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

Safety Evaluation Report

Related to the License Renewal of Perry Nuclear Power Plant, Unit 1

Docket No. 50-440

Vistra Operations Company LLC

Issued: May 2025

Office of Nuclear Reactor Regulation

ABSTRACT

This safety evaluation documents the technical review by the U.S. Nuclear Regulatory Commission (NRC) staff of the Perry Nuclear Power Plant (Perry), Unit 1 license renewal application (LRA).

Perry is located along the southern shoreline of Lake Erie on an ancient lake plain approximately 50 feet above low lake level in a rural area of Lake County, Ohio. The NRC issued the initial operating license on November 13, 1986, for Unit 1. Unit 1 is a boiling water reactor Nuclear Steam Supply System supplied by General Electric Company with a license thermal power of 3,756 megawatts thermal.

By letter dated July 3, 2023 (Agencywide Documents Access and Management System Package Accession No. ML23184A081), Energy Harbor Nuclear Corporation submitted to the NRC an application for license renewal of Facility Operating License No. NFP-58 for Perry, Unit 1. Effective March 1, 2024, the facility operating license for Perry was transferred from Energy Harbor Nuclear Generation LLC (owner) and Energy Harbor Nuclear Corporation (operator) to Energy Harbor Nuclear Generation (owner) and Vistra Operations Company LLC (operator) (ML24057A092). Upon completion of this license transfer, Vistra Operations Company, LLC assumed responsibility for all licensing actions under NRC review at the time of the transfer and requested that the NRC continue its review of these actions (ML24054A498). Energy Harbor Nuclear Corporation and Vistra further supplemented the license renewal application by letters dated June 27, 2024 (ML24180A010), July 24, 2024 (ML24206A150), August 7, 2024 (ML24220A270), September 5, 2024 (ML24249A123), October 21, 2024 (ML24295A352), November 8, 2024 (ML24312A368), December 19, 2024 (ML24354A265), January 27, 2025 (ML25027A327) and April 22, 2025 (ML25112A167). Vistra requested renewal for a period of 20 years beyond the current expiration at midnight on March 18, 2026, for Unit 1 (Renewed Facility Operating License No. NPF-58).

This safety evaluation documents the NRC staff's technical review of information submitted by Energy Harbor Nuclear Corporation and Vistra through April 22, 2025. 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).

TABLE OF CONTENTS

LIST OF TABLES

ABBREVIATIONS AND ACRONYMS

°C	degrees Celsius
°F	degrees Fahrenheit
ACRS	Advisory Committee on Reactor Safeguards
ACI	American Concrete Institute
ADAMS	Agencywide Documents Access and Management System
AEA	Atomic Energy Act
AERM	aging effect requiring management
ALE	adverse localized environments
AMP	Aging Management Program
AMR	aging management reviews
ART	adjusted reference temperature
ASME	American Society for Mechanical Engineers
ASR	alkali-silica reaction
ASTM	American Society for Testing and Materials
ATWS	anticipated transients without scram
B&W	Babcock & Wilcox
BMI	Bottom-mounted instrument
BWR	boiling-water reactor
CARC	Conditions Adverse to Regulatory Compliance
CASS	cast austenitic stainless steel
CB	core barrel
CLB	current licensing basis
CMAA	Crane Manufacturers Association of America
CRDM	control rod drive mechanism
CRGT	control rod guide tube
CUF	cumulative usage factor
CVCS	chemical and volume control system
DBA	design-basis accident
DBE	design-basis event
DMW	dissimilar metal welds
EAF	environmentally assisted fatigue
ECCS	emergency core cooling system
EFPY	effective full-power years
EOC	end of cycle

EPRI	Electric Power Research Institute
EQ	environmental qualification
ESF	engineered safety features
FCG	fatigue crack growth
FSAR	final safety analysis report
FSEIS	final supplemental environmental impact statement
GALL	Generic Aging Lessons Learned for Subsequent License
GALL-SLR	*Generic Aging Lessons Learned for Subsequent License Renewal Report (NUREG-2191)*
HELB	high-energy line break
I&C	instrumentation and controls
I&E	inspection and evaluation
IASCC	irradiation-assisted stress corrosion cracking
IE	irradiation embrittlement
IPA	Integrated plant assessment
ISG	interim staff guidance
ISI	Inservice inspection
ISP	Integrated Surveillance Program
L&C	limitations and conditions
LBB	leak-before-break
LEFM	linear elastic fracture mechanics
LOCA	loss-of-coolant accident
LR	license renewal
LRA	license renewal application
MIC	microbiologically induced corrosion
NDTT	nil-ductility transition temperature
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NOC	normal operating condition
NPP	Nuclear Power Plant
NSR	non-safety related
NRC	Nuclear Regulatory Commission
OE	operating experience
PLL	predicted-lower-limit
PSW	primary shield wall
PVC	polyvinyl chloride
PVDF	polyvinylidene fluoride

PWR	pressurized-water reactors
PWSCC	primary water stress corrosion cracking
QA	quality assurance
RAI	requests for additional information
RAMA	Radiation Analysis Modeling Application
RBCS	Reactor Building Cooling System
RCI	request for confirmation of information
RCIC	reactor core isolation cooling
RCL	Reactor Coolant Line
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
RG	Regulatory Guide
RHR	residual heat removal
RPV	reactor pressure vessel
RT	reference temperature
RV	reactor vessel
RVI	reactor vessel internal
RVIN	Reactor Vessel Inlet Nozzle
RVON	RV outlet nozzle
SAP	Systems-Applications-Products
SBA	small break accident
SBO	station blackout
SC	structures and components
SCC	stress corrosion cracking
SE	safety evaluation
SG	steam generator
SIF	stress intensity factor
SLC	standby liquid control
SLR	subsequent license renewal
SLRA	subsequent license renewal application
SR	safety-related
SRP	Standard Review Plan
SRP-SLR	*Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants (NUREG-2192)*
SSC	structures, systems, and components
TLAA	time-limited aging analyses
UFSAR	updated final safety analysis report

USAR	updated safety analysis report
USE	upper-shelf energy

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 Perry Nuclear Power Plant, Unit 1 (Perry), as filed by Energy Harbor Nuclear Corp. by letter dated July 3, 2023, (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML23184A081), as supplemented by letters dated June 27, 2024 (ML24180A010), July 24, 2024 (ML24206A150), August 7, 2024 (ML24220A270), September 5, 2024 (ML24249A123), October 21, 2024 (ML24295A352), November 8, 2024 (ML24312A368), December 19, 2024 (ML24354A265), January 27, 2025 (ML25027A327) and April 22, 2025 (ML25112A167). Effective March 1, 2024, the facility operating license for Perry was transferred from Energy Harbor Nuclear Generation LLC (owner) and Energy Harbor Nuclear Corp. (operator) to Energy Harbor Nuclear Generation LLC (owner) and Vistra Operations Company LLC (Vistra; operator) (ML24057A092).

In its LRA, Vistra seeks to renew Perry Facility Operating License No. NPF58 for an additional 20 years beyond the current expiration of their license on March 18, 2036, for Unit 1. 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. Vaughn Thomas, who can be contacted by email at Vaughn.Thomas@nrc.gov.

Perry is located along the southern shoreline of Lake Erie on an ancient lake plain approximately 50 feet above low lake level in a rural area of Lake County, Ohio. The NRC issued the initial operating license on November 13, 1986, for Unit 1. Unit 1 is a boiling water reactor Nuclear Steam Supply System supplied by General Electric Company with a license thermal power of 3,756 megawatts thermal (MWt). The Perry updated final safety analysis report (UFSAR) describes the plant and the site (ML23303A132).

Section 54.29 of 10 CFR, "Standards for issuance of a renewed license," sets forth the license renewal standards. Based on these standards, a renewed license may be issued if the Commission finds that aging effects are or will be managed during the period of extended operation and that time-limited aging analyses have been addressed. In addition, the NRC's requirements in 10 CFR Part 51 concerning environmental review must be satisfied, and when applicable, matters raised concerning consideration of Commission rules and regulations in adjudicatory proceedings must be addressed for the issuance of a renewed license. Accordingly, the NRC license renewal process consists of (1) a safety review and (2) an environmental review. Regulations in 10 CFR Part 54, "Requirements for renewal of operating licenses for nuclear power plants," and 10 CFR Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions," set forth requirements for safety reviews and environmental reviews, respectively. The safety review for the Perry license renewal is based on Vistra's LRA, the NRC staff's audits, responses to the staff's requests for additional information, and response to the staff's requests for confirmation of information. Vistra supplemented its application and provided clarifications through its responses to the staff's questions in requests for additional information, requests for confirmation of information, audits, meetings, and docketed correspondence. The staff reviewed and considered information submitted through April 22, 2025.

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).

Sections 2 through 4 of the SE address the NRC staff's evaluation of license renewal issues considered during its review of the application. Section 5 of the SE discusses the role of the Advisory Committee on Reactor Safeguards (ACRS), and Section 6 contains the staff's conclusion. The SE contains four appendices, which provide the following additional information:

- Appendix A: "License Renewal Commitments," contains a table showing Vistra's commitments for renewal of the operating licenses.
- 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.
- Appendix C: "Principal Contributors," contains a list of principal contributors to the SE.
- Appendix D: "References," contains a bibliography of the references that support the NRC 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 F*ederal 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) to establish 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 the following 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 SSCs that are 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

(iii) the capability to prevent or mitigate the consequences of accidents that 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. Criteria that determine which licensee calculations and analyses are to be considered TLAAs for the purposes of license renewal are established in 10 CFR 54.3, "Definitions." 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

The NRC's regulations implementing the requirements of NEPA, as amended, are contained in 10 CFR Part 51. 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 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 Perry plant-specific environmental impacts of LRA, including any new and significant information that was not considered in the GEIS. The staff issued an environmental scoping summary report on August 5, 2024, which included the comments received during the scoping process and the staff's responses to those comments (ML24150A203). As part of its scoping process, the staff held public scoping meetings, via webinar on October 1st and 2nd, 2024 (ML24284A006), to assist the staff in identifying plant-specific environmental issues.

On August 30, 2024, the staff issued the draft, Perry-specific GEIS Supplement 61 (ML24227A958), which documents the results of the NRC staff's environmental review and makes a preliminary recommendation on Perry 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 final supplemental environmental impact statement (FSEIS), NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplemental 61, Regarding License Renewal of Perry Nuclear Power Plant, Final Report," was published in April 2025 (ML25113A032).

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 50.33(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 1.1.9:

> 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 (No. B-96) for Perry Nuclear Power Plant, Unit 1, in Article VII, states 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 Nos. 1 and 2, lists PNPP facility operating license numbers NPF-58. Energy Harbor [now Vistra] has reviewed the original indemnity agreement and Amendments 1 through 7. Neither Article VII nor Item 3 of the attachment specifies an expiration date for license number NPF-58. Therefore, no changes to the indemnity agreement are deemed necessary as part of this application. Should the license number be changed by NRC upon issuance of the renewed license, Energy Harbor [Vistra] 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.

Section 54.21 of 10 CFR, "Contents of Application—Technical Information," requires that the LRA contain (1) an integrated plant assessment, (2) a description of any CLB changes during the staff's review of the LRA, (3) an evaluation of TLAAs, and (4) an 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 July 3, 2024 (ML24185A092), 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 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 technical specification 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. Sections 2, 3, and 4 of the SE 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 NRC staff's LRA review and SE. SE Section 5 describes the role of the ACRS, and Section 6 documents the findings required by 10 CFR 54.29.

1.4 Interim Staff Guidance

License renewal of nuclear facilities is an evolving 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-2015-01 (ML15308A018)	Changes to Buried and Underground Piping and Tank Recommendations	SE Section 3.0.3.2.23
LR-ISG-2012-02- (ML13227A361))	Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation	SE Sections 3.0.3.1.2, 3.0.3.1.11, 3.0.3.2.7 and 3.0.3.2.22
LR-ISG-2011-03 (ML12138A296)	Changes to the Generic Aging Lessons Learned (GALL) Report Revision 2 Aging Management Program XI.M41, 'Buried and Underground Piping and Tanks'	SE Sections 3.0.3.2.18 and 3.0.3.2.19
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	SE Sections 3.0.3.1,2 and 3.0.3.2.21
SLR-ISG-2021-02 (ML20181A434)	BWR Water Chemistry Guidelines, Revision 1	SE Section 3.0.3.2,20

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 Perry LRA, including additional information Vistra submitted through April 22, 2025, 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 judgement, the staff and the applicant have reached an acceptable resolution that meets all applicable regulatory requirements. After reviewing the Perry LRA, including additional information Vistra submitted through April 22, 2025, the staff has determined that no confirmatory items exist that require a formal response from Vistra.

1.7 Summary of Proposed License Conditions

After reviewing the LRA, including additional information and clarifications from Vistra submitted or provided through April 22, 2025, the NRC staff identified two proposed license conditions.

The first license condition requires Vistra, following the NRC staff's issuance of the renewed license, to include the UFSAR supplement (containing a summary of programs and activities for managing the effects of aging and an evaluation of TLAAs for the period of extended operation (as required by 10 CFR 54.21(d))) in its next periodic UFSAR update required by 10 CFR 50.71(e). The regulations at 10 CFR 50.71(e) require 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 UFSAR 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.

The second license condition requires Vistra to complete future activities described in the UFSAR 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 Perry Nuclear Power Plant, Unit 1 (Perry), within the scope of license renewal and the SCs subject to an AMR. U.S. Nuclear Regulatory Commission (NRC) staff reviewed the scoping and screening methodology of Vistra Operations Company, LLC (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 license renewal application (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.

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 Aging Management Review, 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 and Instrumentation and Control Systems”

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 Perry from January 16–18, 2024. 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 license renewal application (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 as provided and described in Appendix B.1.3 of the LRA 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 Aging Management Audit Summary, dated August 26, 2024 (ML24239A778), 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 the 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:

- updated final safety analysis report (UFSAR)
- quality classification (Q-list – contained within the Systems-Applications-Products (SAP) functional location database)
- technical specifications
- maintenance rule basis documents
- engineering calculations
- operating procedures
- station drawings
- other license basis documentation such as licensing letters and safety evaluation reports (SERs)

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 Regulatory Guide (RG) 1.188, Revision 2, "Standard Format and Content for Applications to Renew Nuclear Plant Operating Licenses," issued April 2020, which endorses the use of NEI 95-10. 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 endorsed by the NRC.

The staff confirmed that the applicant's implementing procedures follow appropriate guidance and include provisions 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 sources of information the applicant used are 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 UFSAR). 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 UFSAR, 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 Perry documentation, the staff concludes that the applicant has established adequate measures to control the integrity and reliability of Perry 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 and, therefore, is acceptable.

2.1.3.2 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 if 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 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.

LRA Section 2.1 states that the scoping methodology used at Perry 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 2.1.1.1, "Application of Safety-Related Scoping Criteria," states, in part, the following:

> A system, structure, component, or bulk commodity is within the scope of license renewal if it is relied upon to remain functional during and following a design basis event as stated in 10 CFR 54.4(a)(1) [Reference 1.3-1]. Design basis events are defined in 10 CFR 50.49(b)(1)(ii) [Reference 1.3-7] as conditions of normal operation, including anticipated operational occurrences, design basis accidents, external events, and natural phenomena for which the plant must be designed to ensure functions identified in 10 CFR 54.4(a)(1)(i) through (iii). The design basis

> events include the design basis accidents described in Chapter 15 of the UFSAR and events described in other parts of the licensing basis documentation, such as floods, fires, tornadoes, seismic events, and moderate and high-energy line breaks.

In addition, LRA Section 2.1.1.1 states, in part, the following:

> Plant structures, systems and components important to safety are designed to withstand the effects of a Safe Shutdown Earthquake (SSE) and remain functional if they are necessary to assure:
>
> a. The integrity of the reactor coolant pressure boundary,
> b. The capability to shut down the reactor and maintain it in a safe condition, or
> c. The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guideline exposures of <10 CFR 100> or <10 CFR 50.67> (future revisions to design-basis analyses that compare consequences to 10 CFR 100 will be updated to <10 CFR 50.67>) [References 1.3-7 and 1.3-15].
>
> This definition is similar to that used for safety-related SSCs in 10 CFR 54.4(a)(1) but excludes reference to offsite exposures referenced in 10 CFR 50.34(a)(1). Section 10 CFR 50.34(a)(1) is applicable to facilities seeking a construction permit and is therefore not applicable to renewal of the existing Facility Operating License at Perry.

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 courses 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 Perry. The staff determined that the Perry UFSAR 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 the CLB definition pertaining to 10 CFR 54.4(a)(1). The staff determined that the Perry 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 2.1.1.2, "Application of Criterion for Nonsafety-Related SSCs Whose Failure Could Prevent the Accomplishment of Safety Functions," states, in part, the following:

> PNPP contains nonsafety-related mechanical systems (and portions of systems) and structures (and parts of structures) whose failure could prevent satisfactory accomplishment of a safety function. The method used to identify these components is consistent with Appendix F of NEI 95-10, Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule, [Reference 1.3-3].

Nonsafety-Related SSCs Supporting Safety Functions

LRA Section 2.1.1.2.1, "Functional Failures of Nonsafety-Related SSCs," states, in part, the following:

> At PNPP, systems and structures required to perform a function to support a safety function are generally classified as safety-related and are included in the scope of license renewal per Section 2.1.1.1. For the exceptions where nonsafety-related

> equipment and structures are required to remain functional to support a safety function, the function is listed as an intended function for 10 CFR 54.4(a)(2) [Reference 1.3-1], and the system or part of the structure containing the equipment is included in scope.
>
> Systems that rely on nonsafety-related mechanical components to support a safety function are included in the scope of license renewal. Mechanical systems with nonsafety-related components that support safety-related functions were determined by review of the following PNPP documents:
>
> - UFSAR [Reference 1.3-6]
> - Q-list (contained within the SAP functional location database)
> - Maintenance Rule basis documents
> - Engineering calculations
> - Operating procedures
> - Station drawings
> - Other license basis documentation such as licensing letters and SERs

<u>Nonsafety-Related SSCs Attached to Safety Related SSCs</u>

LRA Section 2.1.1.2.2 subheading, "Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs," states, in part, the following:

> For nonsafety-related SSCs directly connected to safety-related SSCs, the connected piping and supports up to and including the first seismic or equivalent anchor beyond the safety-nonsafety interface are within the scope of license renewal if the nonsafety-related piping may provide structural support to the safety-related piping. For the purposes of license renewal scoping, an equivalent anchor is defined as a seismic anchor or group of supports that provide lateral and torsional restraint in three orthogonal directions.

In addition, LRA Section 2.1.1.2.2 subheading, "Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs," states, in part, the following:

> Systems containing components that perform this function were identified by review of station drawings. Other documents referenced included piping seismic/stress analyses. All piping system transitions from safety-related to nonsafety-related were evaluated to ensure that scoping for this criterion is consistent with the guidance of NEI 95-10 [Reference 1.3-3].
>
> For nonsafety-related structures directly connected to safety-related structures or components, the entire connected structure, or a part of the connected structure up to a designated boundary, will be included within the scope of license renewal. NEI 95-10, Appendix F [Reference 1.3-3], describes acceptable methods of establishing the scope of nonsafety-related structures directly connected to safety-related structures or components.

