigue waiver analysis inputs assumed 200 cycles for plant startup (heatup) and shutdown (cooldown), 600 OBE cycles, and 120 SSE cycles. The staff noted from the LRA that the pressure and temperature conditions have not been redefined or changed. Further, the projected cycles for heatup and cooldown to the end of the period of extended operation (60 years) is 155 (for Comanche Peak Unit 1) and 161 (for Comanche Peak Unit 2), which are bounded by the 200 cycles considered in the original analysis. The staff also verified that the projected heatup and cooldown cycles are consistent with the corresponding projected transients in LRA Table 4.3.1-2. In addition, the staff noted from the LRA that no OBE or SSE events have occurred at the Comanche Peak site thus far; therefore, the 600 OBE cycles and 120 SSE cycles considered in the original evaluation is bounding for the period of extended operation. The staff thus concludes that the existing fatigue waiver analysis for the bounding high temperature penetrations (main steam, feedwater, and steam generator blowdown) remains valid for the period of extended operation because the input transient cycles considered in the original TLAA analysis remain bounding of the expected cycles to the end of the period of extended operation.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i), that the existing fatigue waiver analysis for the containment high temperature piping penetrations (main steam, feedwater, and steam generator blowdown) remains valid for the period of extended operation. Additionally, it meets the acceptance criteria in SRP-LR Section 4.6.2.1.1.1 because the number of assumed cycles of cyclic loads considered in the existing fatigue waiver analysis will not be exceeded during the period of extended operation.

4.6.2.3 FSAR Supplement

LRA Section A.3.5.2, as modified by Supplement 2, provides the FSAR supplement summarizing the containment carbon steel high temperature process piping penetrations (main steam, feedwater, steam generator blowdown) fatigue analysis. The staff reviewed LRA Section A.3.5.2 consistent with the review procedures in SRP-LR Section 4.6.3.2.

Based on its review, the staff finds that the FSAR supplement, as modified by LRA Supplement 2, meets the acceptance criteria in SRP-LR 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 the carbon steel containment process piping penetrations fatigue analysis, as required by 10 CFR 54.21(d).

4.6.2.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the analysis for the containment high temperature process piping penetrations (main steam, feedwater, steam generator blowdown) fatigue remains valid for the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7 Other Plant-Specific TLAAs

LRA Section 4.7, “Other Plant-Specific Time-Limited Aging Analyses,” provides the applicant’s evaluations of those plant-specific analyses in the CLB that have been identified as plant-specific TLAAs. The applicant identifies that the following analyses in the CLB qualify as plant-specific TLAAs for the LRA:

- LRA Section 4.7.1, “Leak-Before-Break”
- LRA Section 4.7.2, “Reactor Coolant Pump Casings ASME Code Case N-481”
- LRA Section 4.7.3, “Reactor Coolant Pump Flywheel Fatigue Crack Growth Analysis”
- LRA Section 4.7.4, “Crane Load Cycle Limits”
- LRA Section 4.7.5, “Spent Fuel Pool Metal Corrosion Allowance”
- LRA Section 4.7.6, “Protective Coatings”
- LRA Section 4.7.7, “Steam Generator Tubes Metal Corrosion Allowance”
- LRA Section 4.7.8, “Steam Generator Flow-Induced Vibration and Tube Wear Evaluations”
- LRA Section 4.7.9, “Steam Generator U-Bend Tube Vibration and Fatigue Assessment”
- LRA Section 4.7.10, “Flaw Tolerance Evaluation for Susceptible Reactor Coolant Loop Cast Austenitic Stainless Steel Piping Components”
- LRA Section 4.7.11, “Safe Shutdown Impoundment Sedimentation”

4.7.1 Leak-Before-Break

4.7.1.1 Summary of Technical Information in the Application

LRA Section 4.7.1, as supplemented by letters dated April 24, 2023 (ML23114A377), and July 12, 2023 (ML23193A845), describes the applicant’s TLAA on the leak-before-break (LBB) evaluation for the RCS piping.

The LBB analyses were originally performed for Comanche Peak to demonstrate that postulated breaks can be eliminated from the structural design basis in the reactor coolant primary loop piping, accumulator injection lines, RHR lines, and pressurizer surge lines piping.

For the LBB evaluations, the following objectives had to be achieved:

- Demonstrate that margin exists between the critical crack size and a postulated crack that yields a detectable leak rate.
- Demonstrate that there is sufficient margin between the leakage through a postulated crack and the leak detection capability.
- Demonstrate margin on the applied load.
- Demonstrate that fatigue crack growth is negligible.

The applicant dispositioned the TLAA for the reactor coolant primary loop piping at Comanche Peak Units 1 and 2 in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analyses have been projected to the end of the period of extended operation.

The applicant dispositioned the TLAA for the accumulator injection lines, RHR, and pressurizer surge lines at Comanche Peak Units 1 and 2 in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analyses remain valid for the period of extended operation.

4.7.1.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the reactor coolant primary loop piping and the corresponding disposition of the TLAA in accordance with 10 CFR 50.21(c)(1)(ii), consistent with the review procedures in SRP-LR Section 4.7.3.1.2 and the acceptance criteria in SRP-LR Section 4.7.2.1 for plant-specific TLAAs. In addition, Standard Review Plan, NUREG-0800, Section 3.6.3, Rev. 1, "Leak-Before-Break Evaluation Procedures," March 2007, provides detailed guidance for LBB analyses and addresses acceptable methods to meet 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 4 regarding LBB analyses.

WCAP-10527, Rev. 0, "Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for the Comanche Peaks Units 1 and 2," April 1984, described the application of LBB to the Comanche Peak primary loop piping during the initial 40-year operating period. The applicant stated that these original evaluations were subsequently revised to account for implementation of mechanical stress improvements and structural weld overlays.

For the updated LBB analysis for the period of extended operation, by letter dated July 12, 2023 (ML23193A846, publicly available), the applicant submitted the proprietary version of WCAP-10527, Rev. 3, "Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for Comanche Peak Units 1 and 2 for the License Renewal Program (60 Years)," for staff review. The LBB evaluations were established based on the mechanical properties of the base metal at the weld points and on the pipe geometry, welding process, operating temperature, operating pressure, and the highest faulted stresses at the welds. In addition, the primary loop piping is made of cast austenitic stainless steel (CASS) materials susceptible to thermal aging at the reactor operating temperature, and therefore, the TLAA evaluation also considered the associated reductions in fracture toughness. A margin of ten was demonstrated between the calculated leak rate and the leak detection capability and a margin of two between the leakage flaw size and the critical flaw size. Fatigue crack growth was not an issue for the RCS primary loop piping. The thermal transients used in the fatigue crack growth analysis were Comanche Peak design transients and projected cycles. The results showed that the 60-year projected cycles are lower than the 40-year design values. Therefore, the staff confirmed that the number of design cycles assumed in the analysis bound the number of design cycles projected for 60 years of operation and the intended LBB margins have been met.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the LBB analysis for the reactor coolant primary loop piping has been projected to the end of the period of extended operation. Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 because the LBB analysis demonstrated that margins for critical crack size, leakage detection, and applied load remain acceptable and fatigue crack growth will be negligible.

The staff also reviewed the applicant's TLAA for the accumulator injection lines, RHR lines, and pressurizer lines and the corresponding disposition of the TLAA in accordance with

10 CFR 50.21(c)(1)(i) consistent with the review procedures in SRP-LR Section 4.7.3.1.1 and the acceptance criteria in SRP-LR 4.7.2.1.

The application of LBB for the accumulator injection lines, RHR lines and pressurizer surge lines for the initial 40-year operating period are described in the following reports: (1) WCAP-13167 Revision 0, “Technical Justification for Eliminating 10 Inch Accumulator Lines Rupture as the Structural Design Basis for the Comanche Peak Nuclear Plant Unit 2,” January 1992; (2) WCAP-13165, Revision 0, “Technical Justification for Eliminating Residual Heat Removal Lines Rupture as the Structural Design Basis for Comanche Peak Nuclear Power Plant Unit 2,” December 1991; (3) WCAP-12258, Supplement 2, Revision 0, “Evaluation of Thermal Stratification for Comanche Peak Unit 1, Residual Heat Removal Lines,” August 1989; (4) WCAP-12248, Supplement 3, Revision 0, “A Supplementary Assessment of Leak-Before-Break for the Pressurizer Surge Line of Comanche Peak Unit 1,” June 1990; and (5) WCAP-13100, Revision 0, “Technical Justification for Eliminating Pressurizer Surge Line Rupture from the Structural Design Basis for Comanche Peak Unit 2,” December 1991. The staff previously approved the original LBB analysis, which also demonstrated that margins for critical crack size, leak detection capability, and applied load are acceptable and that fatigue crack growth is negligible, for the WCAP documents referenced above for the initial 40-year operating period.

The staff reviewed the applicant’s LBB analysis for the period of extended operation and verified that it was based on the same set of design transients as the original analyses, the number of design cycles assumed in the LBB analysis bound the number of design cycles projected for 60 years of plant operation, and the conclusions from the original evaluation remain valid for the 60-year period.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the LBB analysis for the accumulator injection lines, RHR lines, and pressurizer surge lines remains valid for the period of extended operation. Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 because the LBB analysis demonstrated that margins for critical crack size, leakage detection, and applied load remain acceptable and fatigue crack growth will be negligible.

4.7.1.3 FSAR Supplement

LRA Section A.3.6.1 provides the FSAR supplement summarizing the LBB TLAAs for the reactor coolant primary loop piping and the accumulator injection lines, RHR lines, and pressurizer surge lines piping. The staff reviewed LRA Section A.3.6.1 consistent with the review procedures in SRP-LR Section 4.7.3.2.

Based on its review of the FSAR supplement, the staff finds that it meets the acceptance criteria in SRP-LR 4.7.2.2 and is therefore acceptable. The staff also finds that the applicant provided an adequate summary description to address the LBB TLAA for the reactor coolant primary loop piping and the accumulator injection lines, RHR lines, and pressurizer surge lines piping, as required by 10 CFR 54.21(d).

4.7.1.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(ii), that the LBB TLAAs for the RCS piping have been projected to the end of the period of extended operation. The staff also concludes that the

FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

The staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(i), that the LBB TLAA for the accumulator injection lines, RHR lines, and the pressurizer lines remain valid for the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.2 Reactor Coolant Pump Casings ASME Code Case N-481

4.7.2.1 Summary of Technical Information in the Application

LRA Section 4.7.2 describes the applicant's TLAA for the reactor coolant pump (RCP) casings as related to ASME Code Case N-481, "Alternative Examination Requirements for Cast Austenitic Pump Casings." Code Case N-481 allows the replacement of ASME Code, Section XI required volumetric examinations with a fracture mechanics-based evaluation and visual examinations. The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analysis remains valid for the period of extended operation.

4.7.2.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the RCP casings and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-LR Section 4.7.3.1.1 and the acceptance criteria in SRP-LR Section 4.7.2.1.

WCAP-13045, "Compliance to ASME Code Case N-481 of the Primary Loop Pump Casings of Westinghouse Type Nuclear Steam Supply System," presented Westinghouse's structural integrity evaluation of Westinghouse-designed RCP casings, which includes an evaluation of crack stability and fatigue crack growth for a 40-year service life. The applicant initially used the WCAP-13045 evaluation to support the use of visual examinations in lieu of the volumetric examinations of the Comanche Peak Unit 1 RCP casing welds for the first 40 years of service.

A similar evaluation was not performed for Comanche Peak Unit 2 RCP casings since those are single piece castings and the use of the code case was not applicable. However, to address structural integrity of the RCP casings for operation to 60 years, the applicant, in 2021, performed a reconciliation analysis (LTR-SDA-20-093-P) for Comanche Peak Units 1 and 2. This analysis used the Unit 1 plant-specific evaluation for the use of Code Case N-481 and an NRC-approved generic evaluation in PWROG-17033-NP-A, 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.'" Based on this analysis, the applicant concluded that the previous plant-specific analysis for Code Case N-481 will remain valid for the period of extended operation for the RCP casings of both units.

The staff reviewed the validity of the applicant's crack stability and fatigue crack growth (FCG) analysis associated with the use of Code Case N-481, including the effects of the potential loss of fracture toughness over 60 years of service. The staff notes that, in its prior review and approval of the generic use of PWROG-17033-NP-A, Revision 1, to address TLAAs for up to 80 years of operation, the staff concluded that a license renewal applicant that utilizes this evaluation needs to follow four conditions identified in the staff's SE, dated November 30, 2019 (ML19319A188).

- Conditions 1 and 2 require that the applicant confirm that its RCPs are Westinghouse-designed Model 63, Model 70, Model 93, Model 93A, Model 93A-1, Model 93D, Model 100A, or Model 100D, and that they are fabricated with SA-351 CF8 or CF8M material.

During its audit (ML23172A136), the staff audited Proprietary Westinghouse Letter Report, LTR-SDA-20-093-P, “Comanche Peak Units 1 and 2 Reactor Coolant Pump Casings ASME Code Case N-481 Analysis for 60-year License Renewal,” as well as WCAP-13045, and confirmed that the Comanche Peak RCP casings satisfied Conditions 1 and 2 because the RCP pump design and fabrication materials are consistent with those addressed in PWROG-17033-NP-A, Revision 1.

- Condition 3 requires that, for the crack stability analysis, the applicant must confirm that the loadings and limiting material fracture toughness values used in WCAP-13045 and PWROG-17033, Revision 1 bound plant-specific values. Otherwise, a plant-specific crack stability analysis must be submitted.

The staff reviewed the applicant’s reconciliation analysis and confirmed that the 60-year plant-specific normal and faulted loads are bounded by, or insignificantly larger than, those used in WCAP-13045 and PWROG-17033-NP-A, Revision . Therefore, the calculated limiting material fracture toughness values in the generic analysis are applicable to the 60-year Comanche Peak RCP casing crack stability analysis. The NRC staff finds that the minor force variance from the generic analysis is acceptable in this specific instance because the plant-specific load values are bounded by the values used in WCAP-13045 and PWROG-17033-NP-A, Revision 1, and the noted variance was insignificant. Therefore, the NRC staff finds that applicant has satisfied Condition 3.

- Condition 4 requires 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, considering potential increase in applied loading caused by plant-specific system operational changes, power uprate or piping modifications.

The staff reviewed LRA Table 4.3.1-2, “CPNPP 60-Year Transient RCS Transient Events,” and the plant-specific 60-year FCG analysis and confirmed that the projected cycles for 60 years of plant operation used in the reconciliation analysis are appropriate, as discussed in Section 4.3.1 of this SE, and bounded by the PWROG-17033-NP-A, Revision 1, analysis. Additionally, the staff confirmed that the plant-specific reconciliation analysis used the most limiting projected fracture toughness values for Comanche Peak RCP casings based on the guidance of NUREG-4513, Revisions 1 and 2. The staff found that there was significant margin between the postulated final crack size at 60 years and the flaw size used for stability analysis. Therefore, the NRC staff finds that the applicant has satisfied Condition 4.

Based on its review, the staff confirmed that the applicant satisfied all the conditions associated with the use of PWROG-17033-NP-A, Revision 1, to support the use of Code Case N-481. The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the analysis for the RCP casings at Comanche Peak Units 1 and 2 will remain valid for the period of extended operation.

Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1.1 because the crack stability and FCG analysis associated with the use of Code Case N-481 remain valid without change for the period of extended operation, consistent with 10 CFR 54.21(c)(1)(i).

4.7.2.3 FSAR Supplement

LRA Section A.3.6.2 provides the FSAR supplement summarizing the RCP Casings ASME Code Case N-481 TLAA. The staff reviewed LRA Section A.3.6.2 consistent with the review procedures in SRP-LR Section 4.7.2.2.

Based on its review, the staff finds the FSAR supplement meets the acceptance criteria in SRP-LR 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 TLAA, as required by 10 CFR 54.21(d).

4.7.2.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the analysis for the RCP casings remain valid for the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.3 Reactor Coolant Pump Flywheel Fatigue Crack Growth Analysis

4.7.3.1 Summary of Technical Information in the Application

LRA Section 4.7.3.1 describes the applicant’s TLAA to justify a 20-year inspection frequency for the RCP flywheel. The applicant dispositioned the TLAA for the RCP flywheel in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analysis remains valid for the period of extended operation.

4.7.3.2 Staff Evaluation

The staff reviewed the applicant’s TLAA, as modified by LRA Supplement 2, for the RCP flywheel and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-LR Section 4.7.3.1.1.

The licensee’s basis for the 20-year inspection interval is the probabilistic fracture mechanics analysis document in the topical report PWROG-17011-NP-A (ML19318D189). The NRC staff reviewed this topical report as documented in the corresponding SE (ML19198A056). During its audit (ML23172A136), the staff verified that the Comanche Peak Units 1 and 2 flywheels conform to the condition provided in the SE, which states that the applicant needs to confirm that plant-specific start/stop cycles are bounded by the 6,000 cycles assumed in the topical report. In response to RCI 4.7.3-1 (ML23143A135), the applicant confirmed that the start/stop cycles are bounded by the analysis assumptions. Specifically, the applicant estimated that the number of 60-year start/stop cycles at Comanche Peak Units 1 and 2 is 4500, which is bounded by the 6000 cycles assumed in the probabilistic fracture mechanics analysis. The staff, therefore, finds that the applicant’s analysis is consistent with the NRC-approved topical report PWROG-17011-NP-A, Revision 2, and may implement the 20-year inspection interval. Accordingly, the staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i), that the analysis for the RCP flywheel remains valid for the period of extended operation.

Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.3.1.1 because the applicant demonstrated that the RCP flywheel TLAA conforms with the assumptions of an NRC-approved topical report for 60 years of operation.

4.7.3.3 FSAR Supplement

LRA Section A.3.6.3 provides the FSAR supplement summarizing the RCP flywheel TLAA. The staff reviewed LRA Section A.3.6.3 consistent with the review procedures in SRP-LR Section 4.7.3.2

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-LR 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 inspection frequency, as required by 10 CFR 54.21(d).

4.7.3.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the analysis for the RCP flywheel remains valid for the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.4 Crane Load Cycle Limits

4.7.4.1 Summary of Technical Information in the Application

LRA Section 4.7.4, as amended by letter dated April 6, 2023, describes the applicant's TLAA for crane load cycle limits. The applicant dispositioned the TLAAs for the auxiliary filter hoist, containment access rotating platform, containment fuel handling bridge crane, containment polar crane, containment telescopic jib crane, fuel building overhead crane, fuel handling bridge crane, refueling machine, safety chiller hoist, service water intake structure crane and vertical cask transporter in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analyses remain valid for the period of extended operation.

4.7.4.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the subject cranes and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-LR Section 4.7.3.1.1 and the acceptance criteria in SRP-LR Section 4.7.2.1.

<u>Auxiliary Filter Hoist</u>
The applicant projected 1,800 lifts of the auxiliary filter hoist for the period of extended operation (60-years) in LRA Section 4.7.4., "Crane Load Cycle Limit," and in Table 3-1, "Summary of Heavy Load Crane Operation," of Report No. LUM00020-REPT-083, "CPNNP Units 1 and 2 LR," Revision 3. The staff reviewed the basis for the estimated number of lifts for each heavy load type in the table and finds the estimates for the expected number of lifts over the plant life to the end of period of extended operation are reasonable and conservative. Therefore, this confirms the applicant's conservative projected number of 1,800 lifts remains well below the CLB load cycle limit of 500,000 provided for service Class D in the Crane Manufacturers Association of America Specification 70 (CMAA-70), 1975.

Containment Access Rotating Platform Hoist
The applicant projected 500 lifts of the containment access rotating platform hoist for the period of extended operation in LRA Section 4.7.4., “Crane Load Cycle Limit,” and in Table 3-1, “Summary of Heavy Load Crane Operation,” of Report No. LUM00020-REPT-083, “CPNNP Units 1 and 2 LR,” Revision 3. The staff reviewed the basis for the estimated number of lifts for each heavy load type in the table and finds the estimates for the expected number of lifts over the plant life to the end of period of extended operation are reasonable and conservative. Therefore, this confirms the applicant’s conservative projected number of 500 lifts remains well below the CLB load cycle limit of 100,000 provided for service Class A in CMAA-70.

Containment Fuel Handling Bridge Crane
The applicant projected 19,300 lifts of the containment fuel handling bridge crane for the period of extended operation in LRA Section 4.7.4., “Crane Load Cycle Limit,” and in Table 3-1, “Summary of Heavy Load Crane Operation,” of Report No. LUM00020-REPT-083, “CPNNP Units 1 and 2 LR,” Revision 3. The staff reviewed the basis for the estimated number of lifts for each heavy load type in the table and finds the estimates for the expected number of lifts over the plant life to the end of period of extended operation are reasonable and conservative. Therefore, this confirms the applicant’s conservative projected number of 19,300 lifts remains well below the CLB load cycle limit of 100,000 provided for service Class A in CMAA-70.

Containment Polar Crane
The applicant projected 25,100 lifts of the containment polar crane for the period of extended operation in LRA Section 4.7.4, “Crane Load Cycle Limit,” and in Table 3-1, “Summary of Heavy Load Crane Operation,” of Report No. LUM00020-REPT-083, “CPNNP Units 1 and 2 LR,” Revision 3. The staff reviewed the basis for the estimated number of lifts for each heavy load type in the table and finds the estimates for the expected number of lifts over the plant life to the end of period of extended operation are reasonable and conservative. Therefore, this confirms the applicant’s conservative projected number of 25,100 lifts remains well below the CLB load cycle limit of 100,000 provided for service Class A in CMAA-70.

Containment Telescopic Jib Crane
The applicant projected 25,000 lifts of the containment telescopic jib crane for the period of extended operation in LRA Section 4.7.4, “Crane Load Cycle Limit,” and in Table 3-1, “Summary of Heavy Load Crane Operation,” of Report No. LUM00020-REPT-083, “CPNNP Units 1 and 2 LR,” Revision 3. The staff reviewed the basis for the estimated number of lifts for each heavy load type in the table and finds the estimates for the expected number of lifts over the plant life to the end of period of extended operation are reasonable and conservative. Therefore, this confirms the applicant’s conservative projected number of 25,000 lifts remains well below the CLB load cycle limit of 500,000 provided for service Class C in CMAA-70.

Fuel Building Overhead Crane
The applicant projected 60,000 lifts of the fuel building overhead crane for the period of extended operation in LRA Section 4.7.4, “Crane Load Cycle Limit,” and in Table 3-1, “Summary of Heavy Load Crane Operation,” of Report No. LUM00020-REPT-083, “CPNNP Units 1 and 2 LR,” Revision 3. The staff reviewed the basis for the estimated number of lifts for each heavy load type in the table and finds the estimates for the expected number of lifts over the plant life to the end of period of extended operation are reasonable and conservative. Therefore, this confirms the applicant’s conservative projected number of 60,000 lifts remains well below the CLB load cycle limit of 100,000 provided for service Class A in CMAA-70.

Fuel Handling Bridge Crane
The applicant projected 37,000 lifts of the fuel handling bridge crane for the period of extended operation in LRA Section 4.7.4, “Crane Load Cycle Limit,” and in Table 3-1, “Summary of Heavy Load Crane Operation,” of Report No. LUM00020-REPT-083, “CPNNP Units 1 and 2 LR,” Revision 3. The staff reviewed the basis for the estimated number of lifts for each heavy load type in the table and finds the estimates for the expected number of lifts over the plant life to the end of period of extended operation are reasonable and conservative. Therefore, this confirms the applicant’s conservative projected number of 37,000 lifts remains well below the CLB load cycle limit of 100,000 provided for service Class A in CMAA-70.

Refueling Machine
The applicant conservatively projected 20,000 lifts of the refueling machine for the period of extended operation in LRA Section 4.7.4, “Crane Load Cycle Limit,” and in Table 3-1, “Summary of Heavy Load Crane Operation,” of Report No. LUM00020-REPT-083, “CPNNP Units 1 and 2 LR,” Revision 3. The staff reviewed the basis for the estimated number of lifts for each heavy load type in the table and finds the estimates for the expected number of lifts over the plant life to the end of period of extended operation are reasonable and conservative. Therefore, this confirms the applicant’s conservative projected number of 20,000 lifts remains well below the CLB load cycle limit of 100,000 provided for service Class A in CMAA-70.

Safety Chiller Hoist
The applicant projected 1,800 lifts of the safety chiller hoist for the period of extended operation in LRA Section 4.7.4, “Crane Load Cycle Limit,” and in Table 3-1, “Summary of Heavy Load Crane Operation,” of Report No. LUM00020-REPT-083, “CPNNP Units 1 and 2 LR,” Revision 3. The staff reviewed the basis for the estimated number of lifts for each heavy load type in the table and finds the estimates for the expected number of lifts over the plant life to the end of period of extended operation are reasonable and conservative. Therefore, this confirms the applicant’s conservative projected number of 1,800 lifts remains well below the CLB load cycle limit of 100,000 provided for service Class A in CMAA-70.

Service Water Intake Structure Crane
The applicant projected 3,600 lifts of the service water intake structure crane for the period of extended operation in LRA Section 4.7.4, “Crane Loade Cycle Limit,” and in Table 3-1, “Summary of Heavy Load Crane Operation,” of Report No. LUM00020-REPT-083, “CPNNP Units 1 and 2 LR,” Revision 3. The staff reviewed the basis for the estimated number of lifts for each heavy load type in the table and finds the estimates for the expected number of lifts over the plant life to the end of period of extended operation are reasonable and conservative. Therefore, this confirms the applicant’s conservative projected number of 3,600 lifts remains well below the CLB load cycle limit of 100,000 provided for service Class A in CMAA-70.

Vertical Cask Transporter
The applicant projected 1,200 lifts of the vertical cask transporter in LRA Section 4.7.4, “Crane Loade Cycle Limit,” and in Table 3-1, “Summary of Heavy Load Crane Operation,” of Report No. LUM00020-REPT-083, “CPNNP Units 1 and 2 LR,” Revision 3. The staff reviewed the basis for the estimated number of lifts for each heavy load type in the table and finds the estimates for the expected number of lifts over the plant life to the end of period of extended operation are reasonable and conservative. Therefore, this confirms the applicant’s conservative projected number of 1,200 lifts remains well below the CLB load cycle limit of 100,000 provided for service Class A in CMAA-70.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i) that the analyses for the auxiliary filter hoist, containment access rotating platform hoist, containment fuel handling bridge crane, containment polar crane, containment telescopic jib crane, fuel building overhead crane, fuel handling bridge crane, refueling machine, safety chiller hoist, service water intake structure crane and vertical cask transporter remain valid for the period of extended operation. Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 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 period of extended operation.

4.7.4.3 FSAR Supplement

LRA Appendix A, Section A.3.6.4 provides the FSAR supplement summarizing the TLAA for the crane load cycle limits, including the cranes' number of expected lifts for the period of extended operation, as well as the limiting number of lifts. The staff reviewed LRA Section A.3.6.4 consistent with the review procedures in SRP-LR Section 4.7.3.2.

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-LR 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 load cycle limits, as required by 10 CFR 54.21(d).

4.7.4.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for the crane load cycle limits remain valid for the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.5 Spent Fuel Pool Metal Corrosion Allowance

4.7.5.1 Summary of Technical Information in the Application

LRA Section 4.7.5 describes the applicant's TLAA for the spent fuel pool (SFP) metal corrosion allowance. The applicant dispositioned the TLAAs for the SFP metal pool liner, rack lattice structure, and fuel storage tube corrosion allowance in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analyses remain valid for the period of extended operation.

4.7.5.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the SFP metal pool liner, rack lattice structure, and fuel storage tube corrosion allowance and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-LR Section 4.7.3.1.1 and the acceptance criteria in SRP-LR Section 4.7.2.1.

NUREG-0797, Section 9.1.2.1, "Spent Fuel Storage Materials," includes the following statements about SFP corrosion:

> The pool liner, rack lattice structure, and fuel storage tubes are stainless steel, which is compatible with the storage pool environment. In this environment of

> oxygen saturated borated water, the corrosion deterioration of the Type 304 stainless steel should not exceed a depth of 6.00×10^{-5} inch in 100 years, which is negligible relative to the initial thickness.

The applicant concluded that, since this original analysis by the NRC staff was assessed for 100 years, it remains valid for the period of extended operation.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for the SFP metal corrosion allowance remains valid for the period of extended operation because the original analysis was assessed for a term beyond the applicant's period of extended operation. Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 because the calculated corrosive degradation depth of $6.00X10^{-5}$ inch in 100 years for the Type 304 stainless steel SFP materials is negligible relative to the initial component wall thicknesses, and the original 100-year analysis bounds the extended period of operation.

4.7.5.3 FSAR Supplement

LRA Appendix A, Section A.3.6.5 provides the FSAR supplement summarizing the SFP metal corrosion allowance that are the subject of this TLAA. The staff reviewed LRA Section A.3.6.5 consistent with the review procedures in SRP-LR Section 4.7.3.2.

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-LR 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 SFP metal corrosion allowance, as required by 10 CFR 54.21(d).

4.7.5.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to10 CFR 54.21(c)(1)(i), that the analyses for the SFP metal corrosion allowance remain valid for the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.6 Protective Coatings

4.7.6.1 Summary of Technical Information in the Application

LRA Section 4.7.6 describes the applicant's TLAA for the evaluation of protective coatings radiation tolerance.