LRA Section 2.1.1.4, "Scoping of Retired/Abandoned Mechanical Components," states, in part, the following:

> Documentation (drawings, calcs, etc.) was reviewed for each interface with the retired/ abandoned components and/or the components were walked down to determine their status. Piping components (including retired/abandoned piping) that provide structural/seismic support for safety-related piping, or that may contain fluid (water, steam, or oil) in structures that contain safety-related components are within scope of license renewal and are highlighted on license renewal drawings. Retired/abandoned piping components within structures containing safety-related components were only excluded from scope when all the following conditions were met:
>
> - The piping components do not provide structural/seismic support to attached safety-related piping.
> - The piping is separated from sources of water by blanks or flanges. Closed valves are not credited to keep fluid from retired/abandoned components.
> - The piping is known to be empty of fluid. Empty status was established by configuration (such as the piping being open-ended at the low point), or by ultrasonic testing (UT) or other method that can confirm the absence of trapped fluid.

The review included consideration of abandoned components within structures containing safety-related components whose source of water is via a system connection outside of the safety-related structure, or that have no connection to an in-service system, but may contain trapped water. Retired/abandoned piping components that are located entirely outside of structures containing safety-related components do not perform a function corresponding to 10CFR 54.4(a)(2) and are not within scope of license renewal.

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

LRA Section 2.1.1.2.2 subheading, “Nonsafety-Related SSCs Not Directly Connected to Safety-Related SSCs with the Potential for Spatial Interaction,” states, in part, the following:

> Protective features (whip restraints, spray shields, supports, barriers, temporary flood barriers, etc.) may be installed to protect safety-related SSCs from spatial interaction with nonsafety-related SSCs. Such protective features credited in the plant design are within the scope of license renewal per 10 CFR 54.4(a)(2) [Reference 1.3-1]. Where those features provide adequate protection, the nonsafety-related SSC itself is excluded from the scope of license renewal. The protective features are typically associated with a structural element such as a wall and are included in structural scoping.
>
> <u>*Physical Impact*</u>
>
> This category concerns the potential spatial interaction of nonsafety-related SSCs falling on or otherwise physically impacting safety-related SSCs such that safety functions may not be accomplished.
>
> <u>*Leakage, Spray, or Flooding*</u>
>
> Moderate- and low-energy systems, as well as high-energy systems, have the potential for spatial interactions of spray and leakage. Nonsafety-related systems, and nonsafety-related portions of safety-related systems with the potential for spray or leakage that

could prevent safety-related SSCs from performing their required safety function are within the scope of license renewal per 10 CFR 54.4(a)(2) [Reference 1.3-1].

Pipe Whip, Jet Impingement, or Harsh Environments

Pipe whip, jet impingement, and harsh environment effects on safety-related equipment are addressed in site-specific analyses of high- and moderate-energy line breaks. Spatial interactions of pipe whip, jet impingement, and harsh environment are credible only for high-energy systems. The effects of spray, leakage and flooding were also considered, as discussed above, such that high-energy lines within safety-related structures are included within scope. As such, scoping of nonsafety-related systems and components due to the potential for high- and moderate-energy line breaks can be limited to those systems (or portions of systems) that are not already in scope due to the spray and leakage consideration. Categorically, scoping of nonsafety-related structures and commodities due to the potential for high- and moderate-energy line breaks can be limited to those structures (or portions of structures) that are not already in scope due to leakage or flooding considerations.

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 high-energy line breaks (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 judgement 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 2.1.1.2, 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 during the audit, 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 2.1.1.2 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 UFSAR, 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).

Nonsafety-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 Perry LRA
- 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 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 UFSAR—related to missiles, crane load drops, flooding, and HELBs. The staff noted that LRA Section 2.1.1.2 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 2.1.1.2 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 2.1.1.2 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 and the results of the scoping and screening methodology audit, 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 2.1.1.3, "Application of Criterion for Regulated Events," states, in part, the following:

> The scope of license renewal includes SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for any of the following regulated events:
>
> - fire protection (10 CFR 50.48),
> - environmental qualification (EQ) (10 CFR 50.49),
> - pressurized thermal shock (10 CFR 50.61),
> - anticipated transient without scram (ATWS) (10 CFR 50.62), and
> - station blackout (SBO) (10 CFR 50.63).

LRA Section 2.1.1.3.1, “Fire Protection (10 CFR 50.48),” states, in part, the following:

> Systems and structures in the scope of license renewal for fire protection include those required for compliance with 10 CFR 50.48 [Reference 1.3-7]. The fire protection program has been developed to satisfy the requirements of 10 CFR 50 and Branch Technical Position BTP APCSB 9.5-1, Appendix A, and to meet the intent of 10 CFR 50 Appendix R. Equipment relied on for fire protection includes SSCs credited with fire prevention, detection, and mitigation in areas containing equipment important to safe operation of the plant as well as systems that contain plant components credited for safe shutdown following a fire. To identify this equipment, Perry fire protection licensing basis documents were reviewed. The primary reference for this scoping criterion is the Appendix R Safe Shutdown Capability Report. Other documents reviewed included:
>
> - UFSAR [Reference 1.3-6] Section 9.5.1 (fire protection description)
> - UFSAR Appendix 9A (fire protection evaluation report)
> - fire protection program procedure
> - quality classification, Notes and Comments fields of the SAP functional location database
> - station drawings
>
> The Appendix R Safe Shutdown Capabilities Report describes the Perry strategy and analysis that assures safe shutdown of the plant in the event of a fire, in accordance with 10 CFR 50, Appendix R.

LRA Section 2.1.1.3.2, “Environmental Qualification (10 CFR 50.49),” states, in part, the following:

> 10 CFR 50.49 [Reference 1.3–1.7], defines electric equipment important to safety that is required to be environmentally qualified to mitigate certain accidents that would result in harsh environmental conditions in the plant. The Perry EQ program, which satisfies these requirements, controls the maintenance of the list of EQ components. The SAP functional location database contains a controlled field that identifies components within the EQ program.

LRA Section 2.1.1.3.3, “Pressurized Thermal Shock (10 CFR 50.61),” states, in part, the following:

> 10 CFR 50.61 [Reference 1.3–1.7], requires that licensees of pressurized water reactors (PWRs) evaluate the reactor vessel beltline materials against specific criteria to ensure protection from brittle fracture. As a boiling water reactor (BWR), Perry is not subject to this regulation.

LRA Section 2.1.1.3.4, “Anticipated Transients without Scram (10 CFR 50.62),” states, in part, the following:

> An anticipated transient without scram (ATWS) is an anticipated operational occurrence that is accompanied by a failure of the reactor trip function to shut down the reactor. The ATWS rule, 10 CFR 50.62 [Reference 1.3–1.7], requires specific improvements in the design and operation of commercial nuclear power facilities to

> mitigate the consequences of an ATWS event. The licensing bases for the ATWS rule for Perry is described in UFSAR Appendix 15C.
>
> Based on the Perry current licensing bases for ATWS, structure and system intended functions performed in support of 10 CFR 50.62 requirements were determined. The results of this determination are provided for mechanical systems in Section 2.3, Section2.4 for structures and structural elements, and in Section 2.5 for electrical and instrument and controls systems.

LRA Section 2.1.1.3.5, "Station Blackout (10 CFR 50.63)," states, in part, the following:

> 10 CFR 50.63 [Reference 1.3–1.7], requires that each light-water-cooled nuclear power plant be able to withstand, for a specified duration, and recover from an SBO, which is the loss of offsite and onsite AC electric power to the essential and nonessential switchgear buses in a nuclear power plant. It does not include the loss of AC power fed from inverters powered by station batteries or by alternate AC sources. The objective of this requirement is to assure that nuclear power plants can withstand an SBO while maintaining adequate reactor core cooling and containment integrity for the specified duration.
>
> Appendix 15H of the UFSAR describes the licensing bases for SBO at Perry. Perry has developed a four-hour coping analysis to address the requirements of 10 CFR 50.63. Based on the Perry current licensing bases for SBO, structure and system intended functions performed in support of 10 CFR 50.63 requirements were determined. The results of this determination are provided for mechanical systems in Section 2.3, for structures in Section 2.4, and electrical commodities in Section 2.5.

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, EQ, ATWS, PTS, 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 Perry 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 UFSAR, and audited the Perry fire protection-related design-basis documents. 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 UFSAR Section 9.5.1, 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.

EQ. The staff reviewed the LRA and audited implementing procedures and the environmental qualification (EQ) scoping and screening report to verify that the applicant identified SSCs within the scope of license renewal that meet EQ requirements. The staff confirmed that the applicant's EQ 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 UFSAR Section 3.11, as well as its EQ design-basis document 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 Perry Harsh Environment Equipment List contains the EQ identifications for specific components. The staff further determined that the applicant's scoping methodology was adequate for identifying EQ SSCs within the scope of 10 CFR 54.4.

Pressurized thermal shock. The staff did not perform a review for this regulated event because it is not applicable to Perry, which is a BWR design.

ATWS. 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 UFSAR Appendix 15C, "Anticipated Transients Without Scram (ATWS)." 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 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.

SBO. 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 UFSAR Appendix 15H, "Station Blackout (SBO)," 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

Based on its review of the LRA, review of samples, discussions with the applicant, and review of the implementing procedures and reports during the audit, 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

LRA Section 2.0 states, in part, the following:

> The scoping and screening method is described in Section 2.1. This method is implemented in accordance with NEI 95-10, Industry Guidelines for Implementing the Requirements of 10 CFR 54 - The License Renewal Rule, Revision 6, June 2005 [Reference 1.3-3].

LRA Section 2.1.1, “Scoping Methodology,” states, in part, the following:

> NEI 95-10, Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule, Revision 6 [Reference 1.3-3], provides industry guidance for determining which SSCs are within the scope of license renewal. Regulatory Guide 1.188, Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses, Revision 2 [Reference 1.3-2], continues to endorse Revision 6 of NEI 95-10 as acceptable for complying with the requirements of 10 CFR Part 54 for preparing an initial LRA. Perry followed the process and recommendations of NEI 95-10, Revision 6, to determine which SSCs are within the scope of license renewal.

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 make sure the entire plant was addressed.

The staff determined that the applicant documented the results of the plant-level scoping process in accordance with the implementation 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 2.1.1 states, in part, the following:

> Consistent with NEI 95-10, the Perry scoping process developed a list of plant mechanical systems and their functions and then determined which of those functions met any of the three criteria of 10 CFR 54.4(a). Intended functions are the basis for including a system within the scope of license renewal and are identified by comparing the system function with the criteria in 10 CFR 54.4(a).
>
> SAP is the software platform for the Perry configuration management database. Within that database, component data is organized according to functional locations, hereafter referred to as the SAP functional location database. Components in the database have unique identifiers that include a system label. Thus, the database is used as a starting point to develop a list of plant systems. The database system list was then compared to other current licensing basis (CLB) documentation, including the UFSAR [Reference 1.3-6], Maintenance Rule System Basis Documents and plant drawings. Systems which contain mechanical components were evaluated as mechanical systems.

2.1.4.5.2 Staff Evaluation

The staff evaluated LRA Section 2.1.1 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 audited implementation 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 2.1.1 and the guidance contained in SRP-LR Section 2.1 and was implemented adequately.

The staff also reviewed the implementation 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 2.1.1 states, in part, the following:

> Consistent with NEI 95-10, the Perry scoping process developed a list of plant structures and their functions and then determines which of those functions meet any of the three criteria of 10 CFR 54.4(a). Intended functions are the basis for including a structure within the scope of license renewal and are identified by comparing the structure function with the criteria in 10 CFR 54.4(a). Structural components included in mechanical systems, such as pipe supports and insulation, are evaluated as structural elements and bulk commodities. Structural scoping is performed based on identification of functions for structures and structural commodities. That approach bounds components grouped as structural systems and obviates the need for system-level structural scoping.
>
> Functions for structures were identified based on reviews of applicable plant licensing and design documentation. Documents used in the reviews included the UFSAR, quality categorization within the SAP functional location database, Technical Specifications, the Appendix R Safe Shutdown Capability Report, the Fire Protection Evaluation Report (UFSAR Chapter 9 Appendix A), Maintenance Rule basis documents, engineering

calculations, operating procedures, various station drawings, and other license basis documentation such as licensing letters and Safety Evaluation Reports, as necessary.

2.1.4.6.2 Staff Evaluation

The staff evaluated LRA Section 2.1.1 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). 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, UFSAR, 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 implementation 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.

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 2.1.1 states, in part, the following:

> Perry has chosen Method A, the System Level or In-Scope Bounding Approach.
>
> Using Method A, all plant electrical and I&C (EIC) systems are included in the scope of license renewal. All EIC components in mechanical systems are also included, but these systems are not listed separately. Including systems and components beyond those actually required by 10 CFR 54.4 is referred to as an encompassing or bounding review. In addition to the plant EIC systems, certain offsite power systems and components are included in scope based on NRC guidance.

2.1.4.7.2 Staff Evaluation

The staff evaluated LRA Section 2.1.1, and the guidance contained in the implementation 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 UFSAR, 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 and audit, 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 2.1.2, "Screening Methodology," states the following:

> For a structure, system component, structural element, or commodity that is within the scope of license renewal, the screening process determines:
>
> - Whether it performs a component intended function without moving parts and without a change in configuration or properties (i.e., it is passive); and,
> - Whether it is not subject to replacement based on a qualified life or specified time period (i.e., it is long-lived).

NEI 95-10 [Reference 1.3-3] provides industry guidance for screening structures and components to identify the passive, long-lived structures and components that support an intended function. The screening process for PNPP followed the recommendations of NEI 95-10.

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 2.1.2, 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.

In addition, the applicant provided the staff with a detailed discussion of the processes used for each discipline and provided administrative documentation that described the screening methodology. SE Sections 2.1.2.1 through 2.1.2.3 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 is 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 2.1.2.1 states, in part, the following with regard to mechanical screening:

> The identification of components subject to aging management review began with the determination of the system evaluation boundary. The system evaluation boundary includes those portions of the system that are necessary to ensure that the intended functions of the system will be performed. Components needed to support each of the system-level intended functions identified in the scoping process are included within the system evaluation boundary.
>
> Within the system evaluation boundary, long-lived passive components that perform or support an intended function without moving parts or a change in configuration or properties are subject to aging management review.

In addition, LRA Section 2.1.2.1 states, in part, the following:

> License renewal drawings are created by highlighting mechanical flow diagrams to indicate those components that are within the system evaluation boundaries (i.e., that support system intended functions and are thus within scope) and are passive. Components that are periodically replaced may be highlighted and may also be identified as short-lived (and therefore not subject to aging management review) with a drawing note or textually within scoping reports.

Furthermore, LRA Section 2.1.2.1 states, in part, the following:

> 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 include 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 2.1.2.1, 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 UFSAR, 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 were 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 UFSAR, the plant equipment database and other databases, procedures, CLB documentation, 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

With regard to civil and structural screening, LRA Section 2.1.2.2 states, in part, the following:

> The identification of components subject to AMR begins with the determination of the structure evaluation boundary. The structure evaluation boundary generally includes the entire structure. Structural elements and commodities needed to support each of the structure-level intended functions identified in the scoping process are included within the structure evaluation boundary.

Within the structure evaluation boundary, long-lived passive components that perform or support an intended function without moving parts or a change in configuration or properties are subject to aging management review. In accordance with 10 CFR 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants, an in-scope structure (e.g., Auxiliary Building) contains inherently passive long-lived structural elements and commodities. Those structural elements and commodities that perform an intended function are identified in the AMR report.

In addition, LRA Section 2.1.2.2 states, in part, the following:

> The screening process for structural elements and commodities involves review of design and licensing basis documents (UFSAR, drawings, etc.) to identify specific structural elements and commodities that make up the structure. Structural elements and commodities typically have no unique functional location identifiers like those assigned to mechanical components. Therefore, grouping structural elements and commodities based on materials of construction first and then subdividing them based on structural elements or commodity design and functions provides a practical means of categorizing them for AMR.

2.1.5.3.2 Staff Evaluation

The staff reviewed the structural screening methodology documented in LRA Section 2.1.2.2, 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.

As part of this review and audit, the staff reviewed selected portions of the UFSAR, 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

With regard to electrical screening, LRA Section 2.1.2.3 states the following, in part:

> A bounding scoping approach is used for electrical equipment. All electrical components within in-scope systems were included within the scope of license renewal. In-scope electrical components were placed into commodity groups and were evaluated as commodities during the screening process.

The screening phase for electrical components starts by comparing in-scope commodity types to the commodity types listed in Appendix B of NEI 95-10 [Reference 1.3-3]. NEI 95-10 provides guidance for determining whether the commodities are active or passive. Active commodities are screened out.

2.1.5.4.2 Staff Evaluation

The staff reviewed the applicant's methodology used for electrical component screening in LRA Sections 2.1.2.3, 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 and audit 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, and sample system reviews, 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 for which failure could prevent satisfactory accomplishment of any safety-related functions, as required by 10 CFR 54.4(a)(2)
- systems and structures relied on 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 2.2-4, 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, "Mechanical Systems within the Scope of License Renewal," Table 2.2-2, "Structures and Structural Components within the Scope of License Renewal," Table 2.2-3, "Electrical and I&C Systems," and Table 2.2-4 "Structural Systems" 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).