LRA Section 4.7.6 states that due to excessive conservatism in the current analysis, the capability of the protective coatings inside containment to resist environmental radiation for the life of the plant must be evaluated as a TLAA. The requirements for the coatings inside containment are contained in FSAR Section 6.1B.2, "Organic Materials" which establishes the threshold for radiation exposure as 3.0E+08 Rads. This threshold was established based on requirements for electrical equipment which assumes gross fuel failures in the analysis. The LRA states that, because there is no requirement for coatings to meet the same analytical conservatisms, the applicant refined the analysis for Service Level 1 protective coatings for this TLAA.

The greatest calculated radiation exposure is within the reactor cavity area. Because coatings within this area cannot communicate with ECCS sumps, they are not considered Service Level 1 coatings. For this reason, the doses in the reactor cavity area are not used to calculate the radiation exposure of the Service Level 1 coatings inside containment. The next highest calculated radiation exposure regions within containment are used for the calculation of nonreactor cavity coatings.

The refined analysis includes both 40-yr and 60-yr normal operation gamma/beta radiation and postulated accident dose. The calculated 60-yr total integrated dose is below the 3.0E+08 Rads threshold for continued qualification of nonreactor cavity protective coatings inside containment (Service Level I coatings) through the life of the plant. Therefore, LRA Section 4.7.6 states that this analysis and conclusion remains valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

4.7.6.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the evaluation of protective coatings radiation tolerance, consistent with the review procedures in SRP-LR Section 4.7.3.1.1.

The staff reviewed the refined calculations of total integrated dose to Service Level 1 coatings which eliminated excessive conservatisms in the dose value applied to electrical equipment and eliminated the dose seen by reactor cavity coatings. In its review, the staff confirmed that the reactor cavity coatings cannot physically transport to the ECCS sumps, and because the gross fuel failure dose requirements for electrical equipment are not applicable to containment coatings. Based upon its review, the staff confirmed that the calculated 60-yr total integrated dose is below the 3.0E+08 Rads threshold for continued qualification of nonreactor cavity protective coatings inside containment (Service Level I coatings) through the life of the plant. Therefore, the staff finds the applicant's revised analysis for this TLAA to be representative of the radiation exposure of the containment coatings.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i), that the analysis for the protective coatings radiation tolerance remains valid for the period of extended operation.

Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 because the protective coatings radiation tolerance remains valid for the period of extended operation.

4.7.6.3 FSAR Supplement

LRA Section A.3.6.6 provides the FSAR supplement summarizing the protective coatings radiation tolerance. The staff reviewed LRA Section A.3.6.6 consistent with the review procedures in SRP-LR Section 4.7.2.2.

Based on its review of the FSAR supplement, the staff finds it meets the acceptance criteria in SRP-LR 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 protective coatings radiation tolerance, as required by 10 CFR 54.21(d).

4.7.6.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to10 CFR 54.21(c)(1)(i), that the analysis for the protective coatings radiation tolerance remains valid to the end of the period of extended operation.

The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.7 Steam Generator Tubes Metal Corrosion Allowance

4.7.7.1 Summary of Technical Information in the Application

LRA Section 4.7.7 describes the applicant’s TLAA for the evaluation of steam generator tubes metal corrosion allowance.

LRA Section 4.7.7 states that most pressure retaining components are constructed with a wall thickness in excess of the minimum required wall thickness for that component. This excess wall thickness provides a metal corrosion allowance to ensure that minimum wall thickness requirements are maintained through the life of the component. If corrosion allowances are based on a degradation rate and will cover only the original 40-year design life of the component, they could be considered TLAAs.

For Comanche Peak Unit 2, FSAR Section 5.4.2B.5.4, “Allowable Tube Wall Thinning Under Accident Conditions,” contains a discussion of the steam generator tubing corrosion. The corrosion rate is based on a conservative weight loss rate for mill annealed Inconel tubing in flowing 650ºF primary side reactor coolant fluid. The weight loss, when equated to a thinning rate and projected over a 40-year plant life with appropriate reduction after initial hours, is equivalent to 0.080 mils thinning. Because the corrosion of the Unit 2 steam generator tubes is related to aging effects and are limited to the current 40-year period of operation, as well as meeting the other criteria, this is considered a TLAA. Extrapolating the corrosion rate over 60 years equates to 0.12 mils thinning, which is less than the assumed corrosion rate of 3.0 mils. Therefore, LRA Section 4.7.7 states that the Unit 2 steam generator tubes corrosion allowance analysis and conclusion remain valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

The applicant dispositioned the TLAA for the Comanche Peak Unit 2 steam generator tubes in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that their metal corrosion allowance remains valid through the period of extended operation.

4.7.7.2 Staff Evaluation

The staff reviewed the applicant’s TLAA for the steam generator tubing metal corrosion allowance for Comanche Peak Unit 2, consistent with the review procedures in SRP-LR Section 4.7.3.

For the Comanche Peak Unit 2 steam generator tubing, the applicant performed an evaluation of primary water corrosion based on a conservative weight loss rate for mill annealed Alloy 600 tubing in flowing 650ºF primary side reactor coolant fluid. The weight loss, when equated to a thinning rate and projected over a 40-year plant life with appropriate reduction after initial hours, is equivalent to 0.080 mils thinning. Linear extrapolation of the corrosion rate over 60 years equates to 0.12 mils thinning, which is significantly less than the assumed corrosion thinning of 3.0 mils. The staff finds the applicant's evaluation acceptable because: 1) the assumed corrosion rate is based on a conservative accident temperature general corrosion rate applied to the Unit 2 steam generator tubing over a 60-year life, 2) is based on mill annealed Alloy 600 tubing in flowing primary side reactor coolant, and 3) is significantly less than the assumed steam generator tubing corrosion allowance when extrapolated to the end of the period of extended operation. Also, the staff confirmed that operating experience has demonstrated that the general primary side corrosion rate of Alloy 600 in light-water reactor environments is negligible and that the loss of Alloy 600 metal thickness over the lifetime of the plant is trivially small due to the formation of passive, protective, oxide films.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i), that the current analysis for the Comanche Peak Unit 2 steam generator tubing metal corrosion remains valid for the end of the period of extended operation.

Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 because the Comanche Peak Unit 2 steam generator tubes metal corrosion allowance remains valid for the period of extended operation.

4.7.7.3 FSAR Supplement

LRA Section A.3.6.7 provides the FSAR supplement summarizing the steam generator tubes metal corrosion allowance. The staff reviewed LRA Section A.3.6.7 consistent with the review procedures in SRP-LR Section 4.7.2.2.

Based on its review of the FSAR supplement, the staff finds it meets the acceptance criteria in SRP-LR 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 steam generator tube metal corrosion allowance, as required by 10 CFR 54.21(d).

4.7.7.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to10 CFR 54.21(c)(1)(i), that the current analysis for the Comanche Peak Unit 2 steam generator tubing metal corrosion allowance remains valid to the end of the period of extended operation.

The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.8 Steam Generator Flow-Induced Vibration and Tube Wear Evaluations

4.7.8.1 Summary of Technical Information in the Application

LRA Section 4.7.8 describes Comanche Peak's TLAA for the evaluation of Steam Generator Flow-Induced Vibration and Tube Wear Evaluations. The Comanche Peak Unit 1 replacement steam generators and Unit 2 steam generators were evaluated for flow-induced vibration (FIV) and tube wear based on the updated thermal-hydraulic conditions of the steam generators reflecting an analyzed power uprate to 3628 MWt. The aging effects of the steam generator tubes include cumulative fatigue damage and loss of material due to fretting and wear which can be caused by flow-induced excitation and mechanical tube wear.

The Comanche Peak Unit 1 Model Delta 76 replacement steam generators were installed in Spring 2007. The FIV and tube wear analysis for the Unit 1 Delta 76 steam generators was performed for a cumulative operating service of 45 calendar years. Since the Comanche Peak Unit 1 initial license expires February 8, 2030, the 45-calendar year FIV and tube wear analysis beginning in 2007 already considers the period of extended operation.

LRA Section 4.7.8 states that the Comanche Peak Unit 2 Model D5 steam generator FIV and tube wear evaluation includes fluid elastic instability, turbulence, tube wear, vortex shedding, and fatigue. These mechanisms (except for tube wear) are solely based on the steam generator geometry, configuration of the steam generator tubing and supports, and the thermal-hydraulic fluid forces in the steam generators. These parameters are constant, and the evaluation conclusions will not be affected by an additional period of operation. Fatigue is unchanged with additional operation in this case due to the steam generator tubes operating stresses being below the tubing alloy’s fatigue endurance limit. Therefore, the LRA states that the existing analysis results for these parameters (except for tube wear) do not change and remain acceptable for the period of extended operation.

The LRA states that the tube wear evaluations are separated into expected wear due to FIV on the general tube population and active wear on specific tubes due to an active degradation mechanism. For both wear types, the Comanche Peak Unit 2 power uprate in 2009 resulted in an increase in tube wear over the remaining life of the steam generators. For the evaluation of general tube wear for the uprated conditions, the limiting level of tube wear was increased linearly by 150 percent (60/40) to account for the period of extended operation. The limiting updated general tube wear at the end of the period of extended operation remains well below the acceptable tube wall margins. Therefore, LRA Section 4.7.8 states that it was concluded that the general tube wear will not challenge the current acceptance criteria when considering the period of extended operation.

The LRA states that the evaluation of active steam generator tube wear is monitored through periodic inspection during refueling outages. Therefore, active tube wear will be identified and addressed on an ongoing basis during the period of extended operation via periodic inspections and tube wear reporting as part of the Comanche Peak Steam Generator AMP. The applicant trended recent tube wear at the Comanche Peak Unit 2 anti-vibration bars and determined that the 95th percentile growth rate bounds the tube wear data from refueling outages 12, 14, and 16. For wear at tube support plates, the LRA states that conservative through-wall wear rates were calculated using data from the current power uprated conditions for Comanche Peak Unit 2 and these conservative rates were found to be less than the predicted maximum growth rate calculated in the power uprate FIV tubing effects evaluation.

The LRA states that the Comanche Peak Unit 2 Model D5 steam generator analysis tube wear methodology for plugging and stabilizing decisions is based on wear projections for anti-vibration bar (AVB) and tube support plate (TSP) wear. The aging effects/mechanisms of the steam generator nickel alloy tubes include the loss of material due to fretting and wear caused by mechanical tube wear. AVB and TSP wear calculations considered a 60-year plant life from February 1993 to February 2053 to account for a 20-year plant life extension. The LRA states that the wear analysis has been evaluated and it shows that the wear projection analyses within it are currently applicable to 60 years of operation.

The applicant dispositioned the TLAA for the Comanche Peak Unit 1 and Unit 2 steam generators in accordance with:

10 CFR 54.21(c)(1)(i) for the Comanche Peak Unit 1 Delta 76 replacement steam generators since this design is based on a 45 calendar year operating service such that FIV and tube wear is adequately evaluated through the period of extended operation.

10 CFR 54.21(c)(1)(ii) for the Comanche Peak Unit 2 D5 steam generators since the FIV and tube wear evaluations were updated using recent wear trend data to conservatively assess the expected wear and determined to be acceptable through the period of extended operation.

4.7.8.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the steam generator tube FIV and tube wear evaluation and the corresponding disposition that the steam generator tube evaluations are either valid through the period of extended operation (for Unit 1) or have been updated and determined to be acceptable to the end of the period of extended operation (for Unit 2), consistent with the review procedures in SRP-LR Section 4.7.3.

The Comanche Peak Unit 1 replacement steam generators and Unit 2 steam generators were evaluated for flow-induced vibration (FIV) and tube wear based on the updated thermal-hydraulic conditions of the steam generators reflecting an analyzed power uprate to 3628 MWt. The aging effects of the steam generator tubes include cumulative fatigue damage and loss of material due to fretting and wear which can be caused by flow-induced excitation and mechanical tube wear. The staff noted that this analyzed power uprate level was conservative to what was implemented in their 2008 power uprate (ML081510173).

For Comanche Peak Unit 1, the applicant determined, based on the installation date of the Delta 76 replacement steam generators, and the 45-calendar year design basis, that FIV and tube wear is adequately evaluated through the period of extended operation. The staff finds the licensee determination acceptable because the FIV and tube wear year design evaluation for 45 calendar years operation that started in 2007 extends beyond the period of extended operation. For Comanche Peak Unit 1, the period of extended operation would end in 2050. The staff also reviewed the most recent Comanche Peak Unit 1 steam generator tube inspection report from refueling outage (RFO) 22 dated November 3, 2022, to determine if Unit 1 was experiencing any unusual or aggressive tube wear. The Unit 1 steam generator tube inspection report demonstrated that the limiting tube wear detected in RFO 22 was much less than that was predicted by the RFO 19 steam generator operational assessment. The RFO 22 inspection report data also confirmed that the Unit 1 steam generator tubing wear is limited, and the Unit 1 steam generator is not experiencing any aggressive or unusual tube wear. This provides the staff additional confidence that the Comanche Peak Unit 1 Delta 76 steam generator tube wear analysis, which bounds the period of extended operation, is acceptable.

For Comanche Peak Unit 2, the Model D5 tube wear evaluations were updated to account for the period of extended operation. Tube wear was separated into expected wear due to FIV on the general tube population and active wear on specific tubes due to active wear degradation. For both wear types, the Comanche Peak Unit 2 power uprate in 2009 resulted in an increase in tube wear over the remaining life of the steam generators. For the evaluation of general tube wear for the uprated conditions, the limiting level of tube wear was increased linearly by 150 percent to account for the period of extended operation. The limiting updated general tube wear at the end of the period of extended operation remains well below the acceptable tube wall margins. The staff therefore finds the Comanche Peak Unit 2 general tube wear evaluation acceptable since general tube wear, projected through the end of the period of extended operation, will not challenge the current tube degradation acceptance criteria.

Active tube wear is monitored during steam generator tube eddy current tube inspections. Recent wear trends for tube wear at the Unit 2 anti-vibration bars shows that the 95th percentile growth rate bounds the tube wear data from refueling outages 12, 14, and 16. For wear at TSPs, conservative through-wall wear rates were calculated by the applicant using data from the current power uprated conditions for Unit 2 and these conservative calculated rates were found to be less than the predicted maximum growth rate from the power uprate FIV tubing effects evaluation.

The Comanche Peak Unit 2 Model D5 steam generator analysis tube wear methodology for plugging and stabilizing decisions is based on wear projections for AVB and TSP wear. The aging effects/mechanisms of the steam generator nickel alloy tubes include the loss of material due to fretting and wear which can be caused by mechanical tube wear. The AVB and TSP wear calculations considered a 60-year life until 2053, to account for a 20-year plant life extension; therefore, the updated tube wear projections that considered 60 years of operation are acceptable.

The Comanche Peak Unit 2 steam generator inspection reports from RFO 16, 17, and 19 were reviewed to assess the tube wear results from recent eddy current tube inspections. The staff reviewed the tube wear results from the RFO 19 since all inservice steam generator tubes were inspected and the tube wear measured at RFO 19 occurred after the applicant's trended tube wear data (up to RFO 16). Tube wear results for new and existing wear indications at RFO 19 were compared to the RFO 18 operational assessment projections. All limiting tube wear indications at AVBs and at tube support structures were well below the projections from the previous outage. In addition, no tubes were plugged during RFO 19 due to tube wear at support structures. The applicant's 95th percentile wear growth rate at AVBs and conservative growth rate assumed at tube support plates were determined from the Comanche Peak Unit 2 wear data and are less than the maximum growth rate predicted by the power uprate calculations.

The staff finds the applicant's active tube wear evaluation for Comanche Peak Unit 2 acceptable because the tube wear evaluations were updated to account for the period of extended operation and the tube wear rates were shown to be conservative relative to the recent steam generator inspection wear data.

In addition to the general and active tube wear evaluation that the staff determined to be acceptable, the staff notes that steam generator tube wear will continue to be monitored on an ongoing basis through periodic tube inspections during refueling outages. Therefore, should any unexpected tube wear occur prior to or during the period of extended operation, the applicant will account for it during the condition monitoring and operational assessment processes that are part of the steam generator program included in the Comanche Peak TS. All tubing degradation, included tube wear, is reported to and reviewed by the NRC staff. For both Comanche Peak Unit 1 and Unit 2, Technical Specification 5.6.9 requires that a detailed steam generator inspection report be submitted to the NRC following each steam generator inspection.

The staff finds the applicant has demonstrated pursuant to:

> 10 CFR 54.21(c)(1)(i) for the Comanche Peak Unit 1 Delta 76 steam generators that the tube FIV and tube wear analysis is adequately evaluated through the period of extended operation

> 10 CFR 54.21(c)(1)(ii) for the Comanche Peak Unit 2 D5 steam generators since the FIV and tube wear evaluations were projected through the period of extended operation and determined to be acceptable.

Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 for Unit 1 since the analysis remains valid for the period of extended operation, pursuant to 10 CFR 54.21(c)(1)(i), and SRP-LR Section 4.7.2.1 for Unit 2 since the steam generator FIV and tube wear evaluation has been projected to the end of the period of extended operation, pursuant to 10 CFR 54.21(c)(1)(ii).

4.7.8.3 FSAR Supplement

LRA Section A.3.6.8 provides the FSAR supplement summarizing the steam generator tube FIV and tube wear evaluations. The staff reviewed LRA Section A.3.6.8 consistent with the review procedures in SRP-LR Section 4.7.2.2.

Based on its review of the FSAR supplement, the staff finds it meets the acceptance criteria in SRP-LR Section 4.7.3.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address steam generator tube FIV and tube wear, as required by 10 CFR 54.21(d).

4.7.8.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to:

> 10 CFR 54.21(c)(1)(i) for Comanche Peak Unit 1, the analysis for steam generator tube FIV and tube wear remains valid for the period of extended operation, and
>
> 10 CFR 54.21(c)(1)(ii) for Comanche Peak Unit 2, the analysis for the steam generator tube FIV and tube wear has been projected to the end of the period of extended operation.

The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.9 Steam Generator U-Bend Tube Vibration and Fatigue Assessment

4.7.9.1 Summary of Technical Information in the Application

LRA Section 4.7.9 describes the applicant’s TLAA for the evaluation of steam generator U-bend tube vibration and high cycle fatigue. Operating experience has shown that plants with drilled carbon steel TSPs can become susceptible to steam generator tube high cycle fatigue failure. This mechanism has been observed when (1) corrosion of the carbon steel drilled support plate causes tube denting at the uppermost support that results in a fixed support condition, and (2) anomalous conditions exist in the AVB support structure that could lead to unsupported U-bend portions of the tube. These conditions can reduce tube damping at the tube-to-tube support plate intersection and produce local high flow velocities, increasing steam generator tube susceptibility to high cycle fatigue.

Due to fabrication advancements and manufacturing controls used to ensure proper AVB insertion depths for the Comanche Peak Unit 1 Delta 76 replacement steam generators, the Unit 1 steam generator tubing is not affected by the U-bend FIV and fatigue mechanism.

For Comanche Peak Unit 2, the U-bend tube vibration and fatigue assessment already considers 60 years of operation. This assessment assumes steam generator operating life from the time of initial plant startup to the anticipated 60-year plant operating license expiration date. Since the Comanche Peak Unit 2 steam generator tube support plates are manufactured from stainless steel, there is no potential for tube denting to create a fixed support condition at the uppermost support plate. LRA Section 4.7.9 states that high cycle fatigue of the Unit 2 Model D5 steam generator U-bend tubes will also not occur because evaluation showed that none of the unsupported tubes identified in the Comanche Peak Unit 2 steam generators were at risk of fatigue failure during the 60-year plant life. Therefore, the LRA states that the tubes were deemed acceptable, without remediation, with respect to FIV and fatigue through the end of the 60-year operating life. Since the conclusions of the assessment are applicable through the period of extended operation, the applicant determined that no further evaluation is required.

The applicant dispositioned the TLAA for the Comanche Peak Unit 1 and Unit 2 steam generators in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that U-bend tube vibration and fatigue are either not applicable (in the case of Unit 1) or the current fatigue assessment adequately considers the period of extended operation (Unit 2).

4.7.9.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the steam generator U-bend tube vibration and fatigue assessment consistent with the review procedures in SRP-LR Section 4.7.3.

For Comanche Peak Unit 1, the applicant determined the Delta 76 replacement steam generators are not susceptible to the U-bend FIV and fatigue mechanism. The fabrication advancements and manufacturing controls used for Unit 1 ensure proper AVB insertion depths such that U-bend sections would not be unsupported. In addition, the Unit 1 steam generator design features include stainless steel trefoil shaped tube support plates that would not cause tube denting that could lead to a fixed support condition. The staff conducted an audit of the information provided in LRA Section 4.7.9 and the program basis documents, including reports provided to the staff during the audit. Based on the staff review of LRA Section 4.7.9 and the results of the audit, the staff concludes that neither condition for susceptibility to high cycle fatigue is present and the Unit 1 steam generators are not susceptible to the FIV and fatigue mechanism.

For Comanche Peak Unit 2, the applicant performed an assessment for the potential issue of steam generator tube high cycle fatigue that has been discussed in NRC Bulletin 88-02, "Rapidly Propagating Fatigue Cracks in Steam Generator Tubes." The U-bend tube vibration and fatigue analysis already considers 60 years of operation from the plant startup date. Since the Unit 2 tube support plates are manufactured from stainless steel, there is no potential for the support plate corrosion that can lead to tube denting and a fixed support condition. Thus, the necessary fixed tube boundary condition will not be present that could result in a high cycle fatigue failure. The applicant analyzed the unsupported tubes in Comanche Peak Unit 2 and determined that no tubes were susceptible to fatigue failure during the 60-year plant life evaluated. The staff finds the applicant's evaluation acceptable because the Unit 2 steam generators have stainless steel tube support plates that will not create a fixed tube boundary condition that is needed for high cycle fatigue. In addition, the licensee's analysis of unsupported tubes demonstrated that no tubes were susceptible to fatigue failure during a 60-year plant life.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i), that the analysis for the steam generator U-bend tube vibration and fatigue evaluation is either not applicable (in the case of Unit 1) or the current steam generator tube fatigue assessment adequately considers the period of extended operation (Unit 2).

Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 because the steam generator U-bend tube vibration and fatigue evaluation is either not applicable (as for Comanche Peak Unit 1) or the current fatigue assessment adequately considers the period of extended operation (Comanche Peak Unit 2).

4.7.9.3 FSAR Supplement

LRA Section A.3.6.9 provides the FSAR supplement summarizing the steam generator U-bend tube vibration and fatigue assessment. The staff reviewed LRA Section A.3.6.9 consistent with the review procedures in SRP-LR Section 4.7.2.2.

Based on its review of the FSAR supplement, the staff finds it meets the acceptance criteria in SRP-LR 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 steam generator tube high cycle fatigue, as required by 10 CFR 54.21(d).

4.7.9.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the analysis for the steam generator U-bend tube vibration and fatigue evaluation is either not applicable (for Comanche Peak Unit 1) or the current fatigue assessment has been projected to the end of the period of extended operation (for Comanche Peak Unit 2).

The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.10 Flaw Tolerance Evaluation for Susceptible Reactor Coolant Loop Cast Austenitic Stainless Steel Piping Components

4.7.10.1 Summary of Technical Information in the Application

LRA Section 4.7.10 describes Comanche Peak's TLAA for flaw tolerance evaluation performed for the susceptible CASS components at Comanche Peak, Units 1 and 2. It states that the flaw tolerance evaluation was performed to demonstrate that, even with thermal aging, the CASS components susceptible to embrittlement are flaw tolerant for 60 years of service. The applicant dispositioned this TLAA in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the evaluation remains valid for the period of extended operation.

4.7.10.2 Staff Evaluation

The staff reviewed LRA Section 4.7.10, Comanche Peak's TLAA for the flaw tolerance evaluation, and the corresponding disposition of the TLAA in accordance with

10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-LR Section 4.7.3.1.1 and the acceptance criteria in SRP-LR Section 4.7.2.1.

The LRA states that, based on its evaluation, the CASS components susceptible to embrittlement include its reactor coolant loop cast elbow components at Comanche Peak, Units 1 and 2. The staff noted that the applicant determined embrittlement susceptibility of the selected components by the molybdenum content, casting methods, and delta ferrite content consistent with guidance provided in GALL-LR Report AMP XI.M12. Therefore, the staff finds the applicant’s methodology for evaluating susceptibility to be acceptable.

LRA Section 4.7.10 also states that a flaw tolerance evaluation of the susceptible CASS piping components was performed in accordance with paragraph IWB-3640 and Appendix C of ASME Section XI to demonstrate that, even with thermal aging, the susceptible CASS components are flaw tolerant for 60 years of service. The staff reviewed the flaw tolerance evaluation, which includes flaw tolerance charts for the susceptible components for both axial and circumferential flaws that represent the limiting results for inside surface, outside surface, and embedded flaws. The staff also noted that the charts identified the maximum acceptable initial flaw size for a service life of 60 years and that any flaw below the allowable flaw size curve is acceptable in accordance with the IWB-3640 acceptance criteria for 60 years. The applicant concluded that, since the limiting flaw sizes would have been detected during component fabrication, and operational experience has shown that flaws with limiting sizes are not present in CASS components, the components remain flaw tolerant. The staff reviewed the applicant’s limiting flaw calculation methodology, results, and conclusions and finds them to be acceptable because the flaw tolerance evaluation was conducted consistent with IWB-3640 and Appendix C of ASME Section XI, which is an acceptable methodology as discussed in the GALL-LR Report AMP XI.M12 and the NRC assessment documented in letter dated May 19, 2000, from Christopher Grimes.

Based on its evaluation, the staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i) that its flaw tolerance evaluation remains valid for the period of extended operation.

Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 because the calculated limiting flaw sizes would have been detected during component fabrication.

4.7.10.3 FSAR Supplement

LRA Section A.3.6.10 provides the FSAR supplement summarizing the TLAA for the flaw tolerance evaluation of applicable CASS components. The staff reviewed LRA Section A.3.6.10 consistent with the review procedures in SRP-LR Section 4.3.3.2.

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-LR 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 flaw tolerance TLAA for the applicable CASS components, as required by 10 CFR 54.21(d).

4.7.10.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the flaw tolerance evaluation for the applicable CASS components remains valid for the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.11 Safe Shutdown Impoundment Sedimentation

4.7.11.1 Summary of Technical Information in the Application

LRA Section 4.7.11 describes the applicant’s TLAA for the safe shutdown impoundment (SSI) sedimentation. The applicant dispositioned the TLAA for SSI sedimentation in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of sedimentation on the intended functions will be adequately managed by the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP for the period of extended operation.

4.7.11.2 Staff Evaluation

The staff reviewed the applicant’s TLAA for the SSI sedimentation and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.7.3.1.3 and the acceptance criteria in SRP-LR Section 4.7.2.1.

The staff reviewed LRA Section 4.7.11 and noted that FSAR Section 9.2.5.3 discusses the SSI as part of the ultimate heat sink. In the event of a dam failure, an equalization channel limits the low water level in the SSI to 769 feet-6 inches, equivalent to 284 acre-feet of volume with 40 years of sedimentation allowance per FSAR Section 9.2.5.2. TRM Bases Section 13.7.33, “Ultimate Heat Sink,” provides surveillance requirements that verify the average sediment depth does not exceed 1.5 feet within a 12-month frequency.

Regulatory Guide (RG) 1.127, “Inspection of Water-Control Structures Associated with Nuclear Power Plants,” Revision 1, provides guidance regarding examinations for excessive sedimentation, which the applicant implements with its Onsite Inspection Program for Reservoirs. During its audit (ML23172A136), the staff reviewed Comanche Peak document, “RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP Basis Document,” which provides the basis to inspect the SSI dam for sedimentation per commitments specified in the FSAR with respect to RG 1.127. The RG 1.127 AMP references the Station Testing Manual for Safe Shutdown Impoundment Inspection (Procedure No. PPT-SX-7517, Revision 2). Section 2.1, “Acceptance Criteria,” of the Testing Manual provides the maximum allowed average sediment depth in the channel to be less than or equal to 1.5 feet, and failure of the criterion requires corrective action as directed by action statement (A.1) of TRM 13.7.33. Per TRM 13.7.33, a special report will be submitted to the NRC that specifies the measures that will be taken to remove the sediment. The staff finds the applicant’s implementation of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP to manage the effects of SSI sedimentation on the intended functions of the ultimate heat sink because the AMP, when enhanced, will be consistent with GALL-LR Report AMP XI.S7. The staff’s review of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP is discussed in SE Section 3.0.3.2.26.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of SSI sedimentation on the intended functions of the ultimate heat sink will be adequately managed for the period of extended operation. Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1.3 because the RG 1.127, Inspection of Water-Control Structures with Nuclear Power Plants AMP will monitor sedimentation build up on an annual basis and remove excessive sediment as part of the corrective actions.

4.7.11.3 FSAR Supplement

LRA Appendix A, Section A.3.6.11 provides the FSAR supplement summarizing the SSI sedimentation evaluation that is the subject to this TLAA. The staff reviewed LRA Section A.3.6.11 consistent with the review procedures in SRP-LR Section 4.7.3.2.

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-LR 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 SSI sedimentation, as required by 10 CFR 54.21(d).