2.2.4 Conclusion

Based on its review of LRA Section 2.2, the applicant's supplement to the LRA, and UFSAR 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 UFSAR. The objective was to determine whether the applicant, in accordance with 10 CFR 54.4, identified components and supporting structures for mechanical systems that met the 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 UFSARs, license renewal basis documents (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, "Fuel"
- LRA Section 2.3.1.2, "Nuclear Boiler"
- LRA Section 2.3.1.3, "Reactor Coolant Pressure Boundary"
- LRA Section 2.3.1.4, "Reactor Recirculation"
- LRA Section 2.3.1.5, "Reactor Vessel"
- LRA Section 2.3.1.6, "Reactor Vessel Internals"
- LRA Section 2.3.2.1, "Alternative Decay Heat Removal"
- LRA Section 2.3.2.2, "Annulus Exhaust Gas Treatment"
- LRA Section 2.3.2.3, "Containment Atmosphere Monitoring"
- LRA Section 2.3.2.4, "High Pressure Core Spray"
- LRA Section 2.3.2.5, "Low Pressure Core Spray"
- LRA Section 2.3.2.6, "Offgas"
- LRA Section 2.3.2.7, "Reactor Core Isolation Cooling"
- LRA Section 2.3.2.8, "Residual Heat Removal and Containment Spray"
- LRA Section 2.3.2.9, "Suppression Pool"
- LRA Section 2.3.3.1, "Auxiliary Building Ventilation"
- LRA Section 2.3.3.2, "Breathing Air"
- LRA Section 2.3.3.3, "Building Heating"
- LRA Section 2.3.3.4, "Combustible Gas Control"
- LRA Section 2.3.3.5, "Computer Room HVAC"
- LRA Section 2.3.3.6, "Containment and Drywell Vacuum Relief"
- LRA Section 2.3.3.7, "Containment Integrated Leak Rate"
- LRA Section 2.3.3.8, "Containment Vessel and Drywell Purge"
- LRA Section 2.3.3.9, "Containment Vessel Chilled Water"
- LRA Section 2.3.3.10, "Control and Computer Room Humidification"
- LRA Section 2.3.3.11, "Control Complex Chilled Water"
- LRA Section 2.3.3.12, "Control Rod Drive"
- LRA Section 2.3.3.13, "Control Room HVAC and Emergency Recirculation"

- LRA Section 2.3.3.14, “Controlled Access and Miscellaneous Equipment Areas HVAC”
- LRA Section 2.3.3.15, “Diesel Generator and Auxiliaries”
- LRA Section 2.3.3.16, “Diesel Generator Building Ventilation”
- LRA Section 2.3.3.17, “ECCS Pump Room Cooling”
- LRA Section 2.3.3.18, “Emergency Closed Cooling”
- LRA Section 2.3.3.19, “Emergency Closed Cooling Pump Area HVAC”
- LRA Section 2.3.3.20, “Emergency Service Water”
- LRA Section 2.3.3.21, “Emergency Service Water Pump House Ventilation”
- LRA Section 2.3.3.22, “Emergency Service Water Screen Wash”
- LRA Section 2.3.3.23, “Feedwater Zinc Injection”
- LRA Section 2.3.3.24, “Fire Protection”
- LRA Section 2.3.3.25, “Floor and Equipment Drains”
- LRA Section 2.3.3.26, “Fuel Handling Area Ventilation”
- LRA Section 2.3.3.27, “Fuel Storage and Fuel Pool Cooling and Cleanup”
- LRA Section 2.3.3.28, “Hydrogen Water Chemistry”
- LRA Section 2.3.3.29, “Inclined Fuel Transfer System”
- LRA Section 2.3.3.30, “Industrial Waste Disposal”
- LRA Section 2.3.3.31, “Intermediate Building Ventilation”
- LRA Section 2.3.3.32, “Leak Detection”
- LRA Section 2.3.3.33, “Liquid Radwaste Disposal”
- LRA Section 2.3.3.34, “Liquid Radwaste Sumps”
- LRA Section 2.3.3.35, “MCC Switchgear and Miscellaneous Electrical Area HVAC and Battery Room Exhaust”
- LRA Section 2.3.3.36, “Miscellaneous Area Ventilation”
- LRA Section 2.3.3.37, “Miscellaneous Electrical Areas Smoke Ventilation”
- LRA Section 2.3.3.38, “Miscellaneous Sump”
- LRA Section 2.3.3.39, “Nitrogen Supply”
- LRA Section 2.3.3.40, “Nuclear Closed Cooling”
- LRA Section 2.3.3.41, “Offgas Building Ventilation”
- LRA Section 2.3.3.42, “Penetration Electrical”
- LRA Section 2.3.3.43, “Penetration Pressurization”
- LRA Section 2.3.3.44, “Plant Foundation Underdrain”
- LRA Section 2.3.3.45, “Plant Radiation Monitoring and Process Monitoring and Post Accident Radiation Monitoring”

- LRA Section 2.3.3.46, "Post Accident Sampling"
- LRA Section 2.3.3.47, "Portable Water Supply"
- LRA Section 2.3.3.48, "Rx Plant Sampling"
- LRA Section 2.3.3.49, "Radwaste Building Ventilation"
- LRA Section 2.3.3.50, "Reactor Vessel Servicing Equipment"
- LRA Section 2.3.3.51, "Reactor Water Clean Up and Reactor Water Clean Up Filter Demineralizer"
- LRA Section 2.3.3.52 "Safety Related Instrument Air"
- LRA Section 2.3.3.53, "Sanity Drain and Sewer"
- LRA Section 2.3.3.54, "Service Air and Instrument Air"
- LRA Section 2.3.3.55, "Service Water"
- LRA Section 2.3.3.56, "Standby Liquid Control"
- LRA Section 2.3.3.57, "Steam Tunnel Cooling"
- LRA Section 2.3.3.58, "Storm Drain and Sewer"
- LRA Section 2.3.3.59, "Suppression Pool Drain and Clean Up"
- LRA Section 2.3.3.60, "Suppression Pool Makeup"
- LRA Section 2.3.3.61, "Turbine Building Chilled Water"
- LRA Section 2.3.3.62, "Turbine Building Closed Cooling"
- LRA Section 2.3.3.63, "Turbine Building Ventilation"
- LRA Section 2.3.4.1, "Auxiliary Steam and Drains"
- LRA Section 2.3.4.2, "Condensate"
- LRA Section 2.3.4.3, "Condensate Transfer and Storage"
- LRA Section 2.3.4.4, "Control Rod Drive Rebuild Equipment"
- LRA Section 2.3.4.5, "Extraction Steam"
- LRA Section 2.3.4.6, "Feed Water Control, Feedwater and Feedwater Leakage Control"
- LRA Section 2.3.4.7, "Main Condenser and Auxiliaries"
- LRA Section 2.3.4.8, "Main and Reheat Steam"
- LRA Section 2.3.4.9 "Main, Reheat, Extraction, and Miscellaneous Drains"
- LRA Section 2.3.4.10, "Respirator Cleaning"
- LRA Section 2.3.4.11, "Service Water and Emergency Service Water Chlorination"
- LRA Section 2.3.4.12, "Two Bed Demineralizer and Distribution, and Mixed Bed Demineralizer and Distribution"

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	**UFSAR**	**LRA Drawings**
LRA Section 2.3.1, "Reactor Vessel, Internals, and Reactor Coolant System"				
2.3.1.1	Fuel	Table 3.1.2-1, "Reactor Vessel, Internals and Reactor Coolant Systems – Fuel System"	Section 4.1.2.1.3 and Appendix 15 B	None
2.3.1.2	Nuclear Boiler	Table 2.3.1-2, "Nuclear Boiler" Table 3.1.2-2, "Reactor Vessel, Internals and Reactor Coolant Systems – Nuclear Boiler System – Summary of Aging Management Evaluation"	Sections 1.2.2.4.8.b; 5.1; 5.4.4; 5.4.5.2; 5.4.9.2; 5.2.2.4.1; 6.2.4.2.2.1.b;6.3.1.2.4; 6.3.2.2.2; 10.1; Appendix 3BA, Appendix 15C; Appendix 15H	302-0121 302-0605 302-0606 302-0607
2.3.1.3	Reactor Coolant Pressure Boundary	Table 2.3.1-3, "Reactor Coolant Pressure Boundary" Table 3.1.2-3, "Reactor Vessel, Internals and Reactor Coolant Systems – Reactor Coolant Pressure Boundary System – Summary of Aging Management Evaluation	Sections 5.1 and 6.2.4.2.2.1	302-0082 302-0121 302-0601 302-0602 302-0605 302-0606 302-0613 302-0631 302-0632 302-0642 302-0671 302-0672 302-0691 302-0701 302-0705
2.3.1.4	Reactor Recirculation	Tables 2.3.1-4, "Reactor Recirculation" Table 3.1.2-4, "Reactor Vessel, Internals and Reactor Coolant Systems – Reactor Recirculation System – Summary of Aging Management Evaluation"	Sections 1.2.2.3.3; 4.4.3.3.1; 5.4.1.3; and Appendix 15C	302-0600 302-0601 302-0602 302-603 302-604
2.3.1.5	Reactor Vessel	Table 2.3.1-5, "Reactor Vessel" Table 3.1.2-5, "Reactor Vessel, Internals and Reactor Coolant Systems – Reactor Vessel – Summary of Aging Management Evaluation"	Sections 1.2.2.3.2; 3.2.3.2; 5.3.3.1.1.1 and Figure 5.3-6	None

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
2.3.1.6	Reactor Vessel Internals	Tables: 2.3.1-6, "Reactor Vessel Internals" Table 3.1.2-6' "Reactor Vessel, Internals and Reactor Coolant Systems – Reactor Vessel Internals – Summary of Aging Management Evaluation"	Sections 3.2.3.2; 3.9.5.1 and 4.1.2	None
LRA Section 2.3.2, "Engineered Safety Features Systems"				
2.3.2.1	Alternate Decay Heat Removal (G40)	Table 2.3.2-1, "Alternate Decay Heat Removal" Table 3.2.2-1, "Engineered Safety Features Systems – Alternate Decay Heat Removal System – Summary of Aging Management Evaluation	Sections 9.2.10.1, 9.2.10.2, 9.2.10.3 and Table 3.2-1 notes	302-0246
2.3.2.2	Annulus Exhaust Gas Treatment	Table 2.3.2-2, "Annulus Exhaust Gas Treatment" Table 3.2.2-2' "Engineered Safety Features Systems – Annulus Exhaust Gas Treatment System – Summary of Aging Management Evaluation	Sections 1.2.2.4.16, 6.5.3.2, and 9A.4.1.1	912-0605
2.3.2.3	Containment Atmosphere Monitoring	Table 2.3.2-3, "Containment Atmosphere Monitoring" Table 3.2.2-3, "Engineered Safety Features Systems – Containment Atmosphere Monitoring System – Summary of Aging Management Evaluation"	Sections 7.1.1-n and 7.6.1.8	302-0881
2.3.2.4	High Pressure Core Spray	Table 2.3.2-4, "High Pressure Core Spray" Table 3.2.2-4, "Engineered Safety Features Systems – High Pressure Core Spray System – Summary of Aging Management Evaluation"	Sections 1.2.2.4.8.a, Table 6.1-1, 6.3.1.1.1, 6.3.2.2.1, 6.3.2.2.5, 9.3.5.2, Appendix 15C and Appendix 15H.2.2	302-0574 302-0701
2.3.2.5	Low Pressure Core Spray	Table 2.3.2-5, "Low Pressure Core Spray" Table 3.2.2-5, "Engineered Safety	Sections 1.2.2.4.8.c, Table 6.1-1, 6.3.1.1.1, 6.3.2.2.3, 6.3.2.2.5 and 6.9.2	302-0574 302-0705

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		Features Systems – Low Pressure Core Spray System – Summary of Aging Management Evaluation"		
2.3.2.6	Offgas	Table 2.3.2-6, "Offgas" Table 3.2.2-6, "Engineered Safety Features Systems – Off Gas System – Summary of Aging Management Evaluation"	Sections 9.4.11.2, 11.3.1.1, 11.3.1.2, 11.3.2.1.1, 11.3.2.2.1.2.2, Table 9.4-27 and 15.4.9.5	302-0751 302-0752 302-0753 302-0754 913-0009 913-0010 913-0011 913-0012
2.3.2.7	Reactor Core Isolation Cooling	Table 2.3.2-7, "Reactor Core Isolation Cooling" Table 3.2.2-7, "Engineered Safety Features Systems – Reactor Core Isolation Cooling System – Summary of Aging Management Evaluation"	Sections 1.2.2.4.7, 5.4.6.1, Appendix 15C and Appendix 15H.2	302-0574 302-0631 302-0632
2.3.2.8	Residual Heat Removal and Containment Spray	Table 2.3.2-8, "Residual Heat Removal and Containment Spray" Table 3.2.2-8, "Engineered Safety Features Systems – Residual Heat Removal and Containment Spray Systems – Summary of Aging Management Evaluation"	Sections 1.2.2.3.4, 1.2.2.4.8.d, 1.2.2.4.9.4, 1.2.2.4.14, 5.4.7, Table 6.1-1, 6.2.2.2, 6.3.1.1.1, 6.3.1.2.3, 6.3.2.2.4, 6.3.2.2.5, 6.5.2 and Appendix 15C.3	302-0574 302-0641 302-0642 302-0643 302-0661 302-0831
2.3.2.9	Suppression Pool	Table 2.3.2-9, "Suppression Poo" l Table 3.2.2-9, "Engineered Safety Features Systems – Suppression Pool System – Summary of Aging Management Evaluation"	Sections 1.2.2.4.9.1, 5.2.2.4.1, 6.3.2.2, Appendices 9A.3, 15C.3 and 15H.2.2	302-0574 302-0651
LRA Section 2.3.3, "Auxiliary Systems"				
2.3.3.1	Auxiliary Building Ventilation	Table 2.3.3-1, "Auxiliary Building Ventilation Component Types Subject to Aging Management Review" Table 3.3.2-1, "Auxiliary Building Ventilation – Summary of Aging Management Evaluation"	Section 9.4.3 "Auxiliary and Radwaste Area Ventilation Systems" Section 9.4.12, "Miscellaneous Non-safety HVAC Systems"	912-0613 912-0615
2.3.3.2	Breathable Air	Table 3.3-2, "Breathable Air Component Types	Section 6.4, "Habitability Systems"	302-0261

LRA Section 2.3, “Scoping and Screening Results: Mechanical Systems”				
		Subject to Aging Management Review” Table 3.3.2-2, “Breathable Air – Summary of Aging Management Evaluation”		
2.3.3.3	Building Heating	2.3.3-3, “Building Heating Component Types Subject to Aging Management Review” 3.3.2-3, “Building Heating – Summary of Aging Management Evaluation”	Section 9.4.10, “Building Heating System”	913-0016 913-0017
2.3.3.4	Combustible Gas Control	Table 2.3.3-4, “Combustible Gas Control Component Types Subject to Aging Management Review” Table 3.3.2-4, “Combustible Gas Control – Summary of Aging Management Evaluation”	Section 6.2.5, “Combustible Gas Control in Containment”	302-0831 302-0832
2.3.3.5	Computer Room HVAC	Table 2.3.3-5: “Computer Room HVAC Component Types Subject to Aging Management Review” Table 3.3.2-5, “Computer Room HVAC – Summary of Aging Management Evaluation””	Section 9.4.1, “Control Complex HVAC Systems”	912-0607
2.3.3.6	Containment and Drywell Vacuum Relief	Table 2.3.3-6, “Containment and Drywell Vacuum Relief Component Types Subject to Aging Management Review” Table 3.3.2-6, “Containment and Drywell Vacuum Relief – Summary of Aging Management Evaluation”	Section 7.3, “Engineered Safety Feature Systems” Section 6.2.7, “Suppression Pool Makeup System”	912-0606
2.3.3.7	Containment Integrated Leak Rate Test	Table 2.3.3-7, “Containment Integrated Leak Rate Test Component Types Subject to Aging Management Review” Table 3.3.2-7, “Containment Integrated Leak Rate Test – Summary of Aging Management Evaluation”	Section 9.2.6, “Containment Leakage Rate Testing”	302-0811

LRA Section 2.3, “Scoping and Screening Results: Mechanical Systems”				
2.3.3.8	Containment Vessel and Drywell Purge	Table 2.3.3-8, “Containment Vessel and Drywell Purge Component Types Subject to Aging Management Review” Table 3.3.2-8, “Containment Vessel and Drywell Purge – Summary of Aging Management Evaluation”	Section 9.4.6, “Reactor Building Ventilation System”	302-0881 912-0604
2.3.3.9	Containment Vessel Chilled Water	Table 2.3.3.9, “Containment Vessel Chilled Water Component Types Subject to Aging Management Review” Table 3.3.2-9, “Containment Vessel Chilled Water – Summary of Aging Management Evaluation”	Section 9.4.9, “Chilled Water Systems”	913-0007 913-0008
2.3.3.10	Control and Computer Room Humidification	Table 2.3.3-10, “Control and Computer Room Humidification Component Types Subject to Aging Management Review” Table 3.3.2-10, “Control and Computer Room Humidification – Summary of Aging Management Evaluation”	Section 6.4, “Habitability Systems” Section 9.4.12, “Miscellaneous Non-Safety HVAC Systems”	913-0018
2.3.3.11	Control Complex Chilled Water	Table 2.3.3-11, “Control Complex Chilled Water Component Types Subject to Aging Management Review” Table 3.3.2.11, “Control Complex Chilled Water – Summary of Aging Management Evaluation”	Section 9.4.9, “Chilled Water Systems”	913-0001 913-0002
2.3.3.12	Control Rod Drive	Table 2.3.3.12, “Control Rod Drive Component Types Subject to Aging Management Review” Table 3.3.2-12, “Control Rod Drive – Summary of Aging Management Evaluation”	Section 4.6, “Functional Design of Reactivity Control Systems”	302-0871 302-0872
2.3.3.13	Control Room HVAC and Emergency Recirculation	Table 2.3.3-13, “Control Room HVAC and Emergency Recirculation Component Types	Section 6.4, “Habitability Systems”	912-0610

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		Subject to Aging Management Review" Table 3.3.2-13, "Control Room HVAC and Emergency Recirculation – Summary of Aging Management Evaluation"	Section 6.5, "Fission Product Removal and Control Systems"	
2.3.3.14	Controlled Access and Miscellaneous Equipment Areas HVAC	Table 2.3.3.14, "Controlled Access and Miscellaneous Equipment Areas HVAC Component Types Subject to Aging Management Review" Table 3.3.2-14, "Controlled Access and Miscellaneous Equipment Areas HVAC – Summary of Aging Management Evaluation"	Section 9.4.1, "Control Complex HVAC Systems"	912-0608
2.3.3.15	Diesel Generator and Auxiliaries	Table 2.3.3-15a, Diesel Generator and Auxiliaries – Starting Air and Division 1 and 2 Control Air Component Types Subject to Aging Management Review Table 2.3.3-15b, Diesel Generator and Auxiliaries – Fuel Oil Component Types Subject to Aging Management Review Table 2.3.3-15c, Diesel Generator and Auxiliaries – Cooling Water Component Types Subject to Aging Management Review Table 2.3.3-15d, Diesel Generator and Auxiliaries – Lube Oil Component Types Subject to Aging Management Review Table 2.3.3-15e, Diesel Generator and Auxiliaries – Air Intake and Exhaust Component Types Subject to Aging Management Review Table 3.3.2-15a, Diesel Generator and Auxiliaries – Starting Air and Division 1 and 2 Control	Section 8.3, On-site Power Systems Section 9.5.4, Diesel Generator Fuel Oil Storage and Transfer System Section 9.5.5, Diesel Generator Cooling Water Systems Section 9.5.6, Diesel Generator Starting Air Section 9.5.7, Diesel Generator Lubrication System Section 9.5.8, Diesel Generator Combustion Air Intake and Exhaust System Section 9.5.9, High Pressure Core Spray Diesel Generator	302-0346 302-0347 302-0348 302-0349 302-0351 302-0352 302-0353 302-0354 302-0355 302-0356 302-0357 302-0358 302-0359 302-0360

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		Air – Summary of Aging Management Evaluation Table 3.3.2-15b, Diesel Generator and Auxiliaries – Fuel Oil Summary of Aging Management Evaluation Table 3.3.2-15c, Diesel Generator and Auxiliaries – Cooling Water Summary of Aging Management Evaluation Table 3.3.2-15d, Diesel Generator and Auxiliaries – Lube Oil Summary of Aging Management Evaluation Table 3.3.2-15e, Diesel Generator and Auxiliaries – Air Intake and Exhaust Summary of Aging Management Evaluation		
2.3.3.16	Diesel Generator Building Ventilation	Table 2.3.3-16: Diesel Generator Building Ventilation Component Types Subject to Aging Management Review Table 3.3.2-16: Diesel Generator Building Ventilation – Summary of Aging Management Evaluation	Section 9.5.4, Engineered Safety Features Ventilation Systems	912-0619
2.3.3.17	ECCS Pump Room Cooling	Table 2.3.3-17: ECCS Pump Room Cooling Component Types Subject to Aging Management Review Table 3.3.2-17: ECCS Pump Room Cooling – Summary of Aging Management Evaluation	Section 9.4.5, Engineered Safety Features Ventilation Systems	912-0616
2.3.3.18	Emergency Closed Cooling	Table 2.3.3-18, Emergency Closed Cooling Component Types Subject to Aging Management Review Table 3.3.2-18, Emergency Closed Cooling – Summary of Aging Management Evaluation	Section 9.2.1, Emergency Service Water System Section 9.2.2, Emergency Closed Cooling System Section 9.4.9, Chilled Water Systems	302-0621 302-0622 302-0832 302-1001 352-0621