4.7.11.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of sedimentation on the intended functions of the SSI will be adequately managed by the RG 1.127, Inspection of Water-Control Structures with Nuclear Power Plants AMP for the period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.8 Conclusion for TLAAs

The NRC staff reviewed LRA Section 4, “Time-Limited Aging Analyses.” Based on its review, the staff concludes that the applicant provided a sufficient list of TLAAs, as defined in 10 CFR 54.3. In addition, the staff concludes that the applicant demonstrated that (1) the TLAAs remain valid for the 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 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 period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff also reviewed the FSAR supplements for the TLAAs and finds that they contain summary descriptions of the TLAAs for the period of extended operation sufficient to satisfy the requirements of 10 CFR 54.21(d).

With regard to these matters, the NRC staff concludes that there is reasonable assurance that the activities authorized by the 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 license renewal application (LRA) for the Comanche Peak Nuclear Power 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 LRA. The applicant and the staff will attend a meeting of the full committee of the ACRS to discuss issues associated with the LRA. After the ACRS completes its review of the LRA and the SE, it will issue a report discussing the results of its review.

SECTION 6 CONCLUSION

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed the license renewal application (LRA) for Comanche Peak Nuclear Power Plant (Comanche Peak), Units 1 and 2, in accordance with NRC's regulations and the guidance in NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), dated December 2010 (ML103490036) and NUREG-1801, Revision 2, "Generic Aging Lessons Learned (GALL) Report" (GALL-LR Report), dated December 2010 (ML103490041). 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 renewed licenses. In accordance with 10 CFR 54.29, the Commission may issue a 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 renewed license will continue to be conducted in accordance with the current licensing basis and (b) any applicable requirements of Subpart A, "National Environmental Policy Act—Regulations Implementing Section 102(2)," of 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," (addressing environmental review) have been satisfied.

Based on its review of the Comanche Peak LRA, 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 period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21(a)(1) and (2) time-limited aging analyses that have been identified to require review under 10 CFR 54.21(c).

Concerning 10 CFR 54.29(b), the NRC staff's environmental review under the requirements of 10 CFR Part 51, Subpart A, is ongoing. The staff will publish its environmental review findings separately from this report.

APPENDIX A

LICENSE RENEWAL COMMITMENTS

A. LICENSE RENEWAL COMMITMENTS

During the review of the Comanche Peak Nuclear Power Plant, Units 1 and 2 (Comanche Peak or CPNPP) license renewal application by the staff of the U.S. Nuclear Regulatory Commission (NRC or the staff), Vistra Operations Company LLC (Vistra or the applicant) made commitments related to the aging management programs (AMPs) used to manage aging effects for structures and components. Table A-1, below, lists these commitments along with the implementation schedules and sources for each commitment. The period of extended operation (PEO) for CPNPP begins on February 8, 2030, for Unit 1, and February 2, 2033, for Unit 2.

Table A-1 CPNPP License Renewal Commitments

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
1	Fatigue Monitoring (A.2.1.1)	X.M1	Continue the existing Fatigue Monitoring AMP, including enhancements to: a) Include EAF analysis calculations for the additional sentinel locations, not identified in NUREG/CR-6260, that are determined through the EAF screening evaluation. b) The program will be modified to monitor the CUF_{en} at the sentinel locations consistent with the supporting environmentally assisted fatigue analyses. c) The program will be modified to monitor the dissolved oxygen through the primary water chemistry program to ensure it will remain consistent with that assumed in the environmentally assisted fatigue analyses. d) The program will be revised to account for additional critical thermal and pressure transients for components that have been identified to have a fatigue TLAA, as appropriate. Critical transients are those that require monitoring to ensure the CUF/CUF_{en} remain < 1.0. Examples of why a transient would not be monitored is if it results in stresses below the endurance limit or occurs with an already counted transient. e) The program will be modified to include acceptance criteria based on the 60-year cycle projections used in the supporting environmentally assisted fatigue analyses to ensure that the CUF_{en} does not exceed 1.0. f) The program will be modified to provide clarity on when to initiate corrective action. These corrective actions may include repair of the component, replacement of the component, a more rigorous fatigue analysis, or a flaw tolerance analysis consistent with ASME XI, Appendix L. The corrective action should consider the impact on all (both Class 1 and non-Class 1) HELB locations and ASME Section III, Class 2 and 3 allowable stress analyses.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247) LRA Supplement 1 (ML23096A302) RAI Set 1 (ML23193A846)

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
2	Environmental Qualification of Electric Components (A.2.1.2)	X.E1	Continue the existing Environmental Qualification of Electric Components AMP, including an enhancement to: a) Implement Revision 1 of RG 1.89 [June 1984], which provides additional guidance for the application of IEEE Standard 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations" that was not available in the original issuance of RG 1.89.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
3	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (A.2.2.1)	XI.M1	Continue the existing ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
4	Water Chemistry (A.2.2.2)	XI.M2	Continue the existing Water Chemistry AMP, including an enhancement to: a) Revise strategic plans to include evidence of aging effects as items to be evaluated, the cause identified, and the condition corrected.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
5	Reactor Head Closure Stud Bolting (A.2.2.3)	XI.M3	Continue the existing Reactor Head Closure Stud Bolting AMP, including enhancements to: a) Assure the maximum yield strength of replacement reactor head closure stud material purchased in the future is limited to a measured yield strength of <150 ksi. b) Explicitly prohibit the use of lubricants not meeting RG 1.65 guidance.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
6	Boric Acid Corrosion (A.2.2.4)	XI.M10	Continue the existing Boric Acid Corrosion AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
7	Cracking of Nickel-Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (A.2.2.5)	XI.M11B	Continue the existing Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
8	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (A.2.2.6)	XI.M12	Implement the new Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
9	Reactor Vessel Internals (A.2.2.7)	XI.M16A	Implement the new PWR Vessel Internals AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
10	Flow-Accelerated Corrosion (A.2.2.8)	XI.M17	Continue the existing Flow-Accelerated Corrosion AMP, including enhancements to: a) Include erosion mechanisms such as cavitation, flashing, droplet impingement, or solid particle impingement for the components that contain raw water, treated water (including borated water), or steam. b) Address erosion as an aging mechanism for all components that are susceptible to erosion wall-thinning mechanisms such as cavitation, flashing, droplet impingement, or solid particle impingement. This will include guidelines for measuring wall thickness due to erosion. c) Ensure that identification of locations susceptible to erosion are based on the extent of condition reviews from corrective actions in response to plant-specific and industry OE. Components may be treated in a manner similar to “susceptible-not-modeled” lines discussed in NSAC-202L-R4. Additionally, include guidance from EPRI 1011231 for identifying potential damage locations and EPRI TR-112657 and/or NUREG/CR–6031 guidance for cavitation erosion. d) Include trending of wall thickness measurements at locations susceptible to erosion mechanisms to adjust the monitoring frequency and to predict the remaining service life of the component for scheduling repairs or replacements. Inspection results will be evaluated 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 may consider the number or duration of these occurrences. The program will be enhanced to consider periodic wall thickness measurements of replacement components, which would continue until the effectiveness of corrective actions has been confirmed. e) Ensure that updates to plant predictive models are controlled and independently reviewed by a second qualified flow-accelerated corrosion engineer, consistent with NSAC-202L recommendations.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247) LRA Supplement 1 (ML23096A302)

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
			f) Update corrective action guidance for erosion issues to consider adjusting operating parameters or changing component designs to eliminate the cause of erosion mechanisms as part of long-term corrective actions and verify the effectiveness of these corrective actions. Continue periodic monitoring activities for any components (susceptible to erosion) replaced with an alternate material, since a material that is completely erosion resistant is not currently available.		
11	Bolting Integrity (A.2.2.9)	XI.M18	Continue the existing Bolting Integrity AMP, including enhancements to: a) Incorporate the applicable guidance from EPRI NP-5769, NUREG-1339, and EPRI TR-104213. b) Explicitly prohibit the use of molybdenum disulfide (MoS_2) as a lubricant for use on pressure retaining bolts. c) Ensure any future use of bolting material with an actual yield strength greater than or equal to 150 ksi in portions of systems within the scope of the Bolting Integrity program is minimized. Ensure that If bolting with an actual yield strength greater than or equal to 150 ksi is used, bolting is monitored for cracking, with volumetric examinations performed in accordance with ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1. d) Opportunistically inspect closure bolting for loss of preload during piping excavations. e) Inspect submerged bolting for signs of leakage, loss of material, cracking, and loss of preload during SSW pump and SGB sump pump inspections. f) Perform inspections of pressure-retaining closure bolting in locations that preclude detection of joint leakage, where the piping system contains air or gas for which leakage is difficult to detect. At a minimum, in each 10-year interval during the PEO, inspections shall be completed on a representative sample of at least 20% of the population of bolt heads and threads at each unit, up to a maximum of nineteen for each unit, for each	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247) LRA Supplement 1 (ML23096A302)

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
			material/environment combination. Inspection methods will be capable of detecting leakage for systems containing air or gas. g) Ensure periodic system walkdowns inspecting closure bolting occur at least once per refueling cycle for the portions of systems that are within the scope of LR. h) Ensure that submerged closure bolting is visually inspected for loss of material during maintenance activities. In this case, bolt heads are inspected when made accessible, and bolt threads are inspected when joints are disassembled. In each 10-year period during the PEO a representative sample of bolt heads and threads is inspected. If opportunistic maintenance activities will not provide access to 20 percent of the population (for a material/environment combination) up to a maximum of 19 bolt heads and threads per unit over a 10-year period, then it will be stated how integrity of the bolted joint will be demonstrated. For example: (a) periodic pump vibration measurements are taken and trended; or (b) sump pump operator walkdowns are performed demonstrating that the pumps are appropriately maintaining sump levels. i) Consider more frequent bolting inspections if identified leak rates are increasing. j) Provide specific guidance on closure bolting inspections for nonsafety-related bolted connections		
12	Steam Generators (A.2.2.10)	XI.M19	Continue the existing Steam Generators AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
13	Open-Cycle Cooling Water System (A.2.2.11)	XI.M20	Continue the existing Open-Cycle Cooling Water System AMP, including enhancements to: a) Ensure that if corrosion buildup or fouling is noted, the system also is evaluated for their impact on the heat transfer capability of the system. b) Ensure that evidence of corrosion in these systems is evaluated for its potential impact on the integrity of the piping. For relevant indications, inspections or nondestructive testing is used to determine the extent of biofouling, the condition of the surface coating, the magnitude of localized pitting, and the amount of MIC, if applicable. c) Ensure evaluations are performed for test or inspection results that do not satisfy established acceptance criteria, and a CR is initiated to document the concern in accordance with plant administrative procedures.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
14	Closed Treated Water Systems (A.2.2.12)	XI.M21A	Continue the existing Closed Treated Water Systems AMP, including enhancements to: a) Include visual inspection of surfaces exposed to the closed treated water (closed-cycle cooling water) environment for evidence of loss of material, cracking, or fouling whenever the system boundary is opened. At a minimum, in each 10-year period during the PEO, a representative sample (20% of the population, up to a maximum of 25 components) of piping and components will be inspected using techniques capable of detecting loss of material, cracking, and fouling, as appropriate. The representative sample will be selected based on likelihood of corrosion or cracking. Inspections will be conducted in accordance with applicable ASME Code requirements. If there are no ASME Code requirements, inspections will be conducted in accordance with the EPRI Closed Cooling Water Chemistry Guideline. Guidance will be included to report and evaluate any detectable loss of material, cracking, or fouling associated with the surfaces exposed to the closed treated water (closed cooling water) environment per the CPNPP CAP. Components will meet system design requirements, such as minimum wall thickness. If visual examination identifies adverse conditions, additional	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)

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			examinations, including ultrasonic testing, are conducted. Inspection results will be trended so that the progression of any corrosion or cracking can be evaluated and predicted. b) Based on OE, loss of material due to recurring internal corrosion (RIC) has been identified as an aging effect in the TPCW System at weld locations. Implementing documents will be updated or new documents created to perform volumetric inspection of welds located within in-scope carbon steel TPCW piping (located within the Control Building and Auxiliary Building) to address RIC. At a minimum, in each 10-year period during the PEO, a representative sample (20% of the population, up to a maximum of 25 welds) of in scope TPCW welds will be inspected using techniques capable of detecting loss of material. Inspection results which indicate a reduction in wall thickness greater than 50 percent or below minimum wall thickness values will be entered into the corrective action program for evaluation.		
15	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (A.2.2.13)	XI.M23	Continue the existing Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP, including an enhancement to: a) Specifically inspect for signs of loss of material due to corrosion and wear. Any visual indication of loss of material due to corrosion or wear and any visual signs of loss of bolting pre-load will be evaluated according to ASME/ANSI B30.2 or ASME B30.16.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
16	Compressed Air Monitoring (A.2.2.14)	XI.M24	Continue the existing Compressed Air Monitoring AMP, including enhancements to: a) Ensure procedures performing periodic internal inspections specifically inspect components for signs of corrosion and abnormal corrosion products. Ensure visual inspection results are compared to previous inspection results to ascertain if adverse long-term trends exist. Ensure signs of corrosion are evaluated. b) Ensure procedures performing air quality analysis describe review of analysis results and comparison of previous results.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)

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			c) Ensure procedures trend dewpoint temperature readings. d) Ensure air sampling procedures describe the corrective actions taken if air samples are unsatisfactory.		
17	Fire Protection (A.2.2.15)	XI.M26	Continue the existing Fire Protection AMP, including enhancements to: a) Expand the sample size of inspected fire penetration seals if any sign of degradation is found in the sample. b) Require qualified fire protection personnel perform inspections associated with the Fire Protection AMP. c) Revise penetration seal inspection procedures to include a requirement to inspect not less than 10% of each type of seal in walkdowns performed at a frequency in accordance with the plant's NRC-approved fire protection program or at least once every refueling outage. d) Revise Fire Rated Assembly Visual Inspection procedure to include a requirement to inspect the Auxiliary Boiler Fuel Oil Storage tank Concrete berm/dike as a part of Section 8.4 - Fire Walls, Floors and Ceiling Inspections. e) Revise Fire Rated Assembly Visual Inspection procedure to include the following signs of degradation or damage: Change in material properties; Cracking, Delamination; Loss of material, and Separation with the current list as a part of Section 8.4.3.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247) LRA Supplement 2 (ML23114A377) RAI Set 2 (ML23208A193) RAI Set 4 (ML23277A176)
18	Fire Water System (A.2.2.16)	XI.M27	Continue the existing Fire Water System AMP, including enhancements to: a) Inspect the fire water storage tank internal linings. The internal linings will be inspected for blistering, cracking, flaking, peeling, delamination, and rusting. The training and qualification of individuals involved in tank lining inspections and evaluation of degraded conditions will be conducted in accordance with an ASTM International standard endorsed in RG 1.54 including staff limitations associated with a particular standard. The following coating/lining acceptance criteria will be applied:	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247) LRA Supplement 1 (ML23096A302) LRA Supplement 2 (ML23114A377) RAI Set 2 (ML23208A193)

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			o Indications of peeling and delamination are not acceptable. o Blisters will be evaluated by a qualified coating specialist. o Blisters should be limited to a few intact small blisters that are completely surrounded by sound coating/lining bonded to the substrate. Blister size and frequency should not be increasing between inspections (e.g., reference ASTM D714-02, “Standard Test Method for Evaluating Degree of Blistering of Paints”). o As applicable, wall thickness measurements, projected to the next inspection, meet design minimum wall requirements. For fire water storage tank linings inspected by the procedure that do not meet acceptance criteria, appropriate corrective measures will be taken, consistent with LR-ISG-2013-01, Appendix C, Element 7, with the exception of adhesion tests. b) Ensure that visual inspections for loss of material use inspection techniques 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 will be performed. c) Perform augmented tests and inspections on piping segments that cannot be drained or piping segments that allow water to collect. In each 5-year interval, beginning 5 years prior to the PEO, either a flow test or flush sufficient to detect potential flow blockage will be conducted, or a visual inspection of 100 percent of the internal surface of piping segments that cannot be drained or piping segments that allow water to collect will be performed. In each 5-year interval of the PEO, 20 percent of the length of piping segments that cannot be drained or piping segments that allow water to collect will be subject to volumetric wall thickness inspections. Measurement points will be obtained to the extent that each potential degraded condition can be identified (e.g., general corrosion, MIC). The 20 percent of piping that is inspected in each 5-year interval will be in different locations	Perform the pre-PEO inspections within the 5-year period prior to the PEO.	RAI Set 4 (ML23277A176)

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			than previously inspected piping. If the results of a 100-percent internal visual inspection are acceptable, and the segment is not subsequently wetted, no further augmented tests or inspections will be necessary. For portions of the normally dry piping that are configured to drain, the above augmented tests and inspections are not required. d) Update existing procedures and/or develop new procedures, as directed in the table titled, “Fire Water System Inspections and Tests” in LRA Section B.2.3.16, to state that testing and visual inspections are performed in accordance with Table 4a of LR-ISG-2012-02, Appendix L. These tables are based on NFPA 25, 2011 edition. Unless recommended otherwise, external visual inspections are to be conducted on a refueling outage interval. e) Update procedures to state that minimum design wall thickness must be maintained for in-scope fire protection piping. f) Caulking or sealant shall be installed at the interface between the steel FWSTs and the respective concrete foundation ring. The caulking/sealant will be visually inspected and physically manipulated on a refueling outage interval with acceptance criteria of no drying, cracking, or missing caulking/sealant. Flaws in the caulking/sealant are evaluated in the Corrective Action Program and are repaired/replaced accordingly. g) Measure the tank bottom thickness of each FWST in accordance with LR-ISG-2012-02, Appendix L, using ultrasonic testing (UT) during the first 10-year period of the PEO. UT thickness measurements of the tank bottoms are evaluated against the design thickness and corrosion allowance. Inadequate bottom thickness results are evaluated in accordance with the site Corrective Action Program and, if required, repairs are implemented. h) Following any activation of the electric motor driven vertical centrifugal fire pump, the suction strainer/screen shall be inspected and cleared of any debris or obstructions.		

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			i) Perform volumetric examinations at five locations on the carbon steel aboveground fire water piping susceptible to recurring internal corrosion (RIC) on a refueling outage interval to identify loss of material. Continue these examinations until RIC, as defined by LR-ISG-2012-02, of the aboveground carbon steel fire suppression piping has been arrested. Additional locations will be examined if these volumetric examinations or plant operating experience identify significant degradation. For through-wall leaks and material loss greater than 50 percent of nominal wall, four additional locations will be examined. Where the identified material loss is 30 percent to 50 percent of nominal wall thickness and the calculated remaining life is less than two years, two additional locations will be examined. j) Clean and visually inspect the tubesheet and channel head of each fire pump diesel engine heat exchanger based on maintenance history and at least once every ten years. Evaluate any indication of fouling or corrosion. Enter conditions that do not meet acceptance criteria into the CAP for evaluation.		
19	Fuel Oil Chemistry (A.2.2.17)	XI.M30	Continue the existing Fuel Oil Chemistry AMP, including enhancements to: a) Test for levels of microbiological organisms in the new fuel oil prior to acceptance. b) Monitor and trend the following parameters quarterly: water content, sediment content, biological activity, and total particulate concentration for the EDG DFOSTs, Day Tanks, and DDFP Fuel Oil Storage Tanks. c) Drain, clean, and visually inspect the internal surfaces of the EDG Day Tanks and the DDFP Fuel Oil Storage Tanks. Volumetrically inspect the tanks, if evidence of degradation is observed during visual inspection, or if visual inspection is not possible. Perform the maintenance activities and the inspections at least once during the 10-year period prior to the PEO, then periodically on a 10-year frequency during the PEO.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO. Perform the pre-PEO inspections within the 10-year period prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)

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			d) Provide acceptance criteria, consistent with industry standards, for the testing requirement and approach used to detect the microbiological activity in diesel fuel used in the EDG DFOSTs, Day Tanks, and DDFP Fuel Oil Storage Tanks.		
20	Reactor Vessel Surveillance (A.2.2.18)	XI.M31	The Reactor Vessel Surveillance AMP will be enhanced as follows: a) A capsule in each unit will be re-inserted prior to 36 EFPY in order to achieve at least a vessel equivalent fluence of 80 EFPY. For Unit 1, Capsule Z will be re-inserted and then withdrawn and tested at the outage nearest to but following an additional 9 EFPY of operation. If Capsule Z is not available for reinsertion, Capsule W or V can be reinserted for an additional 13 EFPY of operation. For Unit 2, Capsule Z will be re-inserted and then withdrawn and tested at the outage nearest to but following an additional 8 EFPY of operation. If Capsule Z is not available for reinsertion, Capsule Y or V can be reinserted for an additional 14 EFPY of operation. b) The capsule withdrawal schedule will be documented in the PTLR and note that changes require NRC approval per 10 CFR Part 50, Appendix H. c) The program documents will be modified to require that all pulled and tested specimens will be retained unless the NRC has approved the discard of the pulled and tested samples. d) The program documents will be modified to establish operating restrictions to ensure that the plant is operated within the material aging OE, i.e., the cold leg temperature during normal operation will be limited to 525°F (minimum) to 590°F (maximum). e) The program documents will be modified to require an update to the PTLR consistent with the surveillance test results after submittal of the surveillance test result consistent with 10 CFR Part 50, Appendix H.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247) LRA Supplement 1 (ML23096A302)

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21	One-Time Inspection (A.2.2.19)	XI.M32	Implement the new One-Time Inspection AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO. Perform the pre-PEO inspections within the 10-year period prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
22	Selective Leaching (A.2.2.20)	XI.M33	Implement the new Selective Leaching AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO. Perform the pre-PEO inspections within the 5-year period prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
23	ASME Code Class 1 Small-Bore Piping (A.2.2.21)	XI.M35	Implement the new One-Time Inspection of ASME Code Class 1 Small-Bore Piping AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the	LRA, Appendix A, Table A-3 (ML22297A247)

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				last refueling outage prior to the PEO. Perform the pre-PEO inspections within the 6-year period prior to the PEO.	
24	External Surfaces Monitoring of Mechanical Components (A.2.2.22)	XI.M36	Continue the existing External Surfaces Monitoring of Mechanical Components AMP including enhancements to: a) Include elastomeric and polymeric components in the scope of the AMP. b) Include outdoor insulated components and indoor insulated components exposed to condensation in the scope of the AMP to monitor for degraded conditions under insulation. c) Clarify that below-grade components that are accessible during normal operations or refueling outages for which access is not restricted are managed by this AMP. d) Credit external examinations to manage the aging effects of the internal surfaces of components when external conditions are representative of internal conditions. e) Monitor for discoloration, surface cracking, crazing, scuffing, dimensional change and hardening for polymeric and elastomeric components as well as exposure of internal reinforcement for reinforced elastomers. f) Monitor metallic components for loss of material due to material wastage; leakage; worn, flaking or oxide coated surfaces; and corrective coating degradation; as well as corrosion stains on thermal insulation. g) Include examples of components inspected, such as piping, piping components, ducting, polymeric components, and insulation jacketing.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)

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			h) Inspect unit coolers for reduction of heat transfer. The inspection will consist of the heat transfer surfaces of unit coolers that are exposed to external condensation and are credited with a heat transfer function. i) Ensure inspections of surfaces readily visible during plant operations and refueling outages are performed once per refueling cycle. Surfaces that are not readily visible during plant operations and refueling outages are inspected when they are made accessible and at such intervals that would ensure the components' intended functions are maintained. j) Include the use of, when non ASME Code inspections and tests are required, site procedures that include inspection parameters for items such as lighting, distance, offset, surface coverage, and presence of protective coatings. k) Inspect elastomeric and polymeric components through a combination of visual inspection and manual or physical manipulation of the material. Visual inspections will cover 100 percent of accessible component surfaces. Manual or physical manipulation of flexible polymeric 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 will be at least 10 percent of available surface area. The inspection parameters for elastomers and polymers shall include the following: o Surface cracking, crazing, scuffing, and dimensional change (e.g., "ballooning" and "necking"); o Loss of thickness; o Discoloration (evidence of a potential change in material properties that could be indicative of polymeric degradation); o Exposure of internal reinforcement for reinforced elastomers; and o Hardening as evidenced by a loss of suppleness during manipulation where the component and material are appropriate for manipulation.		

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			l) Inspect insulated components in an outdoor environment or in an indoor environment that may be exposed to condensation, once every 10 years during the PEO. The population and sample sizes used for inspections will be determined based on the material type and environment combination. A minimum of 20 percent of the in-scope piping length, or 20 percent of the surface area for components whose configuration does not conform to a 1-foot axial length determination (e.g., valve, accumulator, tank) will be inspected after the insulation is removed. Alternatively, any combination of a minimum of twenty-five 1-foot axial length sections and components from each material type is inspected, with a maximum of 25 inspections required for each material environment in each population. m) Include the following alternatives to removing insulation after the initial inspection: o Subsequent inspections may consist of examination of the exterior surface of the insulation with sufficient acuity to detect indications of damage to the jacketing or protective outer layer (if the protective outer layer is waterproof) of the insulation when the results of the initial inspections meet the following criteria: i. No loss of material due to general, pitting, or crevice corrosion beyond that which could have been present during initial construction is observed during the first set of inspections, and ii. No evidence of SCC is observed during the first set of inspections If: (a) the external visual inspections of the insulation reveal damage to the exterior surface of the insulation or jacketing, (b) there is evidence of water intrusion through the insulation (e.g., water seepage through insulation seams/joints), or (c) the protective outer layer (where jacketing is not installed) is not waterproof, then periodic inspections under the insulation should continue as conducted for the initial inspection. o Removal of tightly adhering insulation that is impermeable to moisture is not required unless there is evidence of damage to the moisture barrier. If the moisture barrier is intact, the		

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			likelihood of corrosion under insulation (CUI) is low for tightly adhering insulation. Tightly adhering insulation is considered to be a separate population from the remainder of insulation installed on in-scope components. The entire population of in-scope piping that has tightly adhering insulation is visually inspected for damage to the moisture barrier with the same frequency as for other types of insulation inspections. These inspections are not credited towards the inspection quantities for other types of insulation. n) Select bounding or lead components most susceptible to CUI in an outdoor environment or in an indoor environment that may be exposed to condensation. This could be due to time in service, severity of operating conditions (e.g., amount of time that condensate would be present on the external surfaces of the component), and lowest design margin for inspection under insulation. o) Include the following acceptance criteria: ○ For metallic surfaces, any indications of degradation are evaluated. ○ For stainless steel surfaces, a clean, shiny surface is expected, and any deviation is evaluated. ○ For flexible polymers, a uniform surface texture and uniform color with no dimension change is expected and any deviation is evaluated. ○ For flexible materials, changes in physical properties (e.g., the hardness, flexibility, physical dimensions, and color of the material are unchanged from when the material was new) are evaluated. ○ For rigid polymers, surface changes affecting performance, such as erosion, cracking, crazing, and chalking, are evaluated.		
25	Flux Thimble Tube Inspection (A.2.2.23)	XI.M37	Continue the existing Flux Thimble Tube Inspection AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032,	LRA, Appendix A, Table A-3 (ML22297A247)

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				or no later than the last refueling outage prior to the PEO.	
26	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (A.2.2.24)	XI.M38	Implement the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
27	Lubricating Oil Analysis (A.2.2.25)	XI.M39	Continue the existing Lubricating Oil Analysis AMP, including an enhancement to: a) Clarify that phase-separated water in any amount is not acceptable for any component within the scope of LR.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
28	Monitoring of Neutron-Absorbing Materials Other Than Boraflex (A.2.2.26)	XI.M40	Continue the existing Monitoring of Neutron-Absorbing Materials Other Than Boraflex AMP, including an enhancement to: a) Ensure the required corrective action to address failed acceptance criteria includes a comparison of current and future predicted parameters to the assumptions of the SFP criticality analysis.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
29	Buried and Underground Piping and Tanks (A.2.2.27)	XI.M41	Continue the existing Buried and Underground Piping and Tanks AMP, including enhancements to: a) Manage loss of material due to corrosion of piping system bolting within the scope of this program.	No later than 6 months prior to the PEO, i.e.:	LRA, Appendix A, Table A-3 (ML22297A247) LRA Supplement 1

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			b) Implement the requirements of NACE SP0169-2007 or NACE RP0285-2002 for cathodic protection. c) Ensure pit depth gages or calipers used for measuring wall thickness have been demonstrated to be effective for the material, environment, and conditions (e.g., remote methods) during the examination, and they are capable of quantifying general wall thickness and the depth of pits. d) Perform inspections of buried and underground piping and tanks within the fire protection, SSW, and emergency diesel generator and auxiliary systems in accordance with LR-ISG-2015-01 Table XI.M41-2 for steel. The inspections will be distributed evenly among the units. Since CPNPP is a two-unit site, the inspection quantities are 50 percent greater than LR-ISG-2015-01 Table XI.M41-2 and are rounded up to the nearest whole inspection. When the inspections for a given material type is 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. e) Ensure a minimum of 25% of the internal surface of the diesel generator fuel oil storage tank, including the upper and lower portion of the tank and tank endbells, is inspected volumetrically. f) With respect to cathodic protection, use an acceptance criterion equal to or more negative than -850 mV instant off for all in-scope buried components. Trend potential difference and current measurements to identify changes in the effectiveness of the cathodic protection system and/or coatings. Ensure the critical potential limit does not exceed -1200 mV. g) Trend the main fire pump activity and, for small leaks, the fire water storage tank level indicator alarms and associated makeup from the treated water system (or similar parameter) to identify concerns with buried fire water yard loop header leakage.	U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO. Perform the pre-PEO inspections within the 10-year period prior to the PEO.	(ML23096A302) RAI Set 2 (ML23208A193)

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			h) Ensure type and extent of coating degradation is evaluated by evaluators who: (a) possess a NACE Coating Inspector Program Level 2 or 3 inspector qualification; (b) who has completed the EPRI Comprehensive Coatings Course and completed 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 RG 1.54, Revision 2, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants." i) Where loss of material is identified, the measured wall thickness is projected to the end of the PEO such that minimum wall thickness requirements are maintained. j) Revise acceptance criteria to ensure there is no evidence that backfill caused damage to the respective component coatings or the surface of the component (if not coated), and that changes in main fire pump activity or increasing frequency of fire water storage tank level indicator alarms (and associated makeup from the treated water system), which cannot be attributed to causes other than leakage from buried piping, are not occurring. k) Conduct an extent of condition evaluation when damage to a coating has been evaluated as significant and the damage was caused by nonconforming backfill to determine the extent of degraded backfill in the vicinity of the observed damage. l) Unacceptable cathodic protection survey results are entered into the plant corrective action program. m) When using the option of monitoring the activity of a main fire pump or fire water storage tank level indicator alarms (and associated makeup from the treated water system) instead of inspecting buried fire water system piping, a flow test or system leak rate test is conducted by the end of the next refueling		

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			outage or as directed by the current licensing basis, whichever is shorter, when unexplained changes in main fire pump activity, fire water storage tank level indicator alarms, or equivalent equipment or parameter are observed. n) If coated or uncoated metallic piping or tanks show evidence of corrosion, the remaining wall thickness in the affected area is determined to ensure that the minimum wall thickness is maintained. 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 PEO meets minimum wall thickness requirements, recommendations for expansion of sample size, below do not apply. o) Where the coatings, backfill, or the condition of exposed piping does not meet acceptance criteria, the degraded condition is repaired, or the affected component is replaced. In addition, where 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 PEO, an expansion of sample size is conducted. The number of inspections within the affected piping categories are doubled or increased by 5, whichever is smaller. If the acceptance criteria are not met in any of the expanded samples, an analysis shall be conducted to determine 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 four years following the end of an inspection interval cannot also be credited towards the number of inspections in Table XI.M41-2 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 mechanism.		