LRA Section 2.3, “Scoping and Screening Results: Mechanical Systems”				
2.3.3.19	Emergency Closed Cooling Pump Area HVAC	Table 2.3.3-19: Emergency Closed Cooling Pump Area HVAC Component Types Subject to Aging Management Review Table 3.3.2-19: Emergency Closed Cooling Pump Area HVAC – Summary of Aging Management Evaluation	Section 9.4.5, Emergency Safety Features Ventilation System	912-0623
2.3.3.20	Emergency Service Water	Table 2.3.3-20: Emergency Service Water Component Types Subject to Aging Management Review Table 3.3.2-20: Emergency Service Water – Summary of Aging Management Evaluation	Section 9.2.1, Emergency Service Water System	302-0791 302-0792
2.3.3.21	Emergency Service Water Pump House Ventilation	Table 2.3.3-21: Emergency Service Water Pump House Ventilation Component Types Subject to Aging Management Review Table 3.3.2-21: Emergency Service Water Pump House Ventilation – Summary of Aging Management Evaluation	Section 9.4.5, Engineered Safety Features Ventilation System	912-0630
2.3.3.22	Emergency Service Water Screen Wash	Table 2.3.3-22, Emergency Service Water Screen Wash Component Types Subject to Aging Management Review	Section 9.2.1.3, “Safety Evaluation” for the Emergency Service Water System	302-0214, Revision 0 LRPY-MAMR-P49 Revision 3, Aging Management Review (AMR) – System P49 Emergency Service Water Screen Wash System Scoping Details Report, Revision 0 – System P49 Emergency Service Water Screen Wash
2.3.3.23	Feedwater Zinc Injection	Table 2.3.3-23, Feedwater Zinc Injection, Component Types Subject to Aging Management Review	Section 9.3.7.1, “Design Bases” for the Zinc Injection System Section 9.3.7.2, “System Description” for the Zinc Injection System”	302-0335, Revision 0 LRPY-MAMR-P85 Revision 2, Aging Management Review (AMR) – System P85

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
			Section 9.3.7.3, "Safety Evaluation" for the Zinc Injection System"	Feedwater Zinc Injection System Scoping Details Report, Revision 1 – System P85 Feedwater Zinc Injection
2.3.3.24	Fire Protection	Tables 2.3.3.24, 2.3.3-22, 2.3.3-25, 2.4.2.26, and 2.4.4-1	Section 8.3.3, "Fire Protection for Cable Systems" Section 9.5.1, "Fire Protection System" Appendix 9A, "Fire Protection Evaluation Report"	None
2.3.3.25	Floor and Equipment Drains	Table 2.3.3-25, Floor and Equipment Drains, Component Types Subject to Aging Management Review* Table 3.3.2-25, Auxiliary Systems – Floor and Equipment Drains Summary of Aging Management Evaluation* License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023 License Renewal Application for the Perry Nuclear Power Plant Revision O - Supplement 2 issued June 27, 2024	Section 2.4.2.3, Effects of Local Intense Precipitation Section 9.3.3, Equipment and Floor Drainage System Section 9.3.3.1, Design Bases Section 9.3.3.2, System Description Section 9.3.3.2.1, Floor Drains Section 9.3.3.2.2, Equipment Drains Section 9.3.3.2.3, Chemical Drains Section 9.3.3.2.4, Detergent Drains Section 9.3.3.2.5, Oil Drains Appendix 9A 9A.4.5.1, Unit 1 Fire Areas	911-0021, Revision 0 911-0022, Revision 0 911-0023, Revision 0 911-0601, Revision 0 911-0617, Revision 0** 911-0627, Revision 0 911-0628, Revision 0 911-0629, Revision 0 911-0671, Revision 0 911-0691, Revision 0 912-0604, Revision 0 919-0022, Revision 1 LRPY-MAMR-P68 Revision 2, Aging Management Review (AMR) – System P68 Floor and Equipment Drains System Scoping Details Report, Revision 6 – System P68 Floor and Equipment Drains
2.3.3.26	Fuel Handling Area Ventilation	Table 2.3.3-26, Fuel Handling Area Ventilation -Component Types Subject to Aging Management Review Table 3.3.2-26, Auxiliary Systems – Fuel Handling Area Ventilation - Summary of Aging Management Evaluation*	Section 6.5.1, Engineered Safety Features (ESF) Filter Systems Section 9.4.2, Fuel Handling Area Ventilation System Section 9.4.2.1, Design Bases	912-0617, Revision LRPY-MAMR-M40 Revision 2, Aging Management Review (AMR) Report – System M40 Fuel Handling Area Ventilation** System Scoping Details Report, Revision 2 –

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023 License Renewal Application for the Perry Nuclear Power Plant Revision O - Supplement 2 issued June 27, 2024	Section 9.4.2.2, System Description	System M40 Fuel Handling Area Ventilation
2.3.3.27	Fuel Storage and Fuel Pool Cooling and Cleanup	Table 2.3.3-27, Fuel Storage and Fuel Pool Cooling and Cleanup Component Types Subject to Aging Management Review Table License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	Section 1.2.2.8.3, Fuel Pool Cooling and Cleanup System Section 9.1.1, New Fuel Storage Section 9.1.2, Spent Fuel Storage Section 9.1.3, Spent Fuel Pool Cooling and Cleanup System Appendix 15H.2, Assessment for Station Blackout	302-0651 Revision 1 302-0653 Revision 0 302-0654 Revision 0 302-0655 Revision 0 LRPY-MAMR- F16 & G41, Revision 4, Aging Management Review (AMR) Report – System F16 & G41 Fuel Storage and Fuel Pool Cooling and Cleanup System Scoping Details Report, Revision 4 – System F16 & G41 Fuel Storage and Fuel Pool Cooling and Cleanup
2.3.3.28	Hydrogen Water Chemistry	Table 2.3.3-28, Hydrogen Water Chemistry – Component Types Subject to Aging Management Review License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	Section 9.3.8, Hydrogen Water Chemistry System Section 9.3.8.1, Design Basis Section 9.3.8.2, System Description Section 9.3.8.3, Safety Evaluation	302-0078, Revision 0 LRPY-MAMR-P73, Revision 2, Aging Management Review (AMR) Report – System P73 Hydrogen Water Chemistry System Scoping Details Report, Revision 3 – System P73 Hydrogen Water Chemistry
2.3.3.29	Inclined Fuel Transfer System	Table 02.3.3-29, Inclined Fuel Transfer System – Component Types Subject to Aging Management Review License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	Section 9.1.4.2.3, Fuel Servicing Equipment Section 9.1.4.2.3.11, Fuel Transfer System	302-0970, Revision 0 302-0972, Revision 302-0973, Revision 0 LRPY-MAMR-F42, Revision 3, Aging Management Review (AMR) Report – System F42 Inclined Fuel Transfer System Scoping Details Report, Revision 4 – System F42 Inclined Fuel Transfer System
2.3.3.30	Industrial Waste Disposal	Table 2.3.3-30, Industrial Waste Disposal – Component Types	Section 9.3.3, Equipment and Floor Drainage System	302-0371, Revision 0

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		Subject to Aging Management Review License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	Section 9.3.3.2.5, Oil Drains	LRPY-MAMR-P64, Revision 0, Aging Management Review (AMR) Report – System P64 Industrial Waste Disposal System Scoping Details Report, Revision 1 – System P64 Industrial Waste Disposal
2.3.3.31	Intermediate Building Ventilation	Table 2.3.3-31, Intermediate Building Ventilation – Component Types Subject to Aging Management Review License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	Section 9.4.7, Intermediate Building Ventilation System Section 9.4.7.1, Design Bases Section 9.4.7.2, System Description	912-0613, Revision 0 LRPY-MAMR-M33, Revision 1, Aging Management Review (AMR) Report – System M33 Intermediate Building Ventilation System Scoping Details Report, Revision 2 – System M33 Intermediate Building Ventilation
2.3.3.32	Leak Detection	Table 2.3.3-32, Leak Detection – Component Types Subject to Aging Management Review License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	Section 1.2.2.3.6, Nuclear Leak Detection System Section 7.6.1.3, Leak Detection System - Instrumentation and Controls	302-0961, Revision 1 302-0962, Revision 0 302-0964, Revision 0 LRPY-MAMR-E31, Revision 2, Aging Management Review (AMR) Report – System E31 Leak Detection System Scoping Details Report, Revision 1 – System E31 Leak Detection
2.3.3.33	Liquid Radwaste Disposal	Table 2.3.3-33, Liquid Radwaste Disposal – Component Types Subject to Aging Management Review License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	Section 1.2.2.9.2, Liquid Radwaste System Section 11.2, Liquid Waste Management Systems Section 15.7.2, Radioactive Liquid Waste System Failures (Release to Atmosphere) Section 15.7.3, Postulated Radioactive Releases Due to Liquid-Containing Tank Failures Appendix 15H.0, Station Blackout (SBO)	302-0731, Revision 0 302-0733, Revision 0 302-0734, Revision 0 302-0736, Revision 0 302-0737, Revision 0 302-0738, Revision 0 LRPY-MAMR-G50, Revision 3, Aging Management Review (AMR) Report – System G50 Liquid Radwaste Disposal System Scoping Details Report, Revision 2 – System G50 Liquid Radwaste Disposal

LRA Section 2.3, “Scoping and Screening Results: Mechanical Systems”				
			Appendix 15H.2, Assessment	
2.3.3.34	Liquid Radwaste Sumps	Table 2.3.3-34, Liquid Radwaste Sumps– Component Types Subject to Aging Management Review License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	Section 9.3.3, Equipment and Floor Drainage System Section 9.3.3.1, Design Bases Section 11.2, Liquid Waste Management Systems Section 11.2.2.10.k, Detailed Component Design- Sumps Appendix 15H.0, Station Blackout (SBO) Appendix 15H.2, Assessment	302-0739, Revision 0 302-0740, Revision 0 302-0741, Revision 0 LRPY-MAMR-G61, Revision 2, Aging Management Review (AMR) Report – System G61 Liquid Radwaste Sumps System Scoping Details Report, Revision 3 – System G61 Liquid Radwaste Sumps
2.3.3.35	Switchgear and Misc. Electrical Area HVAC, and Battery Room Exhaust	Table 2.3.3-35 MCC Switchgear and Miscellaneous Electrical Area HVAC, and Battery Room Exhaust Component Types Subject to Aging Management Review Table 3.3.2-35 Auxiliary Systems – MCC Switchgear and Miscellaneous Electrical Area HVAC, and Battery Room Exhaust Summary of Aging Management Evaluation* License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023 License Renewal Application for the Perry Nuclear Power Plant Revision O - Supplement 2 issued June 27, 2024	• Section 9.4, Air Conditioning, Heating, Cooling, and Ventilating Systems • Section 9.4.1.1, Design Bases Section 9.4.1.1.2, Battery Room Exhaust System Section 9.4.1.2, System Description Section 9.4.1.2.1, MCC, Switchgear and Miscellaneous Electric Equipment Areas HVAC System Section 9.4.1.2.2, Battery Room Exhaust System Appendix 9A.3.2, Systems for Safe Shutdown Table 9A.3-1, List of Safe Shutdown Equipment Appendix 15H.2.2, SBO Capability Evaluation	912-0609, Revision 0 LRPY-MAMR-M23 & M24 Revision 2, Aging Management Review (AMR) – System M23 & M24 – MCC, Switchgear, and Misc. Area HVAC, and Battery Room Exhaust System Scoping Details Report, Revision 1 – System M23 & M24 – MCC, Switchgear, and Misc. Area HVAC, and Battery Room Exhaust
2.3.3.36	Miscellaneous Area Ventilation	Table 2.3.3-36, Miscellaneous Area Ventilation – Component Types Subject to Aging Management Review	Section 9.4.12.2.3, Service Water Pumphouse Ventilation System	912-0629, Revision 0 912-0632, Revision 0 LRPY-MAMR-M46, Revision 2, Aging Management Review

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	Section 9.4.12.2.4, Turbine Lube Oil Storage Area Ventilation System Section 9.4.12.2.5, Auxiliary Boiler Building Ventilation System Section 9.4.12.2.6, Diesel Driven Fire Pump Area Ventilation System Appendix 9A.4.3, Intermediate Building Appendix 9A.4.3.3, Fire Zone IB-3 Appendix 9A.4.6, Emergency Service Water Pumphouse Appendix 9A4.6.2, Fire Area ESW-1b Appendix 9A4.16, Unit 1 Turbine Building	(AMR) Report – System M46 Miscellaneous Area Ventilation System Scoping Details Report, Revision 3 – System M46 Miscellaneous Area Ventilation
2.3.3.37	Miscellaneous Electrical Areas Smoke Ventilation	Table 2.3.3-37, Miscellaneous Electrical Areas Smoke Ventilation – Component Types Subject to Aging Management Review License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	Section 9.4.1, Control Complex HVAC Systems Section 9.4.1.3, Safety Evaluation Section 9.4.12.2.8, Smoke Venting System Appendix 9A.4.3, Intermediate Building Appendix 9A.2.3, Fire Hazards Analysis Appendix 9A.2.3.4, Review of Ventilation Systems Appendix 9A.5, Point-By-Point Comparison Appendix 9A.5, [Position D.3(i)] General Guidelines for Plant Protection (Electric Cable Construction, Cable Trays and Cable Penetrations)	912-0633, Revision 0 LRPY-MAMR-M49, Revision 2, Aging Management Review (AMR) Report – System M49 Miscellaneous Electrical Areas Smoke Venting System Scoping Details Report, Revision 2 – System M49 Miscellaneous Electrical Areas Smoke Venting
2.3.3.38	Miscellaneous Sump	Table 2.3.3-38, Miscellaneous Sump – Component Types	Section 3.8.4, Other Seismic Category I Structures	302-0331, Revision 0

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		Subject to Aging Management Review License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023		LRPY-MAMR-G60, Revision 1, Aging Management Review (AMR) Report – System G60 Miscellaneous Sumps System Scoping Details Report, Revision 0 – System G60 Miscellaneous Sumps
2.3.3.39	Nitrogen Supply	Table 2.3.3-39, Nitrogen Supply – Component Types Subject to Aging Management Review License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	None	302-0950, Revision 0 LRPY-MAMR-P86, Revision 1, Aging Management Review (AMR) Report – System P86 Nitrogen Supply System Scoping Details Report, Revision 0 – System P86 Nitrogen Supply
2.3.3.40	Nuclear Closed Cooling	Table 2.3.3-40 Nuclear Closed Cooling – Component Types Subject to Aging Management Review Table 3.3.2-40 Auxiliary Systems – Nuclear Closed Cooling – Summary of Aging Management Evaluation Table 3.3.1 Summary of Aging Management Evaluations for the Auxiliary Systems License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023 License Renewal Application for the Perry Nuclear Power Plant Revision 0 - Supplement 2 issued June 27, 2024	Section 9.2.8, Nuclear Closed Cooling System Section 9.2.8.1, Design Bases Section 9.2.8.2, System Description Section 9.2.8.3, Safety Evaluation Appendix 1A, Table 1A-1 <NUREG-0737> TMI Action Plan Requirements for Applicants for An Operating License PNPP Summary Item No. II.K.3.25, Table 3.2-1 Equipment Classification note 19	302-0611, Revision 0 302-0612, Revision 0* 302-0613, Revision 0 352-0612, Revision 0* LRPY-MAMR-P43 Revision 3, Aging Management Review (AMR) Report – System P43 – Nuclear Closed Cooling System Scoping Details Report, Revision 2 – System P43 – Nuclear Closed Cooling
2.3.3.41	Offgas Building Ventilation	Table 2.3.3-41, Offgas Building Ventilation Component Types Subject to Aging Management Review Table 3.3.2-41, Auxiliary Systems – Offgas Building Ventilation –	Section 7.6.1.10, Offgas Building Exhaust System Section 9.4.4.2.3, Offgas Building Exhaust System Appendix 9A.4.13.1, Unit 1 Offgas Building – Description	302-0751, Revision 0 302-0752, Revision 0 912-0622, Revision 0 LRPY-MAMR-M36 Revision 2, Aging Management Review (AMR) Report – System M36 – Off-Gas Building Exhaust

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		Summary of Aging Management Evaluation License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023 License Renewal Application for the Perry Nuclear Power Plant Revision 0 - Supplement 2 issued June 27, 2024	Section 15.7.1, Radioactive Gas Waste System Leak or Failure	System Scoping Details Report, Revision 2 – System M36 – Offgas Building Exhaust
2.3.3.42	Penetration Electrical	None. The penetrations are evaluated as structural commodities. License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	Section 8.3.1.4.5, Electrical Penetration Assemblies Figure 3.8-7, Typical Electrical Penetration Details for Reactor Building Complex	None LRPY-MAMR-R72, Revision 1, Aging Management Review (AMR) Report – System R72 Penetration Electrical System Scoping Details Report, Revision 2 – System R72 Penetration Electrical
2.3.3.43	Penetration Pressurization	Table 2.3.3-43, Penetration Pressurization – Component Types Subject to Aging Management Review License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	Section 6.2.6.2, Containment Penetration Leakage Rate Test Appendix 9A.7 Deviations from Regulatory Guidance	302-0761, Revision 0 302-0762, Revision 0 LRPY-MAMR-P53, Revision 2, Aging Management Review (AMR) Report – System P53 Penetration Pressurization and Airlocks System Scoping Details Report, Revision 1 – System P53 Penetration Pressurization and Airlocks
2.3.3.44	Plant Foundation Underdrain	Table 2.3.3-44 Plant Foundation Underdrain Component Types Subject to Aging Management Review License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023 License Renewal Application for the Perry Nuclear Power Plant Revision 0 - Supplement 2 issued June 27, 2024*	Section 2.4.13, Groundwater Section 2.4.13.3, Accident Effects Section 2.4.13.5.1, Pressure Relief Underdrain System Description Section 2.4.13.5.2, System Design Basis Section 15.7.3 Postulated Radioactive Releases	302-0861, Revision 0 LRPY-MAMR-P72 Revision 1, Aging Management Review (AMR) Report – System P72 – Plant Foundation Underdrain System Scoping Details Report, Revision 1 – System P72 – Plant Foundation Underdrain

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		* LRA Section 2.3.3.44 revised because of TRP-046-07	Due to Liquid-Containing Tank Failures Section 15.7.3.2 Sequence of Events and Systems Operation Section 15.7.3.5 Radiological Consequences	
2.3.3.45	Plant Radiation Monitoring and Process Monitoring, and Post Accident Radiation Monitoring	Table 2.3.3-45 Plant Radiation Monitoring and Process Monitoring and Post Accident Radiation Monitoring – Component Types Subject to Aging Management Review License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	Section 1.2.2.10, Radiation Monitoring and Control Section 1.2.2.10.1, Process Radiation Monitoring Section 11.5, Process and Effluent Radiological Monitoring and Sampling Systems Section 12.3.4, Area Radiation and Airborne Radioactivity Monitoring Instrumentation Section 15.7.1.1, Main Condenser Offgas Treatment System Failure Section 15.7.1.1.2.b, Sequence of Events and Systems Operation	806-0004, Revision 0 806-0007, Revision 0 806-0009, Revision 0 806-0010, Revision 0 806-0033, Revision 0 856-0033, Revision 0 912-0613, Revision 0 LRPY-MAMR-D17 & D19 Revision 1, Aging Management Review (AMR) Report – System D17 & D19 – Plant Radiation Monitoring and Process Monitoring and Post Accident Radiation Monitoring System Scoping Details Report, Revision 3 – System D17 & D19 – Plant Radiation Monitoring and Process Monitoring and Post Accident Radiation Monitoring
2.3.3.46	Post-Accident Sampling	Table 2.3.3-46 Post-Accident Sampling – Component Types Subject to Aging Management Review License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	Section 9.3.6, Post-accident Sampling System Section 9.3.6.2, System Description Section 9.3.6.3, Safety Evaluation	302-0431, Revision LRPY-MAMR-P87 Revision 2, Aging Management Review (AMR) Report – System P87 – Post-Accident Sampling System Scoping Details Report, Revision 1 – System P87 – Post-Accident Sampling
2.3.3.47	Potable Water Supply	Table 2.3.3-47 Potable Water Supply – Component Types Subject to Aging Management Review License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023	Section 9.2.4, Potable Water System Section 9.2.4.2, System Description Section 9.2.4.3, Safety Evaluation	302-0382, Revision 0 919-0022, Revision 1 LRPY-MAMR-P71 Revision 2, Aging Management Review (AMR) Report – System P71 – Potable Water Supply

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
				System Scoping Details Report, Revision 0 – System P71 – Potable Water Supply
2.3.3.48	Reactor Plant Sampling	Table 2.3.3-48 Process Sampling (Rx Plant Sampling) – Component Types Subject to Aging Management Review Table 3.3.2-48 Auxiliary Systems – Rx Plant Sampling Summary of Aging Management Evaluation* License Renewal Application for the Perry Nuclear Power Plant issued July 2, 2023 License Renewal Application for the Perry Nuclear Power Plant Revision 0 - Supplement 2 issued June 27, 2024 * Revised Bolting "Notes" in LRA Revision 0-Supplement 2	Section 9.3.2, Process Sampling System Section 9.3.2.2.1, Sample Locations	302-0772, Revision 0 LRPY-MAMR-P35 Revision 3, Aging Management Review (AMR) Report – System P35 – Reactor Plant Sampling System Scoping Details Report, Revision 0 – System P33, P34, & P35 – Process Sampling (Turbine Plant Sampling, Nuclear Sampling, & Reactor Plant Sampling)
2.3.3.49	Radwaste Building Ventilation	Table 2.3.3-49 Radwaste Building Ventilation Component Types Subject to Aging Management Review	Section 9.4.3.2.3 Radwaste Building Ventilation System	912-0612
2.3.3.50	Reactor Vessel Servicing Equipment	Table 3.3.2-50, Auxiliary Systems – Reactor Vessel Servicing Equipment – Summary of Aging Management Evaluation	Section 3.2.3.2.2 Design Requirements for Safety Class 2 Section 9.1.4.2.5, Reactor Vessel Servicing Equipment Table 9.1-5, Reactor Vessel Servicing Equipment	None
2.3.3.51	Reactor Water Cleanup and Reactor Water Clean Up Filter Demineralizer	Table 2.3.3-51, Reactor Water Clean Up and Reactor Water Clean Up Filter Demineralizer (G33 & G36) Component Types Subject to Aging Management Review Table 3.3.2-51, Reactor Water Clean Up and Reactor Water Clean Up Filter Demineralizer (G33 & G36) – Summary of	Section 1.2.2.3.5, Reactor Water Cleanup System Section 5.4.8, Reactor Water Cleanup System Appendix 15C, Anticipated Transient Without Scram (ATWS)	302-0078 302-0671 302-0672 302-0675 302-0737

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		Aging Management Evaluation	Appendix 15H.2, [Station Blackout (SBO)] - Assessment	
2.3.3.52	Safety Related Instrument Air	Table 2.3.3-52, Safety Related Instrument Air Component Types Subject to Aging Management Review	Section 6.8.1, Design Bases Section 6.8.2, System Design Appendix 15H, Station Blackout (SBO)	302-0271
2.3.3.53	Sanitary Drain and Sewer	Table 2.3.3-53, Sanitary Drain and Sewer Component Types Subject to Aging Management Review	Section 6.4.1, Design Bases	919-0022
2.3.3.54	Service Air (P51) and Instrument Air	Table 2.3.3-54, Service Air and Instrument Air Component Types Subject to Aging Management Review	Section 9.3.1, Compressed Air Systems 9.3.1.1, Design Bases 9.3.1.2, System Description	302-0241 302-0242 302-0243 302-0244 302-0762 352-0241
2.3.3.55	Service Water	Table 2.3.3-55, Service Water Component Types Subject to Aging Management Review	Section 9.2.7, Service Water System Section 9.2.10, Alternate Decay Heat Removal System	302-0212
2.3.3.56	Standby Liquid Control	Table 2.3.3-56, Standby Liquid Control Component Types Subject to Aging Management Review	Section 9.3.5.2, Standby Liquid Control (SLC) System Appendix 15C, Anticipated Transient Without Scram (ATWS)	302-0691 302-0692
2.3.3.57	Steam Tunnel Cooling	Table 2.3.3-57, Steam Tunnel Cooling Component Types Subject to Aging Management Review	Section 9.4.3.1.2, Steam Tunnel Cooling System Section 9.4.3.2.2, Steam Tunnel Cooling System Appendix 9A.4.8, Unit 1 Steam Tunnel	912-0625
2.3.3.58	Storm Drain and Sewer	None	Letter L-22-272, Attachment 2, proposed UFSAR text Section 2.4.2.2, Flood Design Considerations Section 2.4.2.3, Effects of Local Intense Precipitation, and Section 2.4.13.5.5.e, Infiltration Due to Rainfall,	None

LRA Section 2.3, “Scoping and Screening Results: Mechanical Systems”				
			Surface Spills or Lawn Sprinkling	
2.3.3.59	Suppression Pool Drain and Clean Up	Table 2.3.3-59, Suppression Pool Drain and Clean Up Component Types Subject to Aging Management Review	Section 12.3.1.2, Illustrative Examples of Plant Design Features to Minimize Occupational Doses	302-0681
2.3.3.60	Suppression Pool Makeup	Table 2.3.3-60, Suppression Pool Makeup Component Types Subject to Aging Management Review	Section 6.2.7, Suppression Pool Makeup System Section 6.2.7.1, Design Bases Section 6.2.7.2, System Design Appendix 15H.2.2, SBO Capability Evaluation	302-0686
2.3.3.61	Turbine Building Chilled Water	Table 2.3.3-61, Turbine Building Chilled Water Component Types Subject to Aging Management Review	Section 9.4.9.2.2, Turbine Building Chilled Water System Section 9.4.9.3, System Evaluation	913-0003 913-0004
2.3.3.62	Turbine Building Closed Cooling	Table 2.3.3-62, Turbine Building Closed Cooling Component Types Subject to Aging Management Review	Section 9.2.9, Turbine Building Closed Cooling System	302-0221
2.3.3.63	Turbine Building Ventilation	Table 2.3.3-52, Turbine Building Ventilation Component Types Subject to Aging Management Review	Section 9.4.4.2.1, Turbine Building Ventilation System Appendix 9A.4.16.1, Description	912-0614
LRA Section 2.3.4, “Steam and Power Conversion Systems”				
2.3.4.1	Auxiliary Steam and Drains	Table 2.3.4-1, Auxiliary Steam and Drains Component Types Subject to Aging Management Review	None	302-0052 302-0053
2.3.4.2	Condensate	Table 2.3.4-2, Condensate Component Types Subject to Aging Management Review	Section 10.4.7.1.1, Design Basis Section 10.4.7.1.2, System Description	302-0101
2.3.4.3	Condensate Transfer and Storage	Table 2.3.4-1, Condensate Transfer and Storage Component Types Subject to Aging Management Review	Section 3.1, Conformance with NRC General Design Criteria Section 7.4.1, Description Section 9.2.6.2, System Description	302-0102

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
			Section 9.2.6.3, Safety Evaluation Appendix 15H, Station Blackout (SBO)	
2.3.4.4	Control Rod Drive Rebuild Equipment	Table 2.3.4-1, Control Rod Drive Rebuild Equipment Component Types Subject to Aging Management Review	Table 12.3-16, Fuel Handling Area Sub-Compartment Ventilation Data M40 System	302-0008
2.3.4.5	Extraction Steam	None	Section 9.4.10.3, Safety Evaluation Section 10.2.2.1, Turbine Generator Section 10.2.3, Turbine Disk Integrity	None
2.3.4.6	Feed Water Control, Feedwater and Feedwater Leakage Control	Table 2.3.4-1, Feed Water Control, Feedwater and Feedwater Leakage Control Component Types Subject to Aging Management Review	Tables 3.6-3, 6.9.2, 7.7.1.4., 10.4.7.2.1, 10.4.7.2.3 Appendix 9A.3.1	302-0081 302-0082 302-0971
2.3.4.7	Main Condenser and Auxiliaries	Table 2.3.4-1, Main Condenser and Auxiliaries Component Types Subject to Aging Management Review	Sections 10.4.1.3, 10.4.1.4. 15.4.9.5.1	302-0103
2.3.4.8	Main and Reheat Steam	Table 2.3.4-1, Main and Reheat Steam Component Types Subject to Aging Management Review	Section 9.5.10.2	302-0011 302-0605
2.3.4.9	Main, Reheat, Extraction, and Miscellaneous Drains	Table 2.3.4-1, Main, Reheat, Extraction, and Miscellaneous Drains Component Types Subject to Aging Management Review	None	302-0121
2.3.4.10	Respirator Cleaning	Table 2.3.4-1, Respirator Cleaning Component Types Subject to Aging Management Review	Section 12.5.2.1	302-0714
2.3.4.11	Service Water and Emergency Service Water Chlorination	Table 2.3.4-1, Service Water and Emergency Service Water Chlorination Component Types Subject to Aging Management Review	Sections 6.4.4.2, 9.2.1.2, 9.2.7.2	302-0215
2.3.4.12	Two Bed Demineralizer and Distribution, and Mixed Bed Demineralizer and Distribution	Table 2.3.4-1, Two Bed Demineralizer and Distribution (P21), and Mixed Bed Demineralizer and Distribution Component Types	Section 9.2.3	302-0711 302-0712 302-0713

LRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		Subject to Aging Management Review		

2.3.3 Conclusion

Based on its review of the LRA, UFSAR, 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 UFSAR, 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 2.4.4, 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 Structure (Reactor Building Complex), Unit 1"

- LRA Section 2.4.2, “Turbine Buildings and Associated Structures, Process Facilities, Yard Structures and Unit 2 Structures”
- LRA Section 2.4.3, “Water Control Structures”
- LRA Section 2.4.4, “Structural Bulk Commodities”

LRA Tables 2.4.1-1 through 2.4.4-1 list the structures and structural component types subject to an AMR and their intended functions. LRA Tables 3.5.2-1 through 3.5.2-4 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 UFSAR 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, UFSARs, 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 instrumentation and control (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 UFSAR, 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 LRBDs 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 the UFSAR 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.

2.5.2.1 Components Within the Scope of License Renewal

Regulations at 10 CFR 54.4(a) identify plant SSCs that perform specific functions within the scope of license renewal. The SRP-LR and RG 1.188, Rev. 2, provide the guidance on the scoping of electrical and I&C SSCs based on the license renewal intended functions identified in 10 CFR 54.4(a). SRP-LR, Section 2.5.2.1.1, "Components Within the Scope of SBO (10 CFR 50.63)," provides the guidance for identifying electrical components in the onsite and offsite power systems that meet the requirements under 10 CFR 54.4(a)(3) and relied upon to satisfy the requirements of 10 CFR 50.63 (SBO rule) for license renewal, as required by 10 CFR 54.4(a)(3).

The applicant performed an initial plant-level scoping of the plant's electrical and I&C in accordance with the scoping criteria identified in 10 CFR 54.4(a) using the scoping methodology described in the LRA, Section 2.1.1, "Scoping methodology." The applicant included in the scope of license renewal all plant electrical and I&C systems and all electrical and I&C components in mechanical systems based on a bounding scoping approach and certain offsite power systems and components based on NRC guidance for SBO in SRP-LR. The applicant noted that the intended functions for each electrical and I&C system were not evaluated during the scoping process. The results of the plant-level scoping for electrical and I&C systems are provided in the LRA Table 2.2-3, "Electrical and I&C Systems." The staff's evaluation for the plant-level scoping results for the electrical and I&C systems is provided in Section 2.2, "Plant-Level Scoping Results," of this SER.

In LRA, Supplement 1, Section 2.1.2.3, "Screening of Electrical and I&C Systems," the applicant stated that all electrical and I&C component commodity groups were identified from a review of electrical systems within the scope of 10 CFR 54, controlled electrical drawings, the SAP functional location database, and interface with the mechanical and structural screening process. These electrical and I&C systems are listed in Table 2.2-3 of the LRA. In LRA, Supplement 1, Section 2.1.1.3.5, "Station Blackout (10 CFR 50.63)," the applicant described the in-scope electrical components that are relied upon to recover from an SBO event in accordance with the guidance in the SRP-LR. The applicant stated that for SBO recovery, the license renewal scoping boundary is extended to the first interconnection device that would restore offsite power to the main switchyard buses and the step-up station transformer (startup transformers). The boundary with the offsite transmission system is defined at the 345 kV switchyard circuit breakers: breakers S-612, S-620, S-621, S-650, S-652, S-660 and S-661. The boundary for the SBO offsite recovery path is highlighted in LRA, Supplement 1, Figure 2.1-1, "Electrical One Line Diagram 13.8 kV and 4.16 kV." The SBO recovery path includes components in both Perry Units 1 and 2 from the 345 kV switchyard breakers and buses through the disconnect switches, startup transformers, the 13.8 kV buses, circuits in cable tray and underground duct banks and the interbus transformers for Perry Units 1 and 2, to the 4.16 kV safety buses and the emergency diesel generators for Unit 1. In LRA, Supplement 1, the applicant noted that the 125 V DC control circuits for the switchyard boundary breakers, and their protective structures are included in scope of license renewal and subject to AMR. In LRA, Supplement 4, the applicant noted that these circuits are identified in LRA Table 2.2-3 as System S42.

The NRC staff reviewed in-scope electrical systems in LRA section 2.1.1.3.5 and Figure 2.1-1, UFSAR Appendix H, "Station Blackout (SBO)," section 8.2, "Offsite Power System," and Figure 8.3-1, "Main One Line Diagram, 13.8 KV and 4.16 KV," to confirm that the applicant did not omit any equipment required to comply with 10 CFR 50.63 for license renewal in accordance with the guidance in SRP-LR. Based on its review, the staff finds that the electrical components provided for the restoration of offsite power following an SBO event conforms to the guidance in SRP-LR for meeting 10 CFR 50.63 and are, therefore, acceptable. In addition, because all electrical and I&C components within the in-scope systems in LRA Table 2.2-3 were included within the scope of license renewal, the NRC staff has reasonable assurance that the applicant has identified all electrical and I&C components within the scope of LR for the electrical and I&C systems.

2.5.2.2 <u>Components Subject to an Aging Management Review</u>

Section 54.21(a)(1) of 10 CFR specifies the requirement to identify structures and components subject to an AMR. SRP-LR and RG 1.188, Rev. 2, provide guidance on the screening of electrical and I&C components based on the screening criteria in 10 CFR 54.21(a)(1) and the commodity grouping of components. 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," includes typical electrical and I&C components and commodity groups that are within the scope of LR.

The Perry screening methodology for the in-scope electrical and I&C systems is described in LRA Supplement 1, Section 2.1.2.3 and LRA section 2.5. The applicant used a component commodity group approach, as described in the SRP-LR and NEI 95-10, Rev. 6, which is endorsed in RG 1.188, Rev. 2, 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 electrical and I&C systems listed in LRA Table 2.2-3 in commodity groups, and (2) 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/support a license renewal intended function and require an AMR.

In LRA Supplement 1, Section 2.1.2.3, the applicant noted that all electrical and I&C component commodity groups were identified from the electrical and I&C systems. The electrical and I&C systems are listed in LRA Table 2.2-3. Furthermore, in LRA Supplement 1, the applicant stated that this commodity-based approach, whereby component types with similar design and/or functional characteristics are grouped together, is consistent with the guidelines from NEI 95-10 and Table 2.1-5 of NUREG-1800 (i.e., SRP-LR). In LRA Section 2.5, the applicant noted that Perry documents were reviewed to determine the applicability of the industry standard commodity groups, as provided in Appendix B of NEI 95-10, and no additional commodity groups for evaluation were identified. Table 2.5-2, “All Electrical Commodity Groups in In-Scope Systems Screened for Aging Management,” of the applicant’s 10 CFR 54.21(b) annual amendment to the Perry LRA provides the list of all electrical and I&C commodity groups considered for screening. The applicant applied the screening criterion of 10 CFR 54.21(a)(1)(i) to the electrical and I&C commodity groups to identify those that are passive (i.e., they perform their LR intended functions without moving parts or without a change in configuration or properties) following the guidance in SRP-LR Table 2.1-5. LRA Table 2.5-1, “Electrical Commodity Intended Function Definitions,” defines the commodity intended functions that support the LR intended functions, as described in 10 CFR 54.4. Based on the screening criterion in 10 CFR 54.21(a)(1)(i), the applicant eliminated the following electrical and I&C commodity groups that do not perform an LR intended function:

- Uninsulated ground conductors. The applicant noted that uninsulated ground conductors are not safety-related, and their failure cannot cause the loss of a safety-related function; they are not required for any fire protection commitment, are not part of the SBO or anticipated transients without scram evaluations; they are not included in the EQ program; and they are not relied upon in safety analyses or plant evaluations to perform any function consistent with the requirements of 10 CFR 54.4(a)(3). The staff reviewed the Perry UFSAR and confirmed that uninsulated ground conductors are not credited for any DBEs and do not support a license renewal intended function, as identified in 10 CFR 54.4. Therefore, the staff finds it acceptable to eliminate uninsulated ground conductors from the scope of license renewal for Perry because they have no license renewal intended function, as described in 10 CFR 54.4.
- Metal enclosed bus (MEB). The applicant noted that the isolated phase bus at the main generator does not perform a license renewal intended function, and that Perry has no segregated phase or non-segregated phase MEB. According to UFSAR Chapter 8, “Electric Power,” an isolated phase bus feeds the 22 kV power generated from the unit’s main generator to the unit’s main transformer. The staff reviewed UFSAR Chapter 8 and finds that the 22 kV isolated phase buses do not perform a license renewal intended function in accordance with 10 CFR 10 CFR 54.4(a) because they are NSR components whose failure would 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 MEB commodity group from the scope of license renewal acceptable.
- Cable tie wraps. The applicant noted that cable tie wraps and Kellum grips (both of which are considered cable tie wraps for this review), are used in cable installation, are evaluated as structural bulk commodities, and are not included as electrical commodities. The applicant stated that cable tie wraps are used in cable installations (in panels and

raceway) to hold groups of cables together for restraint and ease of maintenance. The applicant also noted that cable tie wraps at Perry have no current license basis requirements are not required to remain functional during and following DBEs, and are not required to maintain cable ampacity, minimum bend radius, cables within vertical raceways, or for any seismic analysis. The staff reviewed the UFSAR and confirmed that cable tie wraps are not credited in the applicant's design basis and have no requirements associated with them. Therefore, the staff finds it acceptable to eliminate cable tie wraps from the scope of license renewal because they have no license renewal intended function.