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
			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 the 10-year interval.		
30	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (A.2.2.28)	XI.M42	Continue the existing Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP, including enhancements to: (a) Include the following internal coatings/linings in the scope of the AMP: o Emergency Diesel Generator Intercoolers o Fire Protection Cement-lined Piping o Internally Coated Four Inch Service Water Piping within the SWIS (b) Perform visual inspections capable of identifying flaking, peeling, delamination, and spalling. (c) Perform baseline inspections of coatings/linings in the 10-year period prior to the PEO for the o Emergency Diesel Generator Intercoolers. o Internally Coated Four Inch Service Water Piping within the SWIS. (d) Perform subsequent inspections based on an evaluation of the effect of a coating/lining failure on the in-scope component's intended function, potential problems identified during prior inspections, and known service life history. Subsequent inspection intervals are established by a coating specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54. Inspection intervals should not exceed those in LR-ISG-2013-01, Table 4a, "Inspection Intervals for	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO. Perform the pre-PEO inspections no earlier than 10 years prior to the PEO and no later than 6 months prior to the PEO or the last refueling outage prior to PEO.	LRA, Appendix A, Table A-3 (ML22297A247) LRA Supplement 2 (ML23114A377)

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
			Internal Coatings/Linings for Tanks, Piping, Piping Components, and Heat Exchangers." (e) Perform inspections of all accessible internally coated surfaces of in-scope heat exchangers. (f) Establish qualifications for cementitious coatings/linings inspectors to have a minimum of 5 years of experience inspecting or testing concrete structures or cementitious coatings/linings, or a degree in the civil/structural discipline and a minimum of 1 year of experience. (g) Perform opportunistic inspections of the cement lining applied to the internal surface of buried fire protection piping. (h) Perform a pre-inspection review of the previous two inspections, when available that includes reviewing the results of inspections and any subsequent repair activities. (i) Prepare post-inspection reports, by a coatings specialist, to include: a list and location of all areas evidencing deterioration, a prioritization of the repair areas into areas that must be repaired before returning the system to service and areas where repair can be postponed to the next refueling outage, and where possible, photographic documentation indexed to inspection locations. When corrosion of the base material is the only issue related to coating/lining degradation of the component and external wall thickness measurements are used in lieu of internal visual inspections of the coating/lining, the corrosion rate of the base metal is trended. (j) Include the following acceptance criteria: ○ Indications of peeling and delamination are not acceptable. ○ Blisters, cracking, flaking, and rusting are evaluated by a coatings specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54. Blisters should be limited to a few intact small blisters that are completely surrounded by sound coating/lining bonded to the substrate.		

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
			Blister size and frequency should not be increasing between inspections. ○ Minor cracking and spalling of cementitious coatings/linings is acceptable provided there is no evidence that the coating/lining is debonding from the base material. ○ As applicable, wall thickness measurements, projected to the next inspection, meet design minimum wall requirements. (k) Revise corrective actions to include the following: ○ As an alternative to repair/replacement, coatings exhibiting indications of peeling and delamination may be returned to service if: (a) physical testing is conducted to ensure that the remaining coating is tightly bonded to the base metal; (b) the potential for further degradation of the coating is minimized, (i.e., any loose coating is removed, the edge of the remaining coating is feathered); (c) adhesion testing using ASTM International standards endorsed in RG 1.54 is conducted at a minimum of 3 sample points adjacent to the defective area; (d) an evaluation is conducted of the potential impact on the system, including degraded performance of downstream components due to flow blockage and loss of material of the coated component; and (e) follow-up visual inspections of the degraded coating are conducted within 2 years from detection of the degraded condition, with a re-inspection within an additional 2 years, or until the degraded coating is repaired or replaced. ○ If coatings/linings are credited for corrosion prevention (e.g., corrosion allowance in design calculations is zero, the “preventive actions” program element credited the coating/lining) and the base metal has been exposed or it is beneath a blister, the component’s base material in the vicinity of the degraded coating/lining will be examined to determine if the minimum wall thickness is met and will be met until the next inspection.		

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
			○ If a blister is not repaired, physical testing may be conducted to ensure that the blister is completely surrounded by sound coating/lining bonded to the surface. Physical testing consists of adhesion testing using ASTM International standards endorsed in RG 1.54. An alternative means of determining that the remaining coating/lining is tightly bonded to the base metal may be conducted such as lightly tapping the coating/lining. Acceptance of a blister to remain in-service should be based both on the potential effects of flow blockage and degradation of the base material beneath the blister. (l) For baseline and periodic inspections of the Internally Coated Four Inch Service Water Piping within the SWIS, either inspect a representative sample of 73 1-foot axial length circumferential segments of piping or 50 percent of the total length of each coating/lining material and environment combination, whichever is less.		
31	ASME Section XI, Subsection IWE (A.2.2.29)	XI.S1	Continue the existing ASME Section XI, Subsection IWE AMP, including enhancements to: (a) Specify that selection of bolting material, lubricants and installation torque or tension are in accordance with the guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339 to prevent or mitigate degradation and failure of safety-related containment closure bolting. (b) Prohibit the use of molybdenum disulfide or other sulfur containing lubricants for structural bolts. (c) Augment existing procedures to monitor cracking due to cyclic loading of equipment hatch, personnel airlocks, electrical penetrations, piping penetrations with stainless steel or dissimilar metal welds, and fuel transfer tube sleeve by periodic supplemental surface examinations at intervals no greater than 10 years.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO. Perform the pre-PEO inspections within the 5-year period prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247) LRA Supplement 2 (ML23114A377)

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
			(d) Implement pre-PEO supplemental one-time volumetric/surface examinations or enhanced visual examination (EVT-1) for a representative sample of subject penetrations, performed by qualified personnel comprising (a) four 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 one stainless steel fuel transfer tube on each unit. These inspections are intended to confirm the absence of SCC. 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. Periodic inspection of subject penetrations with dissimilar metal welds for cracking will be added to the ASME Section XI, Subsection IWE AMP if necessary, depending on the inspection results.		
32	ASME Section XI, Subsection IWL (A.2.2.30)	XI.S2	Continue the existing ASME Section XI, Subsection IWL AMP, including enhancements to: a) Clarify that concrete deterioration and distress includes damage or degradation, such as those described in ACI 201.1 and ACI 349.3R; b) Explicitly require that areas of concrete deterioration and distress be recorded in accordance with the guidance provided in ACI 349.3R; c) Specify that inspection results are to 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; and d) Include quantitative acceptance based on the "Evaluation Criteria" provided in Chapter 5 of ACI 349.3R to augment the qualitative assessment of the Responsible Engineer.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
33	ASME Section XI, Subsection IWF (A.2.2.31)	XI.S3	Continue the existing ASME Section XI, Subsection IWF AMP including enhancements to: a) Specify that selection of bolting material, lubricants, and installation torque or tension are in accordance with the	No later than 6 months prior to the PEO, i.e.:	LRA, Appendix A, Table A-3 (ML22297A247) LRA Supplement 2

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
			guidelines of EPRI NP-5769, EPRI TR-104213, and the additional recommendations of NUREG-1339 to prevent or mitigate degradation and failure of safety-related bolting. b) Specify the use of preventive actions for storage, lubricants, and SCC potential discussed in Section 2 of Research Council for Structural Connections publication, "Specification for Structural Joints Using ASTM A325 or A490 Bolts" for structural bolting consisting of ASTM A325, A490, and equivalent bolts. c) Prohibit the use of molybdenum disulfide or other sulfur containing lubricants for structural bolts. d) Specify that the following conditions are also unacceptable: o Debris, dirt, or excessive wear that could prevent or restrict sliding of the sliding surfaces as intended in the design basis of the support. o Cracked or sheared bolts, including high-strength bolts, and anchors.	U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	(ML23114A377)
34	10 CFR Part 50, Appendix J (A.2.2.32)	XI.S4	Continue the existing 10 CFR Part 50, Appendix J AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
35	Masonry Walls (A.2.2.33)	XI.S5	Continue the existing CPNPP Masonry Walls AMP, including enhancement – a) To include bricks and mortar near the silencer for each diesel generator and perform a baseline inspection; and	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the	LRA, Appendix A, Table A-3 (ML22297A247) LRA Supplement 1 (ML23096A302)

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
			b) of inspector and reviewer qualifications for Masonry Walls and other structural components to match current ACI 349.3R requirements through the Structures Monitoring AMP. c) to include gaps between supports and masonry walls as an inspection parameter.	last refueling outage prior to the PEO.	
36	Structures Monitoring (A.2.2.34)	XI.S6	Continue the existing Structures Monitoring AMP, including enhancements to: a) Include the Diesel Generator Buildings, Switchgear Buildings, Transmission Towers associated with Startup Transformers (XST1, XST2), Alternate Start-up Transformers (XST1A, XST2A), Firewater Valve Houses, and seismic Category I Manholes, Handholes, and Duct Banks, and Plant Effluent Holdup and Monitor Tanks and pipe encasement in the scope of the Structures Monitoring AMP. b) Perform periodic sampling and testing of groundwater chemistry at a frequency once every 5 years to determine the quality of groundwater. c) Inspect structural members of crane supports, high energy line break (HELB) and spray shields, stairs, and platforms, industrial and HELB doors. d) Include exposed steel embedment's in the "Steel Structural Elements" group. e) Inspect concrete structures for increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete degradation. f) Visually inspect concrete structures for unique cracking such as "craze", "mapping" or "patterned" cracking to determine the presence of alkali-silica gel. g) Provide guidance for documenting significant findings of the inspection, consistent with ACI 349.3R, Section 3.5.5 to monitor and trend the extent of degradation.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247) LRA Supplement 2 (ML23114A377) LRA Annual Update (ML23290A273) LRA Supplement 3, Revision 1 (ML24031A608)

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
			h) Provide guidance for documentation and archival requirements in accordance with ACI 349.3R Section 3.4. i) Provide guidance for inspection reports to be completed in accordance with ACI 349.3R Section 3.5.5. j) Evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. k) Specify the qualification requirements for inspection of structures and components as well as the requirements for the reviewer to match the ACI 349.3R current code requirements. l) Specify that the selection of bolting material, lubricants, and installation torque or tension are in accordance with the guidelines of EPRI NP-5769, NP-5067 and EPRI TR-104213, and the additional recommendations of NUREG-1339 to prevent or mitigate degradation and failure of structural bolting. m) Specify the use of preventive actions for storage, lubricants, and SCC potential in Section 2 of Research Council for Structural Connections publication, “Specification for Structural Joints Using ASTM A325 or A490 Bolts,” for structural bolting consisting of ASTM A325, A490, and equivalent bolts. n) Prohibit the use of molybdenum disulfide (MoS2) or other sulfur containing lubricants for structural bolts. o) Monitor structural sealants for cracking, loss of material, and hardening. p) Specify that the condition of structural sealants is acceptable if observed loss of material, cracking, and hardening will not result in loss of sealing. q) Require engineering evaluation, more frequent inspections, or destructive testing of affected concrete (to validate properties) if ground water leakage is identified. When leakage volumes allow, assessments may include analysis of the leakage pH, along with mineral, chloride, sulfate, and iron content in the water.		