- Unit 2 buildings. Most electrical and I&C components and commodities in the Unit 2 turbine building, the Unit 2 turbine power complex, and the Unit 2 auxiliary building from the scope of license renewal because they do not perform an intended function. The applicant noted that the Perry Unit 2 construction permit was withdrawn, and some shared components used to support Perry Unit 1 operations are in some Unit 2 buildings. The applicant provided the components and commodities that support Perry Unit 1 operations with a license renewal intended function in LRA Section 2.5.3.4, "Unit 2 Buildings." The staff reviewed LRA section 2.5, UFSAR Chapter 8, and LRA Supplement 1, Figure 2.1-1 and finds that the applicant has adequately included the Unit 2 electrical components and commodities that support Unit 1 license renewal intended functions (i.e., SBO); therefore, the remaining Unit 2 electrical components and commodities do not perform a license renewal intended function, and their elimination is acceptable.

As indicated in the SRP-LR and RG 1.188, Rev. 2, some active components or commodity groups, such as elements, sensors, and thermocouples, meet the passive component screening criterion of 10 CFR 54.21(a)(1)(i) if they have a pressure boundary function. In Supplement 2, Table 2.2.-3 of the LRA, the applicant provided Note 1 to Table 2.2-3 to indicate that thermocouples/electrodes in the suppression pool corrosion monitoring system and the temperature and vibration sensors in the post fuel load vibrational and thermal testing system have no pressure boundary functions. LRA section 2.3, "Scoping and Screening Results: Mechanical Systems," discussed mechanical systems that include flow elements, sensors, and thermocouples (nuclear closed cooling system) and have pressure and/or leakage boundary functions. The staff's evaluation for these mechanical systems is provided in Section 2.3 of this SER.

The applicant applied the screening criterion of 10 CFR 54.21(a)(1)(ii) to the remaining passive electrical and I&C component 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) to be subjected to an AMR. The applicant excluded from AMR all electrical and I&C components and commodities included in the EQ program because they have defined qualified lives, and the applicant indicated that they would be replaced prior to the expiration of their qualified lives. The staff finds it acceptable to eliminate components and commodities that are within the EQ program from the passive, long-lived commodity groups because it is consistent with the requirements of 10 CFR 54.21(a)(1)(ii).

LRA Table 2.5-2, "Electrical Commodities Subject to Aging Management," listed the following electrical commodities that required an AMR, and their associated component intended functions:

- cable connection (metallic parts) – electrical continuity
- insulation material for electrical cables and connections – insulate (electrical)

- switchyard bus and connections, transmission conductors, and transmission connectors – electrical continuity
- fuse holders (not part of active equipment): insulation material – insulate (electrical)
- fuse holders (not part of active equipment): metallic clamps – electrical continuity
- high-voltage insulators (e.g., porcelain switchyard insulators, transmission line insulators) – insulate (electrical)

The staff reviewed the electrical 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). Based on its review, the staff finds that the Perry 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 UFSAR, 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

Based on its review of information in Section 2 of the LRA, 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).

The staff also 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 Perry Nuclear Power Plant, Unit 1 (Perry).

The applicant described these AMRs and AMPs in its license renewal application (LRA) for Perry. 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 45 AMPs that the applicant will rely on to manage or monitor the aging of passive, long-lived SCs.

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

(1) reactor vessel, internals, and reactor coolant system (SE Section 3.1)

(2) engineered safety features (SE Section 3.2)

(3) auxiliary systems (SE Section 3.3)

(4) steam and power conversion systems (SE Section 3.4)

(5) containments, structures, and component supports (SE Section 3.5)

(6) electrical and instrumentation and controls (SE Section 3.6)

3.0 <u>Applicant's Use of the Generic Aging Lessons Learned for License Renewal Report</u>

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 (PEO) 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 Perry 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 Perry. 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 Perry’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 November 20, 2023, to April 19, 2024, in accordance with the audit plan dated September 25, 2023 (ML23261B019), and as detailed in the Audit Report dated August 26, 2024 (ML24239A778).

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

(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, 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, Note D 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 sites-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 an updated final safety analysis report (UFSAR) supplement for the facility that contains a summary description of the programs and activities for managing the effects of aging and the evaluation of time-limited aging analyses (TLAAs) for the period of extended operation determined by the integrated plant assessment and the evaluation of TLAAs, respectively. Consistent with the SRP-LR, the staff reviewed the UFSAR 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 license renewal, 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 license renewal (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 program or a 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 Perry Aging Management Programs

Perry 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
10 CFR 50, Appendix J	A.1.1 B.2.1	Existing	Consistent	XI.S4 10 CFR 50, Appendix J	3.0.3.1.1
Aboveground Metallic Tanks	A.1.2 B.2.2	New	Consistent	XI.M29 Aboveground Metallic Tanks	3.0.3.1.2
ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	A.1.3 B.2.3	Existing	Consistent	XI.M1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	3.0.3.1.3
ASME Section XI, Subsection IWE	A.1.4 B.2.4	Existing	Consistent	XI.SI ASME Section XI, Subsection IWE	3.0.3.1.4
ASME Section XI, Subsection IWF	A.1,5 B.2.5	Existing	Consistent with enhancements	XI.S3 ASME Section XI, Subsection IWF	3.0.3.2.1
ASME Section XI, Subsection IWL	A.1.6 B.2.6	Existing	Consistent	XI.S2 ASME Section XI, Subsection IWL	3.0.3.2.24
Bolting Integrity	A.1.7 B.2.7	Existing	Consistent with enhancements	XI.M18 Bolting Integrity	3.0.3.2.2

Perry 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
Buried and Underground Piping and Tanks	A.1.8 B.2.8	Existing	Consistent with exception and enhancements	XI.M41 Buried and Underground Piping and Tanks as revised by LR-ISG-2015-01, “Changes to Buried and Underground Piping and Tank Recommendations	3.0.3.2.23
BWR Control Rod Drive Return Line Nozzle	A.1.9 B.2.9	Existing	Consistent	XI.M6 BWR Control Rod Drive Return Line Nozzle	3.0.3.1.5
BWR Feedwater Nozzle	A.1.10 B.2.10	Existing	Consistent with exception	XI.M5 BWR Feedwater Nozzle	3.0.3.2.3
BWR Penetrations	A.1.11 B.2.11	Existing	Consistent with enhancement	XI.M8 BWR Penetrations	3.0.3.2.4
BWR Stress Corrosion Cracking	A.1.12 B.2.12	Existing	Consistent	XI.M7 BWR Stress Corrosion Cracking	3.0.3.1.6
BWR Vessel ID Attachment Welds	A.1.13 B.2.13	Existing	Consistent with exception and enhancement	XI.M4 BWR Vessel ID Attachment Welds	3.0.3.2.5
BWR Vessel Internals	A.1.14 B.2.14	Existing	Consistent with enhancements	XI.M9 BWR Vessel Internals	3.0.3.2.6
Closed Treated Water Systems	A.1.15 B.2.15	Existing	Consistent with enhancements	XI.M21A Closed Treated Water Systems as modified by LR-ISG-2012-02, “Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation”	3.0.3.2.7
Compressed Air Monitoring	A.1.16 B.2.16	Existing	Consistent with enhancements	XI.M24 Compressed Air Monitoring	3.0.3.2.8
Environmental Qualification (EQ) of Electrical Components	A.1.17 B.2.17	Existing	Consistent	X.E1 X.E1 Environmental Qualification (EQ) of Electrical Components	3.0.3.1.7
External Surfaces Monitoring of Mechanical Components	A.1.18 B.2.18	New	Consistent	XI.M36 External Surfaces Monitoring of Mechanical Components	3.0.3.1.8
Fatigue Monitoring	A.1.19 B.2.19	Existing	Consistent with enhancements	X.M1 Fatigue Monitoring	3.0.3.2.9
Fire Protection	A.1.20 B.2.20	Existing	Consistent	XI.M26 Fire Protection	3.0.3.1.9

Perry 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
Fire Water System	A.1.21 B.2.21	Existing	Consistent with enhancements	XI.M27 Fire Water System	3.0.3.2.10
Flow Accelerated Corrosion	A.1.22 B.2.22	Existing	Consistent with enhancements	XI.M17 Flow-Accelerated Corrosion	3.0.3.2.11
Fuel Oil Chemistry	A.1.23 B.2.23	Existing	Consistent with enhancements	XI.M30 Fuel Oil Chemistry	3.0.3.2.12
Fuse Holders	A.1.24 B.2.24	New	Consistent	XI.E5 Fuse Holders	3.0.3.1.10
Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	A.1.25 B.2.25	New	Consistent	XI.M38 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, as revised by LR-ISG-2012-02, “Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation”	3.0.3.1.11
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	A.1.26 B.2.26	Existing	Consistent	XI.M23 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	3.0.3.1.12
Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	A.1.27 B.2.27	New	Consistent with exceptions	XI.M42 Internal Coatings/Linings for in-Scope Piping, Piping Components, Heat Exchangers, and Tanks as added 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”	3.0.3.2.21
Lubricating Oil Analysis	A.1.28 B.2.28	Existing	Consistent	XI.M39 Lubricating Oil Analysis	3.0.3.1.13
Masonry Walls Monitoring	A.1.29 B.2.29	New	Consistent	XI.S5 Masonry Walls Monitoring	3.0.3.1.14

Perry 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
Monitoring of Neutron-Absorbing Materials Other than Boraflex	A.1.30 B.2.30	Existing	Consistent	XI.M40 Monitoring of Neutron-Absorbing Materials Other Than Boraflex	3.0.3.1.15
Non-EQ Electrical Cable Connections	A.1.31 B.2.31	New	Consistent	XI.E6 Non-EQ Electrical Cable Connections	3.0.3.1.16
Non-EQ Inaccessible Power Cables	A.1.32 B.2.32	Existing	Consistent with enhancements	XI.E3 Non-EQ Inaccessible Power Cables	3.0.3.2.13
Non-EQ Instrumentation Circuits	A.1.33 B.2.33	New	Consistent	XI.E2 Non-EQ Instrumentation Circuits	3.0.3.1.17
Non-EQ Insulated Cables and Connections	A.1.34 B.2.34	Existing	Consistent with enhancement	XI.E1 Non-EQ Insulated Cables and Connections	3.0.3.2.14
One-Time Inspection	A.1.35 B.2.35	New	Consistent	XI.M32 One-Time Inspection	3.0.3.1.18
One-Time Inspection of ASME Code Class 1 Small-Bore Piping	A.1.36 B.2.36	New	Consistent	XI.M35 One-Time Inspection of ASME Code Class 1 Small-Bore-Piping	3.0.3.1.19
Open Cycle Cooling Water System	A.1.37 B.2.37	Existing	Consistent with enhancements	XI.M20 Open Cycle Cooling Water System and additional guidance in LR-ISG-2012-02, “Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation”	3.0.3.2.22
Protective Coating Monitoring and Maintenance	A.1.38 B.2.38	Existing	Consistent with enhancement	XI.S8 Protective Coating Monitoring and Maintenance	3.0.3.2.15
Reactor Head Closure Stud Bolting	A.1.39 B.2.39	Existing	Consistent with exception and enhancements	XI.M3 Reactor Head Closure Stud Bolting	3.0.3.2.16
Reactor Vessel Surveillance	A.1.40 B.2.40	Existing	Consistent	XI.M31 Reactor Vessel Surveillance	3.0.3.1.20
RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	A.1.41 B.2.41	Existing	Consistent with enhancements	XI.S7 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	3.0.3.2.17

Perry 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
Selective Leaching	A.1.42 B.2.42	New	Consistent with exceptions	XI.M33 Selective Leaching as revised by LR-ISG-2011-03	3.0.3.2.18
Structures Monitoring	A.1.43 B.2.43	Existing	Consistent with enhancements	XI.S6 Structures Monitoring	3.0.3.2.19
Water Chemistry	A.2.44 B.2.44	Existing	Consistent with exception	XI.M2 Water Chemistry	3.0.3.2.20
Plant-Specific Periodic Inspections for Selective Leaching Program	A.1.45 B.2.45	New	Plant-specific	N/A	3.0.3.3.1

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:

- 10 CFR Part 50, Appendix J
- Aboveground Metallic Tanks
- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- ASME Section XI, Subsection IWE
- BWR Control Rod Drive Return Line Nozzle
- BWR Stress Corrosion Cracking
- EQ of Electrical Components
- External Surfaces Monitoring of Mechanical Components
- Fire Protection
- Fuse Holders
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling System
- Lubricating Oil Analysis
- Masonry Walls Monitoring
- Monitoring of Neutron-Absorbing Materials Other Than Boraflex
- Non-EQ Electrical Cable Connections
- Non-EQ Instrumentation Circuits
- One-Time Inspection

- One-Time Inspection of ASME Code Class 1 Small-Bore Piping
- Reactor Vessel Surveillance

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 UFSAR supplement summary of the program.

3.0.3.1.1 10 CFR Part 50, Appendix J

LRA Section B.2.1 describes the existing 10 CFR Part 50, Appendix J program as consistent with GALL-LR Report AMP XI.S4, "10 CFR Part 50, Appendix J."

Staff Evaluation. During its audit, 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 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.2.1 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, the staff conducted an independent search of the plant OE information to (1) to 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 10 CFR Part 50, Appendix J Program, was evaluated.

UFSAR Supplement. LRA Section A.1.1 provides the UFSAR supplement for the 10 CFR Part 50, Appendix J Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1 because the program is performed in accordance with NEI 94-01, Rev. 3-A and conditions and limitations specified in NEI 94-01 Rev. 2-A. The latest revisions of NEI 94-01 referenced in the Appendix J Program fulfill the earlier Rev. 0 of NEI 94-01 that is recommended in SRP-LR Table 3.0-1. The staff also noted that in LRA Table A-3, the applicant committed (LRA Commitment No. 1) 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 UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's 10 CFR Part 50, Appendix J 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.2 Aboveground Metallic Tanks

LRA Section B.2.2. describes the new Aboveground Metallic Tanks Program as consistent with GALL-LR Report AMP XI.M29, "Aboveground Metallic Tanks," as described in ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation," November 22, 2013 Appendix M and as modified by 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," November 6, 2014.

Staff Evaluation. During its audit (ML24239A778), 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 of the applicant's program to the corresponding program elements of GALL-LR Report AMP XI.M29.

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, 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.M29.

Operating Experience. LRA Section B.2.2 summarizes OE related to the Aboveground Metallic Tanks Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24239A778), the staff reviewed search results 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 Aboveground Metallic Tanks Program was evaluated.

UFSAR Supplement. LRA Appendix A, Section A.1.2 provides the UFSAR supplement for the Aboveground Metallic Tanks Program. The staff reviewed this UFSAR 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 the applicant committed to implement the new Aboveground Metallic Tanks Program for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Aboveground Metallic Tanks Program, the staff concludes that those program elements for which 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

LRA Section B.2.3 describes the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program as an existing program that is consistent with GALL-LR Report AMP XI.M1 “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD.”

Staff Evaluation. During its audit (ML24239A778), 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 of the applicant’s program to the corresponding program elements of GALL-LR Report AMP XI.M1.

The staff conducted an audit to verify the applicant’s claim of consistency with the GALL-LR Report. Based on its 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.M1. The staff finds that the applicant’s program is adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.3 summarizes OE related to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24239A778), the staff conducted a search of the plant’s OE information (1) to identify any age-related degradation, as documented in the applicant’s corrective action program database, and (2) 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 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program was evaluated.

UFSAR Supplement. LRA Section A.1.3 provides the UFSAR supplement for the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Report Table 3.0-01. The staff also noted that the applicant committed to the ongoing implementation of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program for managing the effects of aging for all applicable components during the period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.4 ASME Section XI, Subsection IWE

LRA Section B.2.3.6 describes the existing ASME Section XI, Subsection IWE Aging Management Program as consistent with GALL-LR Report AMP XI.S1, "ASME Section XI, Subsection IWE."

Staff Evaluation. During its audit (ML24239A778), 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 conducted an audit to verify the applicant's claim of consistency 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 are consistent with the corresponding program elements of GALL-LR Report AMP XI.S1.

Operating Experience. LRA Section B.2.4 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 (ML24239A778), the staff conducted a search of the plant OE information to (1) to 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 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.

UFSAR Supplement. LRA Section A.1.4 and Table A-3 item 4 provide the UFSAR supplement for the ASME Section XI, Subsection IWE program. The staff reviewed this UFSAR 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 finds that the information in the UFSAR supplement is an adequate summary description of the program.

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

3.0.3.1.5 BWR Control Rod Drive Return Line Nozzle

LRA Section B 2.9 describes the existing BWR Control Rod Drive Return Line Nozzle Aging Management Program as consistent with GALL-LR Report AMP XI.M6, “BWR Control Rod Drive Return Line Nozzle.”

Staff Evaluation. During its audit (ML24239A778), 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 element(s) of the LRA of the applicant’s program to the corresponding program elements of GALL-LR Report AMP XI.M6.

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.M6. The staff finds the applicant’s AMP acceptable because it manages cracking of control rod drive return line nozzles in accordance with the provisions of the GALL-LR Report AMP XI.M6.

Operating Experience. LRA Section B.2.9 summarizes OE related to the BWR Control Rod Drive Return Line Nozzle Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24239A778), the staff conducted an independent search of the plant OE information to (1) to 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 BWR Control Rod Drive Return Line Nozzle Program was evaluated.

UFSAR Supplement. LRA Section A.1.9 provides the UFSAR supplement for the BWR Control Rod Drive Return Line Nozzle Program. The staff reviewed this UFSAR 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 BWR Control Rod Drive Return Line Nozzle Program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s BWR Control Rod Drive Return Line Nozzle 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.6 BWR Stress Corrosion Cracking

LRA Section B.2.12 describes the existing BWR Stress Corrosion Cracking Program as consistent with GALL-LR Report AMP XI.M7, “BWR Stress Corrosion Cracking.”

Staff Evaluation. During its audit (ML24239A778), 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 of the applicant’s program to the corresponding program elements of GALL-LR Report AMP XI.M7.

Based on its 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.M7.

Operating Experience. LRA Section B.2.12 summarizes OE related to the BWR Stress Corrosion Cracking Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24239A778), the staff conducted an independent search of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program; and (2) provide a basis for the staff’s conclusion 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 BWR Stress Corrosion Cracking Program was evaluated.

UFSAR Supplement. LRA Section A.1.12 provides the UFSAR supplement for the BWR Stress Corrosion Cracking Program. The staff reviewed this UFSAR 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 the ongoing implementation of the existing BWR Stress Corrosion Cracking Program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s BWR Stress Corrosion Cracking 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.7 Environmental Qualification (EQ) of Electrical Components

LRA Section B.2.17 describes the existing Environmental Qualification (EQ) of Electrical Components Program as consistent with GALL-LR Report AMP X.E1, “Environmental Qualification of Electric Components.”

Staff Evaluation. During its audit, 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 of the applicant’s program to the corresponding elements of the GALL-LR Report AMP X.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 the GALL-LR Report AMP X.E1.

Operating Experience. LRA Section B.2.17 summarizes OE related to the Environmental Qualification (EQ) of Electrical Components Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results 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 Environmental Qualification (EQ) of Electrical Components Program was evaluated.

UFSAR Supplement. LRA Section A.1.17 provides the UFSAR supplement for the Environmental Qualification (EQ) of Electrical Components Program. The staff reviewed this UFSAR 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 Environmental Qualification (EQ) of Electrical 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 UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s Environmental Qualification (EQ) of Electrical 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.8 External Surfaces Monitoring of Mechanical Components

LRA Section B.2.18 describes the new External Surfaces Monitoring of Mechanical Components Program as consistent with GALL-LR Report AMP XI.M36, “External Surfaces Monitoring of Mechanical Components.” The applicant modified this section by letters dated June 27, 2024 (LRA Supplement 2, ML24180A010), December 19, 2024 (LRA Supplement 7, ML24354A265), January 27, 2025 (LRA Supplement 8, ML25027A327) and April 22, 2025 (LRA Supplement 9, ML25112A167).

Staff Evaluation. During its audit, 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.

Based on a review of the LRA and as verified during its audit of the program, 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.M36.

Operating Experience. LRA Section B.2.18 summarizes operating experience related to the External Surfaces Monitoring of Mechanical Component Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant operating experience information to: (1) identify examples in the applicant's corrective action program database where management of aging effects associated with the program had not been previously considered in the GALL-LR Report 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 recent and historical operating experience reports concerning leaks in flexible stainless-steel air supply hoses for several main steam safety relief valves. A failure analysis of the two hoses leaking in 2023 determined that the leakage stemmed from outside-diameter chloride induced stress corrosion cracking. However, the applicant had initially concluded this mechanism was not an aging management issue. The staff determined the need for additional information and the applicant responded to the staff's request for additional information (RAI-10276-R1) by letter dated October 2, 2024 (ML24276A083). The RAI response acknowledged an invalid prior investigation into the source of chloride contamination and an incorrect aging management evaluation (in CR-2024-01530) that had concluded the "stress based cracking, potentially from chloride," was not an aging management issue. The applicant subsequently issued condition reports (CR-2024-07520 and CR-2024-07527) to address these issues and stated that an LRA supplement would be issued after completing further investigations into the source of the chlorides that contributed to the stress corrosion cracking. The staff noted that the revised aging management evaluation (in CR-2024-01530) subsequently concluded that "chloride induced stress corrosion cracking…would be a new aging mechanism not seen for this material and environment."

The applicant issued LRA Supplement 8, by letter dated January 27, 2025, and modified LRA Section B.2.1.18 by noting that the external surfaces of the stainless-steel flexible hoses are periodically exposed to a localized source of chloride contaminants from an approved leak detection solution. The supplement notes that the leak detection solution meets the allowable limits for contaminants, including chlorides. However, repeated application of this solution results in a higher-than-expected concentration of contaminants through evaporation on the flexible hose bellows beneath the integral braided wire sheathing. The supplement also notes that vendor guidance for removing the leak detection solution with demineralized water had not been implemented at the site.

LRA Supplement 8 also modifies LRA Section B.2.18 by adding that the stainless-steel air supply flexible hoses on the main steam safety relief valves will be managed through periodic replacements. The revised operating experience discussion for LRA Section B.2.18 recounts the background issues for these components and states that the initial flex hose replacement frequency will be every three operating cycles (stated as a 6-year interval elsewhere in the supplement). The staff noted that although periodically replaced components are not within the scope of the license renewal, the supplement states that Perry is conservatively retaining these flexible hoses in LRA Table 3.1.2-2 until they have all been replaced. The staff also noted that the supplement changes the aging management review items in that table for these components to now include cracking as an aging effect requiring management and the External Surfaces Monitoring of Mechanical Components Program as the associated aging management program. See SE Section 3.1.2.3.1 for the staff's evaluation of the modified, associated aging management review item.

Following discussions with the staff, the applicant subsequently issued LRA Supplement 9 based on a further extent of condition review performed for other plant systems with comparable stainless-steel flexible hoses that are periodically leak tested and potentially susceptible to a similar chloride exposure scenario. Although these other flexible hoses will also be periodically replaced, the associated AMR items have been changed to cite cracking as an aging effect requiring management using the External Surfaces Monitoring of Mechanical Components Program. See SE Section 3.1.2.3.1 (same as above) for the staff's evaluation of the modified, associated aging management review items.

Based on its audit and review of the application, except as addressed above regarding chloride induced stress corrosion cracking of stainless-steel flexible hoses, the staff finds that the conditions and operating experience at the plant are bounded by those for which the External Surfaces Monitoring of Mechanical Components Program was evaluated.

UFSAR Supplement. LRA Section A.1.18, as modified by letters dated June 27, 2024, December 19, 2024, January 27, 2025, and April 22, 2025, provides the UFSAR supplement for the External Surfaces Monitoring of Mechanical Components Program. The staff reviewed this description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The UFSAR supplement also discusses the periodic replacement of the stainless-steel air supply flexible hoses for various systems to address cracking associated with potential chloride exposure from accumulated leak detection solution residue. The staff also noted that the applicant committed to implementing the new External Surfaces Monitoring of Mechanical Components Program by May 8, 2026, and to periodically replacing stainless-steel air supply flexible hoses that are potentially subjected to chloride exposure from an accumulation of leak detection solution residue. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's External Surfaces Monitoring of Mechanical Components 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.9 Fire Protection

LRA Section B.2.20 states that the Fire Protection Program is an existing program that is consistent with the program elements in the GALL-LR Report AMP XI.M26, "Fire Protection." The applicant amended the LRA section by letters dated June 27, 2024 (LRA Supplement 2, ML24180A010), November 19, 2024 (RAI Set 3 response, ML24324A185), and December 19, 2024 (LRA Supplement 7, ML24354A265).

Staff Evaluation. During its audit (ML24239A778), 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" and "parameters monitored or inspected" program elements, the staff needed additional information regarding the programs that will manage the effects of aging of the drywell mechanical penetrations; aging effects for Pyrocrete, fiberglass/alumina

silicate/calcium silicate/mineral fiber, unimpregnated fiberglass fabric; fiberglass fabric impregnated with elastomer, and gypsum board drywall; and the programs that will manage loss of sealing of elastomer fire stops. The staff's requests and the applicant's responses are documented in RAI-10337-R1, Questions 1–6, RCI-10338-R1, and RCI-10460-R1 (ML24324A185, ML24305A134, and ML25030A014, respectively).

In its response to RAI-10337-R1, Question 1 (ML24324A185), the applicant revised LRA Table 3.5.2-1 to cite ASME Section XI, Subsection IWE, Structures Monitoring, and Fire Protection programs for managing cracking of the stainless-steel drywell mechanical penetrations (AMR item 3.5.1-10) and loss of material of the steel drywell electrical penetrations (AMR items 3.5.1-35 and 3.3.1-59). The staff finds the response acceptable because the periodic inspections required by the ASME Section XI, Subsection IWE, Structures Monitoring, and Fire Protection programs are capable of detecting cracking and loss of material prior to a loss of intended function. For additional information, see SER Section 3.5.2.2.1.6.

In addition, the applicant revised the AMPs credited for managing the effects of aging for drywell equipment hatch (AMR item 3.5.1-35), drywell equipment hatch seals (AMR item 3.5.1-33), drywell head (AMR item 3.5.1-35), drywell liner plate (AMR item 3.5.1-35), and drywell personnel airlock (AMR item 3.5.1-35) in LRA Table 3.5.2-1; and revised the discussion of AMR items 3.5.1-33 and 3.5.1-35 in LRA Table 3.5.1 to reflect the credited programs. These components do not have a fire barrier intended function. For additional information, see SER Section 3.5.2.1.6 for AMR item 3.5.1-33 as it relates to drywell equipment hatch seals and for AMR item 3.5.1-35 as it relates to drywell equipment hatch, drywell head, drywell liner plate, and drywell personnel airlock.

In its response to RAI-10337-R1, Question 2 (ML24324A185), the applicant revised LRA Table 3.5.2-4 to cite delamination as an applicable aging effect for Pyrocrete "fire proofing" and "fireproofing, fire damper housing;" revised LRA Table 3.5.2-4 to cite change in material properties as an applicable aging effect for Pyrocrete "fireproofing, fire damper housing;" and added plant-specific note 540 identifying the environmental zones where Pyrocrete "fireproofing, fire damper housing" is located where the gamma irradiation dose will exceed 10^6 rads. For the staff's evaluation of this response, see subsections "Fire barriers exposed to indoor uncontrolled air" and "Pyrocrete Fire Proofing" in SER Section 3.5.2.3.1.

In its response to RAI-10337-R1, Question 3 (ML24324A185), the applicant revised LRA Table 3.5.2-1 to cite separation and change in material properties as applicable aging effects for fiberglass/alumina silicate/calcium silicate/mineral fiber “drywell mechanical penetration (fiberglass);” revised LRA Sections A.1.20 and B.2.20 to state separation and change in material properties is managed by the Fire Protection Program for fiberglass/alumina silicate/calcium silicate/mineral fiber; and revised LRA Table 3.5.2-4 to cite change in material properties as an applicable aging effect for fiberglass/alumina silicate/calcium silicate/mineral fiber “fire wrap” and “penetration sealant (fire).” For the staff’s evaluation of this response, see subsections “Fire barriers exposed to indoor uncontrolled air” and “Fiberglass/Alumina Silicate/Calcium Silicate/Mineral Fiber Fire Wrap” in SER Section 3.5.2.3.1.

In addition, in its response to RAI-10337-R1, Question 3 (ML24324A185), the applicant revised LRA Table 3.5.2-4 to manage change in material properties for fiberglass/alumina silicate/calcium silicate/mineral fiber “insulation” by the External Surfaces Monitoring of Mechanical Components Program; revised the discussion of AMR item 3.4.1-64 in LRA Table 3.4.1 to include change in material properties (i.e., reduced thermal insulation resistance and moisture intrusion) for fiberglass/alumina silicate/calcium silicate/mineral fiber “insulation;” revised LRA Sections A.1.18 and B.2.18 to include change in material properties of fiberglass/alumina silicate/calcium silicate/mineral fiber “insulation;” and revised LRA Table 3.5.2-4 to cite change in material properties for fiberglass/alumina silicate/calcium silicate/mineral fiber “penetration sealant (flood, radiation).” The fiberglass/alumina silicate/calcium silicate/mineral fiber “insulation” and “penetration sealant (flood, radiation)” do not have a fire barrier intended function. The staff finds the applicant’s response acceptable because managing reduced thermal insulation resistance due to moisture intrusion by the External Surfaces Monitoring of Mechanical Components Program for jacketed calcium silicate or fiberglass insulation exposed to indoor uncontrolled air and outdoor air is consistent with GALL-LR, as modified by LR-ISG-2012-02.

In its response to RAI-10337-R1, Question 4 (ML24324A185), the applicant revised LRA Tables 3.5.2-1 and 3.5.2-4 to cite separation and cracking/delamination as applicable aging effects for unimpregnated fiberglass fabric; fiberglass fabric impregnated with elastomer “drywell mechanical penetration (fiberglass fabric),” “penetration sealant (fire),” and “SRV [safety relief valve] tailpipe penetration boot seals.” For the staff’s evaluation of this response, see subsection “Fire barriers exposed to indoor uncontrolled air” in SER Section 3.5.2.3.2.

In its response to RAI-10337-R1, Question 5 (ML24324A185), the applicant provided a plant-specific evaluation of the aging effects for fire stops identified in Section 6 of EPRI 3002013084, “Long-Term Operations: Subsequent License Renewal Aging Affects for Structures and Structural Components (Structural Tools),” issued November 2018, and concluded no aging effects require managing for gypsum board drywall. For the staff’s evaluation of this response, see subsection “Gypsum Board Drywall” in SER Section 3.5.2.3.1. Also see the discussion of RCI-10460-R1 below.

In its response to RAI-10337-R1, Question 6 (ML24324A185), the applicant revised LRA Table 3.5.2-4 to delete the row managing loss of sealing for elastomer penetration sealant (fire) by the Structures Monitoring program and revised plant-specific note 522 to cite only the Fire Protection Program for managing loss of sealing. The staff finds the applicant’s response acceptable because it is consistent with the Fire Protection Program managing loss of sealing for elastomer fire stops and seismic isolation joints. For additional information, see subsection “Fire Stops, Penetration Sealant (Fire), and Seismic Isolation Joint” in SER Section 3.5.2.1.6.

In its response to RCI-10338-R1 (ML24305A134), the applicant confirmed that the Fire Protection Program's inspections, inspection frequency, acceptance criteria, and corrective actions are sufficient to manage the effects of aging for fire barriers with intended functions in addition to the fire barrier intended function (i.e., support for regulated events – Criterion (a)3) equipment (SRE), structural pressure boundary (SPB), support for safety related – Criterion (a)(1) equipment (SSR), and enclosure (shelter or protection) (EN)). In addition, the applicant updated the intended functions for drywell mechanical penetration (fiberglass), Shield building electrical penetration seals and sealant, penetration sealant (fire), seismic isolation joint, and SRV tailpipe penetration boot seals in LRA Tables 2.4.1-1, 2.4.4-1, 3.5.2-1, and 3.5.2-4. The staff finds the applicant's response acceptable because the periodic visual inspections performed by the Fire Protection Program are capable of detecting the effects of aging prior to loss of intended functions, and the LRA was revised to cite the applicable intended functions. For additional information, see subsections "Shield Building Electrical Penetration Seals and Sealant" and "Fire Stops, Penetration Sealant (Fire), and Seismic Isolation Joint" in SER Section 3.5.2.1.6 and subsection "Fire barriers exposed to indoor uncontrolled air" in SER Section 3.5.2.3.2.

In its response to RCI-10460-R1 (ML25030A014), the applicant confirmed that there has been no plant-specific operating experience related to gypsum board drywall due to age-related degradation. The staff finds the applicant's response acceptable because it supports the applicant's plant-specific evaluation of aging effects for gypsum board drywall. For additional information related to the staff's review of the applicant's evaluation related to aging effects for gypsum board drywall, see the discussion of Question 5 in RAI-10337-R1 above and subsection "Gypsum Board Drywall" in SER Section 3.5.2.3.1.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-LR Report AMP XI.M26. Based on a review of the LRA, amendments, and the applicant's responses to RAI-10337-R1, Questions 1–6, RCI-10338-R1, and RCI-10460-R1, 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 AMP XI.M26 are consistent with the corresponding program elements of the GALL-LR Report AMP XI.M26.

Operating Experience. LRA Section B.2.20 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 (ML24239A778), the staff reviewed search results of the plant operating experience information to: (1) to 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 PEO. 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.

UFSAR Supplement. As supplemented by letters dated June 27, 2024 (LRA Supplement 2, ML24180A010), November 19, 2024 (RAI Set 3 response, ML24324A185), and December 19, 2024 (LRA Supplement 7, ML24354A265), LRA Section A.1.20 provides the UFSAR supplement for the Fire Protection Program. The staff reviewed this UFSAR 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 ongoing implementation of the Fire Protection Program. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Fire Protection Program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-LR Report AMP XI.M26 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 PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.10 Fuse Holders

LRA Section B.2.24 describes the new Fuse Holders Program as consistent with GALL-LR Report AMP XI.E5 "Fuse Holders." The applicant supplemented this LRA section by letters dated August 7, 2024 (Supplement 1 (ML24220A270)), and August 8, 2024 (Supplement 4 (ML24221A093)).

Staff Evaluation. During its audit, 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 of the applicant's program to the corresponding program elements of GALL-LR Report AMP XI.E5. Based on a review of the LRA, Supplement 1, and Supplement 4, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria" and "corrective actions" program elements are consistent with the corresponding program elements of GALL-LR Report AMP XI.E5.

Operating Experience. LRA Section B.2.24, as amended in Supplement 1 and Supplement 4, summarizes OE related to the Fuse Holders Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results 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 Fuse Holders Program was evaluated.

UFSAR Supplement. LRA Section A.1.24 provides the UFSAR supplement for the Fuse Holders Program. The staff reviewed this UFSAR 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 the applicant committed to implement the new Fuse Holders Program by May 08, 2026, for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Fuse Holders 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.11 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

LRA Section B.2.25 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 revised by LR-ISG-2012-02, “Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation.”

Staff Evaluation. During its audit (ML24239A778), 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 of the applicant’s program to the corresponding program elements of GALL-LR Report AMP XI.M38, as revised by LR-ISG-2012-02.

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, 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, as revised by LR-ISG-2012-02.

Operating Experience. LRA Section B.2.25 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 (ML24239A778), the staff reviewed plant OE information provided by the applicant to (1) to 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 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program was evaluated.

UFSAR Supplement. LRA Section A.1.25 provides the UFSAR supplement for the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted the applicant committed to implement the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program no later than 6 months prior to the period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s 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 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.12 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling System

LRA Section B.2.26 describes the existing Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program as consistent with GALL-LR Report AMP XI.M23, “Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems.”

Staff Evaluation. During its audit (ML24239A778), 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 of the applicant’s program to the corresponding program elements of GALL-LR Report AMP XI.M23.

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.2.26 summarizes OE related to the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24239A778), the staff conducted an independent 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 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program was evaluated.

UFSAR Supplement. LRA Appendix A, Section A.1.26, provides the UFSAR supplement for the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program. The staff reviewed this UFSAR 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 Program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.13 Lubricating Oil Analysis

LRA Section B.2.28 describes the existing Lubricating Oil Analysis program as consistent with GALL-LR Report AMP XI.M39, “Lubricating Oil Analysis.”

Staff Evaluation. During its audit (ML24239A778), the staff reviewed 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 of the applicant’s program to the corresponding program elements of GALL-LR Report AMP XI.M39.

The staff conducted an audit to verify applicant’s claim of consistency with 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 are consistent with the corresponding program elements of AMP XI.M39 GALL-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M39.

Operating Experience. LRA Section B.2.28 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 (ML24239A778), the staff reviewed search results of the plant OE information to (1) to 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 Lubricating Oil Analysis program was evaluated.

UFSAR Supplement. LRA Appendix A Section A.1.28 provides the UFSAR supplement for the Lubricating Oil Analysis program. The staff reviewed this UFSAR 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 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 UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s Lubricating Oil Analysis 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.14 Masonry Walls Monitoring

LRA Section B.2.29 describes the new Masonry Walls Program as consistent with GALL-LR Report AMP XI.S5, “Masonry Walls.” The applicant amended this LRA section in Supplement 3 dated July 24, 2024.

Staff Evaluation. During its audit, 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 element(s) of the LRA of the applicant’s program to the corresponding program elements of GALL-LR Report AMP XI.S5.

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.S5.

Operating Experience. LRA Section B.2.29 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, the staff conducted an independent 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 Masonry Walls Program was evaluated.