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
			r) Ensure Component supports are included in the inspections every 5 years. s) Explicitly address the potential for exposure of SSCs to leakage containing boric acid and require that the periodic walkdowns include all accessible interior walls and ceilings of rooms that are adjacent to (including below) the SFPs, Fuel Transfer Canals, and Refueling Cavities (when accessible). This includes a requirement that newly identified leaks or changes in existing leaks are entered into and evaluated via the CAP. t) Revise existing preventive maintenance tasks to require periodic inspection and cleaning, including blockage removal, of the Fuel Transfer Canal and Refueling Cavity tell-tale drains in addition to the SFP tell-tale drains. u) Sample and analyze discharge from the leak chase system for, at minimum, flow (drip) rate and the following chemistry parameters: pH, boron concentration, and iron content. v) Assess blockage detection techniques, including the use of video probes to check for development of blockages in the tell-tales. w) Inspect for evidence of leakage from the SFP, Fuel Transfer Canals, or Refueling Cavities, such as the formation of deposits or wet areas on the structures. x) Assess the frequency of inspection of the tell-tale drains (to increase confidence that there are no blockages), including sample collection and analysis. An initial frequency of once per year for the SFP tell-tales and once per refueling outage (when filled) for the Fuel Transfer Canal and Refueling Cavity tell-tales will be established. The long-term frequency may be adjusted by evaluating internal and external operating experience. y) Develop appropriate acceptance criteria for the parameters that are monitored for the leak detection system, including, at a minimum, leak chase system discharge flow (drip) rate, pH, boron concentration, and iron content. Any indications of new or		

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
			increased leakage from the SFP, Fuel Transfer Canals, or Refueling Cavities (formation of white crystal deposits or wet areas) will be documented and evaluated via the CAP. The following guidance for acceptance criteria will be included in the evaluation: • Drip rate: > 0 if any leakage has previously occurred; 0 if leakage has not previously occurred. No discharge from a telltale that had previously drained leakage may indicate a blockage. New leakage may indicate a change to leakage pathways. Significant changes (increases or decreases) to the drip rate will be reviewed as part of the overall trend analysis. • pH: > 5 or within +/- 1.5 pH units of 12-month average for each telltale drain. • Boron: The reason for measuring the boron concentration is to assist in interpretation of the other chemistry results. Therefore, a specific acceptance criterion for boron concentration is not warranted. • Iron: Detection of any changes in iron corrosion occurring behind the liner. Iron levels will be trended and evaluated. z) Revise existing preventive maintenance tasks to include cleaning of the Fuel Transfer Canal and Refueling Cavity (in addition to the SFP) tell-tale drains using a rod or brush or by high-pressure cleaning (hydrolasing) if inspection results indicate cleaning is necessary. aa) Require that any results of inspections or analysis of data collected (associated with leak detection for the SFP, Fuel Transfer Canals, and Refueling Cavities) that do not meet the acceptance criteria will be entered into the CAP and evaluated, including consideration of revisiting structural evaluations to determine whether any future observed indications of changes in the leakage conditions cause structural margin to become inadequate. bb) Evaluate operating experience relative to effective methods for restoring flow to tell-tale drains.		

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
37	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (A.2.2.35)	XI.S7	Continue the existing RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP, including enhancements to: a) Inspect concrete structures for an increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete degradation. b) Inspect concrete structures for unique cracking such as "craze", "mapping" or "patterned" cracking to determine the presence of alkali-silica gel. c) Evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. d) Include guidance for documenting and trending all significant findings of the inspection, consistent with ACI 349.3R, Section 3.5.5. e) Specify that the selection of bolting material, lubricants, and installation torque or tension are in accordance with the guidelines of EPRI NP-5769, NP-5067, EPRI TR-104213, and the additional recommendations of NUREG-1339 to prevent or mitigate degradation and failure of structural bolting. f) Specify the use of preventive actions for storage, lubricants, and SCC potential in Section 2 of Research Council for Structural Connections publication, “Specification for Structural Joints Using ASTM A325 or A490 Bolts,” for structural bolting consisting of ASTM A325, A490, and equivalent bolts. g) Prohibit the use of molybdenum disulfide (MoS2) or other sulfur containing lubricants for structural bolts.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247) LRA Supplement 2 (ML23114A377)
38	Protective Coating Monitoring and Maintenance (A.2.2.36)	XI.S8	Continue the existing Protective Coating Monitoring and Maintenance AMP, including enhancement to: a) Ensure that inspection reports prioritize repair areas as either needing repair during the same outage or as postponed to future outages, but under surveillance in the interim period.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032,	LRA, Appendix A, Table A-3 (ML22297A247)

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
				or no later than the last refueling outage prior to the PEO.	
39	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (A.2.2.37)	XI.E1	Implement the new Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
40	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (A.2.2.38)	XI.E2	Implement the new Insulation Material 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 PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
41	Inaccessible Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements (A.2.2.39)	XI.E3	Implement the new Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
42	Metal Enclosed Bus (A.2.2.40)	XI.E4	Implement the new Metal Enclosed Bus AMP.	No later than 6 months prior to the PEO, i.e.:	LRA, Appendix A, Table A-3 (ML22297A247)

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
				U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	
43	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (A.2.2.41)	XI.E6	Implement the new Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP.	No later than 6 months prior to the PEO, i.e.: U1: 08/08/2029 U2: 08/02/2032, or no later than the last refueling outage prior to the PEO.	LRA, Appendix A, Table A-3 (ML22297A247)
44	Operating Experience Program (A.1.4)	Appendix B	Continue the existing OE Program, including enhancement to: a) Require the review of internal and external OE for aging-related degradation or impacts to aging management activities, to determine if improvements to CPNPP aging management activities are warranted. NRC and industry guidance documents and standards applicable to aging management are considered part of this information. b) Provide procedural guidance for identifying and reviewing OE including descriptions of aging-related degradation. In general, the descriptions will be used to identify aging that is in excess of what would be expected, relative to design, previous inspection experience and the inspection intervals. c) Establish coding for use in identification, trending, and communication of aging-related degradation. d) Establish guidelines for reporting plant-specific OE on age-related degradation and aging management to the industry. e) Provide training, on a periodic basis, to those responsible for AMP implementation and those responsible for reviewing,	No later than the date the renewed operating licenses are issued.	LRA, Appendix A, Table A-3 (ML22297A247)

Item No.	Aging Management Program or Activity (Section)	NUREG-1801 Section	Commitment	Implementation Schedule	Source
			evaluating, and communicating OE items related to aging management and aging-related degradation.		
45	Quality Assurance (A.1.3)	Appendix A	Continue the existing QA Program, including enhancement to include NNS SSCs that are Subject to AMR for LR.	No later than the date the renewed operating licenses are issued.	LRA, Appendix A, Table A-3 (ML22297A247)

APPENDIX B

CHRONOLOGY

B. CHRONOLOGY

This appendix lists chronologically the routine licensing correspondence between the U.S. Nuclear Regulatory Commission (NRC) staff and Vistra Operations Company LLC (Vistra). This appendix also lists other correspondence under St. Comanche Peak Nuclear Power Plant, Units 1 and 2 (Comanche Peak or CPNPP) Docket Nos. 50-445 and 50-446 related to the staff's review of the Comanche Peak 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 email to pdr.resource@nrc.gov.

Table B-1 Chronology

Date	ADAMS Accession No.	Subject
12/14/2015	ML16013A201	Vistra. Comanche Peak, Units 1 and 2 - License Renewal Application Submittal Schedule Revision.
5/10/2021	ML21124A003	NRC. Comanche Peak Nuclear Power Plant, Unit Nos. 1 and 2 – Meeting Summary for Environmental Pre-Submittal Meeting for Initial License Renewal Application
8/9/2021	ML21221A298	NRC. Pre-Submittal Meeting for License Renewal Application for Comanche Peak Nuclear Power Plant, Unit Nos. 1 and 2 - Safety
8/31/2021	ML20244A274	Vistra. Comanche Peak Nuclear Power Plant, License Renewal Application Submittal Schedule Revision
6/22/2022	ML22151A184	NRC. Comanche Peak Nuclear Power Plant, Unit Nos. 1 And 2, License Renewal Application May 26, 2022, Pre-submittal Public Meeting Summary
10/3/2022	ML22297A247	Vistra. License Renewal Application
10/5/2022	ML21259A140	NRC. Comanche Peak Nuclear Power Plant, Unit Nos. 1 and 2 – Meeting Summary for Safety Pre-Submittal Meeting for Initial License Renewal on September 21, 2021 (EPID No. L-2020-RNW-0029)
10/24/2022	ML22285A075	NRC. Notice of Availability Letter
10/31/2022	ML22285A074 (87 FR 65617)	NRC. Federal Register Notice, Comanche Peak Nuclear Power Plant, Units 1 and 2 – Notice of Availability, Regarding the Vistra Operations Company LLC Application For License Renewal
11/23/2022	ML22297A005 (Package) ML22297A007 (Letter)	NRC. Comanche Peak Nuclear Power Plant, Units 1 and 2 – Determination of Acceptability and Sufficiency For Docketing, Proposed Review Schedule, and Opportunity for a Hearing Regarding The Vistra Operations Company LLC Application For License Renewal
11/23/2022	ML22304A191	NRC. Comanche Peak Nuclear Power Plant, Units 1 And 2 – Aging Management Audit Plan Regarding the License Renewal Application Review
11/29/2022	ML22297A005 (Package) ML22297A006 (87 FR 73798)	NRC. Federal Register Notice, Comanche Peak Nuclear Power Plant, Units 1 and 2 – Determination of Acceptability and Sufficiency For Docketing, and Opportunity for a Hearing Regarding The Vistra Operations Company LLC Application For License Renewal
12/1/2022	ML22298A016	NRC. Comanche Peak Nuclear Power Plant, Units 1 And 2 – License Renewal Application Online Reference Portal

Date	ADAMS Accession No.	Subject
12/13/2022	ML22299A179 (87 FR 76219)	NRC. Federal Register Notice, Notice of Intent to Conduct Scoping Process and Prepare Environmental Impact Statement; Vistra Operations Company LLC; Comanche Peak Nuclear Power Plant, Units 1 and 2
1/4/2022	ML22355A043	NRC. Comanche Peak Nuclear Power Plant, Units 1 and 2 – Aging Management Audit Plan Regarding The License Renewal Application Review - Supplement
1/17/2023	ML23031A096	NRC. Scoping Transcript- Environmental Scoping Meeting Related to the Comanche Peak Nuclear Power Plant, Units 1 and 2, License Renewal Application
2/1/2023	ML23032A384	NRC. Comanche Peak LRA On-Site Audit Needs List
4/6/2023	ML23096A302	Vistra. License Renewal Application Supplement 1
4/24/2023	ML23114A377	Vistra. License Renewal Application Supplement 2
5/23/2023	ML23143A135	NRC. Request for Confirmation of Information – Set 1
5/25/2023	ML23145A230	NRC. Request for Confirmation of Information – Set 2
6/13/2023	ML23164A223	Vistra. Response to Request for Confirmation of Information Set 1
6/13/2023	ML23167A021	NRC. Request for Additional Information – Set 1
6/20/2023	ML23171B072	Vistra. Response to Request for Confirmation of Information Set 2
6/29/2023	ML23181A018	NRC. Request for Additional Information – Set 2
7/7/2023	ML23188A042	NRC. Request for Additional Information – Set 3
7/12/2023	ML23193A845 (non-public) ML23193A846 (public)	Vistra. Response to Request for Additional Information – Set 1
7/27/2023	ML23208A193	Vistra. Response to Request for Additional Information – Sets 2 and 3
8/9/2023	ML23172A136	NRC. Aging Management Audit Report
9/11/2023	ML23256A144	NRC. Request for Additional Information – Set 4
10/4/2023	ML23277A176	Vistra. Response to Request for Additional Information – Set 4
10/17/2023	ML23290A273	Vistra. Annual Update
12/6/2023	ML23340A191	Vistra. License Renewal Application Supplement 3
1/30/2024	ML24019A034	NRC. Public Meeting Summary
1/31/2024	ML24031A608	Vistra. License Renewal Application Supplement 3, Revision 1

APPENDIX C

PRINCIPAL CONTRIBUTORS

C. PRINCIPAL CONTRIBUTORS

This appendix lists the principal contributors for the development of this safety evaluation (SE) and their areas of responsibility.

Table C-1 Principal Contributors

Name	Area of Responsibility
Allik, Brian	Reviewer—Mechanical and Materials
Alvarado, Lydiana	Reviewer—Mechanical and Materials
Bailey, Stewart	Management Oversight
Benson, Michael	Reviewer—Mechanical and Materials
Boruk, Reena	Reviewer—Mechanical and Materials
Bloom, Steven	Management Oversight
Burton, Mat	Reviewer—Mechanical and Materials
Buford, Angela	Management Oversight
Cintron-Rivera, Jorge	Reviewer—Electrical
Collins, Jay	Reviewer—Mechanical and Materials
Davis, Robert	Reviewer—Mechanical and Materials
Dinh, Thinh	Reviewer — Scoping and Screening Methodology
Dijamco, David	Reviewer—Mechanical and Materials
Fairbanks, Carolyn	Reviewer—Mechanical and Materials
Foli, Adakou	Reviewer—Electrical
Fu, Bart	Reviewer—Mechanical and Materials
Gardner, William (Tony)	Reviewer—Mechanical and Materials
Gavula, James	Reviewer—Mechanical and Materials
Gibson, Lauren	Management Oversight
Hammock, Jessica	Project Manager
Haywood, Emma	Reviewer—Mechanical and Materials
Hiser, Allen	Senior Technical Advisor
Iqbal, Naeem	Reviewer—Scoping and Screening Methodology
Istar, Ata	Reviewer—Structural
Jackson, Christopher	Reviewer—Mechanical and Materials
Jenkins, Joel	Reviewer—Mechanical and Materials
Johnson, Andrew	Reviewer—Mechanical and Materials
Kalikian, Varoujan	Reviewer—Mechanical and Materials
Karipineni, Nageswara	Reviewer—Scoping and Screening Methodology
Klein, Paul	Reviewer—Mechanical and Materials
Kodali, Hari	Reviewer—Electrical
Lee, Brian	Reviewer—Scoping and Screening Methodology
Lehman, Bryce	Reviewer—Structural
Li, Chang	Reviewer—Scoping and Screening Methodology
Makar, Gregory	Reviewer—Mechanical and Materials
McConnel, Matthew	Reviewer—Electrical
Medoff, James	Reviewer—Mechanical and Materials
Min, Seung	Reviewer—Mechanical and Materials
Mitchell, Matthew	Management Oversight

Name	Area of Responsibility
Morton, Wendell	Reviewer—Mechanical and Materials
Paige, Jason	Management Oversight
Parker, Cory	Reviewer—Mechanical and Materials
Prinaris, Andrew	Reviewer—Structural
Ramadan, Liliana	Reviewer—Electrical
Rau, Adam	Reviewer—Mechanical and Materials
Reichelt, Eric	Reviewer—Mechanical and Materials
Rezai, Ali	Reviewer—Mechanical and Materials
Rogers, Bill	Reviewer—Scoping and Screening Methodology
Rudland, David	Senior Technical Advisor
Sahd, Phillip	Management Oversight
Scarbrough, Thomas	Reviewer—Scoping and Screening Methodology
Sida, Karen	Reviewer—Mechanical and Materials
Siwy, Andrew	Project Manager
Smith, Brian	Management Oversight
Stubbs, Angelo	Reviewer—Mechanical and Materials
Terry, Leslie	Reviewer—Mechanical and Materials
Thomson, Bernie	Management Oversight
Thomas, George	Reviewer—Structural
Tyree, Christopher	Project Manager
Tsao, John	Reviewer—Mechanical and Materials
Tseng, Ian	Management Oversight
Wang, George	Reviewer—Structural
Wise, John	Senior Technical Advisor
Wittick, Brian	Management Oversight
Xi, Zuhan	Reviewer—Structural
Yoder, Matthew	Reviewer—Chemical
Yee, On	Reviewer—Mechanical and Materials
Yoo, Mark	Project Manager

APPENDIX D

REFERENCES

D. REFERENCES

This appendix lists the references used throughout this safety evaluation (SE) for review of the Comanche Peak, Units 1 and 2, license renewal application.

Table D-1 References

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