UFSAR Supplement. LRA Section A.1.29 provides the UFSAR supplement for the Masonry Walls Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1; however, the licensee stated that there are no safety related masonry walls that are in close proximity to, or having attachments from, safety related systems or components at Perry. The licensee further stated that the masonry walls that are within the scope of license renewal at Perry are limited to isolated nonsafety-related, non-seismic Category I structures, and the monitoring of those masonry walls will be performed under the Structures Monitoring program. The staff also noted the applicant committed to implement the new Masonry Walls Program by May 8, 2026, for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement, as amended by letter dated July 24, 2024, 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 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.15 Monitoring of Neutron-Absorbing Materials Other Than Boraflex

LRA Section B.2.30 describes the existing Monitoring of Neutron-Absorbing Materials Other than Boraflex as consistent with GALL-LR Report AMP XI.M40, “Monitoring of Neutron-Absorbing Materials Other Than Boraflex.” However, since testing has not been conducted previously the staff considers this program a new program and evaluated it as such. The applicant amended this LRA section by letter dated June 27, 2024 (ML24180A010).

Staff Evaluation. During its audit (ML24239A778), 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 of the applicant’s program to the corresponding program elements of GALL-LR Report AMP XI.M40. 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, 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.M40.

Operating Experience. LRA Section B.2.30 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, the staff reviewed search results 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 Monitoring of Neutron-Absorbing Materials Other Than Boraflex program was evaluated.

UFSAR Supplement. As amended by letter dated June 27, 2024 (ML24180A010), LRA Section A.1.30 provides the UFSAR supplement for the Monitoring of Neutron-Absorbing Materials Other Than Boraflex program. The staff reviewed this UFSAR 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 continuing the existing Monitoring of Neutron-Absorbing Materials Other Than Boraflex beginning in-situ testing of the Boral panels in the spent fuel pool 12 months prior to the period of extended operation by November 8, 2025. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s 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 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.16 Non-EQ Electrical Cable Connections

LRA Section B.2.31 describes the new Non-EQ Electrical Cable Connections 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, 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 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 GALL-LR Report AMP XI.E6.

Operating Experience. LRA Section B.2.31 summarizes OE related to the Non-EQ Electrical Cable Connections Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results 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 Non-EQ Electrical Cable Connections Program was evaluated.

UFSAR Supplement. LRA Section A.1.31 provides the UFSAR supplement for the Non-EQ Electrical Cable Connections Program. The staff reviewed this UFSAR 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 implement the new Non-EQ Electrical Cable Connections Program (which is a one-time program) by May 8, 2026, for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s Non-EQ Electrical Cable Connections 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.17 Non-EQ Instrumentation Circuits

LRA Section B.2.33 describes the new Non-EQ 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, 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 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.2.33 summarizes OE related to the Non-EQ Instrumentation Circuits Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results 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 Non-EQ Instrumentation Circuits Program was evaluated.

UFSAR Supplement. LRA Section A.1.33 provides the UFSAR supplement for the Non-EQ Instrumentation Circuits Program. The staff reviewed this UFSAR 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 implement the new Non-EQ Instrumentation Circuits Program by May 8, 2026, for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Non-EQ 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.18 One-Time Inspection

LRA Section B.2.35 describes the new One-Time Inspection Program as consistent with GALL-LR Report AMP XI.M32, “One-Time Inspection.”

Staff Evaluation. During its audit (ML24239A778), 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 of the applicant’s program to the corresponding program elements of GALL-LR Report AMP XI.M32.

The staff conducted an audit to verify the applicant’s claim of consistency with 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 are consistent with the corresponding program elements of GALL-LR Report AMP XI.M32.

Operating Experience. LRA Section B.2.35 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 (ML24239A778), the staff reviewed search results of the plant OE information to (1) to 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 One-Time Inspection Program was evaluated.

UFSAR Supplement. LRA Section A.1.35 provides the UFSAR supplement for the One-Time Inspection Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted the applicant committed to implement the new One-Time Inspection Program by May 08, 2026, for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s 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 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

LRA Section B.2.36 states that the One-Time Inspection of ASME Code Class 1 Small-Bore Piping is a new program that is consistent with the program elements in the GALL-LR Report AMP XI.M35, “One-Time Inspection of ASME Code Class 1 Small-Bore Piping.”

Staff Evaluation. During its audit (ML24239A778), 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 of the applicant's program to the corresponding program elements of GALL-LR Report AMP XI.M35. During the audit, the applicant confirmed that the One-Time Inspection of ASME Code Class 1 Small-Bore Piping is currently ongoing, and it will be fully completed no later than 6 months prior to the period of extended operation, which the staff finds it consistent with the recommended completion time specified in the "Detection of Aging Effects" program element.

Based on its audit, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M35. The staff finds that the AMP is adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.36 summarizes OE related to the One-Time Inspection of 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 (ML24239A778), the staff conducted an independent 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 One-Time Inspection of ASME Code Class 1 Small-Bore Piping program was evaluated.

UFSAR Supplement. LRA Section A.1.36 provides the UFSAR supplement for the One-Time Inspection of ASME Code Class 1 Small-Bore Piping program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Report Table 3.0-1. The staff also noted that the applicant committed to implement the new One-Time Inspection of ASME Code Class 1 Small-Bore Piping program within the 6-year period prior to the period of extended operation and no later than 6 months prior to the period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's One-Time Inspection of 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.20 Reactor Vessel Surveillance

LRA Section B.2.40 describes the existing Reactor Vessel Surveillance Program as consistent with GALL-LR Report AMP XI.M31, "Reactor Vessel Material Surveillance."

Staff Evaluation. During its audit (ML24239A778), 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 element(s) of the LRA of the applicant's program to the corresponding program elements of GALL-LR Report AMP XI.M31.

In particular, the "detection of aging effects" program element states "[a]lternatively, an integrated surveillance program for the period of extended operation may be considered for a set of reactors that have similar design and operating features in accordance with 10 CFR Part 50, Appendix H, Paragraph III.C." The staff noted that the applicant is a participant in the BWRVIP Integrated Surveillance Program (ISP) described in BWRVIP-86, Revision 1-A, which has been reviewed and approved by the NRC staff. The staff concluded in its SE (ML13176A097) that the ISP and ISP(E) will continue to adequately address the requirements of Appendix H to 10 CFR Part 50 for boiling-water reactor (BWR) licensees through the end of facility's proposed 60-year operating licenses. Thus, the staff finds the applicant's participation in BWRVIP ISP described in BWRVIP-86, Revision 1-A is consistent with the GALL-LR AMP XI.M31 and ensure compliance with the requirements of 10 CFR 50, Appendix H during the period of extended operation

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, 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.M31.

Operating Experience. LRA Section B.2.40 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 (ML24239A778), the staff reviewed search results of the plant OE information to (1) to 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 Reactor Vessel Surveillance Program was evaluated.

UFSAR Supplement. LRA Section A.1.40 provides the UFSAR supplement for the Reactor Vessel Surveillance Program. The staff reviewed this UFSAR 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 UFSAR supplement is an adequate summary description of the program. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Reactor 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 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2 AMPs Consistent with the GALL-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:

- ASME Section XI, Subsection IWF
- Bolting Integrity
- BWR Feedwater Nozzle
- BWR Penetrations
- BWR Vessel ID Attachment Welds
- BWR Vessel Internals
- Closed Treatment Water Systems
- Compressed Air Monitoring
- Fatigue Monitoring
- Fire Water System
- Flow-Accelerated Corrosion
- Fuel Oil Chemistry
- Non-EQ Inaccessible Power Cables
- Non-EQ Insulated Cables and Connections
- Protective Coating Monitoring and Maintenance
- Reactor Head Closure Stud Bolting
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants
- Selective Leaching
- Structures Monitoring
- Water Chemistry
- Internal Coatings/Linings for in-Scope Piping, Piping Components, Heat Exchangers, and Tanks
- Open-Cycle Cooling Water System
- Buried and Underground Piping and Tanks
- ASME Section XI, Subsection IWL

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 ASME Section XI, Subsection IWF

LRA Section B.2.5 states that the ASME Section XI, Subsection IWF AMP is an existing program that, with enhancements, will be consistent with the program elements in the GALL-LR Report AMP XI.S3, "ASME Section XI, Subsection IWF." The applicant amended this LRA section by letter(s) dated July 24, 2024 (ML24206A150).

Staff Evaluation. During its audit (ML24239A778), 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.S3.

The staff also reviewed the portions of the "preventive actions," "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 evaluation of enhancements to these three program elements are as follows:

Enhancement 1. LRA Section B.2.5 includes an enhancement to the "preventive actions," program element which relates consistency of bolting to NUREG-1339 and EPRI Reports NP-5769, NP-5067, and TR-104213 for material selection, installation, and the use of lubricants and sealants for high strength bolts in sizes greater than 1-inch nominal diameter and yield strength equal to or in excess of 150 ksi. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S3 and finds it acceptable because when it is implemented, the LRA AMP B.2.5 "preventive actions" program element will be consistent with that of the GALL-LR AMP XI.S3, and therefore, it is acceptable.

Enhancement 2. LRA Section B.2.5 includes an enhancement to the "preventive actions," program element which relates high strength bolting storage, lubricants, and SCC potential consistent with the requirements of Section 2 of RCSC "Specification for Structural Joints Using ASTM A325 or A490 Bolts." In addition, the enhancement states that lubricants that contain molybdenum disulfide shall not be applied to structural high strength bolts within the scope of license renewal. The staff reviewed this enhancement, as modified by Supplement 3 (ML24206A150), against the corresponding program element in GALL-LR Report AMP XI.S3 and finds it acceptable because when it is implemented, the LRA AMP B.2.5 "preventive actions" program element will be consistent with that of the GALL-LR AMP XI.S3, and therefore, it is acceptable.

Enhancement 3. LRA Section B.2.5 includes a combined enhancement between the "parameters monitored or inspected," and "detection of aging effects" program elements to specify that in addition to VT-3 examinations, a representative sample equal to 20 percent of the entire IWF population (not to exceed 25 bolts for a given ASTM specification) of the discussed above high strength bolting shall receive a volumetric examination in accordance with the requirements of ASME Code Section V, Article 5, Appendix IV for SCC, while considering ALARA principles. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.S3 and finds it acceptable because when it is implemented the program will be consistent with the GALL-LR AMP XI.S3 "parameters monitored or inspected," and "detection of aging effects" program elements, and therefore, it is acceptable.

Enhancement 4A. LRA Section B.2.5 includes an enhancement to the "preventive actions," program element that relates to revision of plant procedures for loss of material due to corrosion or wear that reduces the load bearing capacity of the component support. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S3 and finds that these conditions are addressed in "parameters monitored" and "detection of aging effects" program elements of XI.S3. However, the applicant selected to enhance the LRA AMP B.2.5 "preventive actions" program element for these conditions instead. Upon its implementation the staff finds that the AMP will be consistent in essence with GALL-LR AMP XI.S3, and therefore, the enhancement is acceptable.

Enhancement 4B. LRA Section B.2.5 includes an enhancement to the "preventive actions," program element that relates to revision of plant procedures for cracking or shearing of bolts, including high strength bolts, and anchors. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S3 and finds that these conditions are addressed in "detection of aging effects" and "acceptance criteria" program elements of XI.S3. However, the applicant selected to enhance the LRA AMP B.2.5 "preventive actions" program element for these conditions instead. Upon its implementation the staff finds that the AMP will be consistent in essence with GALL-LR AMP XI.S3, and therefore, the enhancement is acceptable.

Enhancement 5. LRA Section B.2.5 includes an enhancement to the "monitoring and trending," program element that relates to sampling of supports to be examined in subsequent inspection intervals, when a support that is acceptable for continued service as defined in IWF-3400 is restored in accordance with the corrective action program. To maintain integrity of the sample another support, of the same type and function but not restored to correct the observed condition is included in the sample. The staff notes that the GALL-LR does not consider the noted enhancement. However, the enhancement is included in the GALL-LR XI.S3 program element. Its inclusion to the "monitoring and tending" program element of LRA AMP B.2.5 results in strengthening its aging management activities. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S3 and finds it consistent with its guidance. The staff also finds that when the enhancement is implemented, the LRA AMP B.2.5 will improve its monitoring and trending of IWF supports, and therefore, the enhancement is acceptable.

The staff also reviewed portion of the LRA AMP B.2.5 "preventive actions," program element enhancement that relates to sliding surfaces. The staff finds its deletion by a letter dated July 24, 2024 (LRA Supplement 3, ML24206A150), to be acceptable because "Perry does not have any components with sliding surfaces within the purview of ASME Section XI, Subsection IWF," noted in revised Table 1 AMR line item 3.5.1-75 and confirmed during the AMP audit (ML24239A778). Staff's additional review of this not applicable Table 1 AMR line item is included in in this SE Section 3.5.2.1.1 AMR Results Identified as Not Applicable or Not Used.

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 Section B.2.5, 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 with enhancements with the corresponding program elements of GALL-LR Report AMP XI.S3. In addition, the staff reviewed the enhancements associated with the “preventive actions,” “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.2.5 summarizes OE related to the ASME Section XI, Subsection IWF Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24239A778), the staff reviewed search results 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 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 ASME Section XI, Subsection IWF program was evaluated.

UFSAR Supplement. LRA Section A.1.5 provides the UFSAR supplement as amended by a letter dated July 24, 2024 (ML24206A150), for ASME Section XI, Subsection IWF Program. The staff reviewed this UFSAR 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 (Commitment No. 5) to these enhancements for the existing ASME Section XI, Subsection IWF program to be implemented by May 8, 2026. The staff finds that the information in the UFSAR, is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s ASME Section XI, Subsection IWF 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, 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 UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.2 Bolting Integrity

LRA Section B.2.7 states that the Bolting Integrity program is an existing program that with enhancements will be consistent with the program elements in the GALL-LR Report AMP XI.M18, “Bolting Integrity.”

Staff Evaluation. During its audit, 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 “parameters monitored/affected,” “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 three enhancements are discussed below.

Enhancement 1. LRA Section B.2.7 includes an enhancement to the "preventive actions" and detection of aging effects" program elements for high strength bolting (regardless of code classification) will be monitored for cracking in accordance with ASME 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 bolting known to be more susceptible to SCC.

Enhancement 2. LRA Section B.2.7 includes an enhancement to the "parameters monitored/affected" and "detection of aging effects" program elements to perform visual inspection of submerged bolting for the emergency service water pumps, diesel and motor fire pumps, emergency service water screen-wash pumps and Spent Fuel Rack Grid Structure for loss of material and loss of preload on a 10-year frequency. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M18 and finds that GALL-LR AMP XI.M18 does not provide any guidance on the frequency and extent of inspections of the submerged closure bolting. However, GALL-LR NUREG–2191 AMP XI.M18 Bolting Integrity provides specific guidance on the frequency and extent of inspection of the submerged bolting that should be conducted. The applicant has proposed to inspect this bolting during maintenance activities to assess the aging effects. Bolt heads would be inspected when made accessible and both threads would be inspected when joints are disassembled. During each 10-year period of extended operation, a representative sample of 20 percent of the population (i.e., bolts with the same material and environment combination) of bolt heads and bolt threads or a maximum of 25 bolts per population would be inspected for aging effects as indicated in Table A.3. The staff finds the proposed enhancement acceptable because when it is implemented it will make the program consistent with the GALL-LR Report recommendations.

Enhancement 3. LRA Section B.2.7 includes an enhancement to the "detection of aging effects," and "parameters monitored/affected" program elements to perform visual inspection of submerged bolting for the emergency core cooling systems (ECCS) and reactor core isolation cooling (RCIC) system suction strainer in the suppression pool for loss of material and loss of preload (loose or missing nuts and bolts) on a 10-year frequency. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M18 and finds it acceptable because when it is implemented it will improve the program and make it consistent with the GALL-LR Report recommendations.

Enhancement 4. In the letter dated July 24, 2024 (ML24206A150), the applicant has removed this enhancement, as shown in revised LRA Table A.3.

Enhancement 5. LRA Section B.2.7 includes an enhancement to the "preventive actions" program element to include using bolting material that has an actual measured yield strength limited to less than 1,034 megapascals (MPa) (150 kilo-pounds per square inch [ksi]). The staff reviewed this enhancement, against the corresponding program elements in GALL-LR Report AMP XI.M18 and finds it acceptable because when it is implemented it will make the program consistent with the GALL-LR Report recommendations

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 and amendment, 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, either natively or 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/affected," 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.2.7 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 (ML24239A778), the staff conducted an independent 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 PEO. 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.

UFSAR Supplement. LRA Section A.1.7 provides the UFSAR supplement for the Bolting Integrity program. The staff reviewed this UFSAR 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 (LRA Commitment No. 7) 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 6 months prior to the period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's 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, with the enhancements when implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.3 BWR Feedwater Nozzle

LRA Section B.2.10 states that the BWR Feedwater Nozzle Program is an existing program that will be consistent with the program elements in the GALL-LR Report AMP XI.M5, "BWR Feedwater Nozzle," except for the exception identified in the LRA.

Staff Evaluation. During its audit, 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," "acceptance criteria," and "corrective actions" program elements of the LRA to the corresponding program elements of GALL-LR Report AMP XI.M5.

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

Exception. LRA Section B.2.10 includes an exception to the "detection of aging effects" and "monitoring and trending" program elements related to inspecting the feedwater nozzles on a sampling basis instead of inspecting the entire feedwater nozzle population through the end of the fourth inservice inspection interval, which will continue partially into the period of extended operation. The applicant stated that prior to entering the subsequent 10-year ISI intervals, Perry would have to either comply with the ASME Code requirements or request relief from the requirements consistent with what Perry has done during the initial operating period. The staff reviewed this exception against the corresponding program elements in GALL-LR Report AMP XI.M5 and finds it acceptable because (1) the reduced nozzle inspections was implemented as part of an NRC-approved alternative to the requirements of ASME Code Section XI and the guidance of NUREG-0619 and GE-NE-523-A71-0594, Revision 1, and (2) prior to entering the subsequent 10-year ISI intervals, the applicant will either comply with the ASME Code requirements or request relief from the requirements consistent with what was done during the initial operating period.

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.M5. The staff also reviewed the exception between the applicant's program and GALL-LR Report XI.M5 associated with the "detection of aging effects" and "monitoring and trending" program elements, and its justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.10 summarizes OE related to the BWR Feedwater Nozzle Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results 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 BWR Feedwater Nozzle Program was evaluated.

UFSAR Supplement. LRA Section A.1.10 provides the UFSAR supplement for the BWR Feedwater Nozzle Program. The staff reviewed this UFSAR 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 BWR Feedwater Nozzle Program for managing the effects of aging for applicable components during the PEO. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's BWR Feedwater Nozzle 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 finds that, with the exception 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 will be maintained consistent with the CLB for the PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.4 BWR Penetrations

LRA Section B.2.11 states that the BWR Penetrations is an existing program with an enhancement that will be consistent with the program elements in the GALL-LR Report AMP XI.M8, “BWR Penetrations.”

Staff Evaluation. During its audit (ML24239A778), 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 of the applicant’s program to the corresponding program elements of GALL-LR Report AMP XI.M8. 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 the enhancement is as follows:

Enhancement. LRA Section B.2.11 includes an enhancement to the “monitoring and trending” program element which relates to incorporating the guidelines of staff-approved boiling water reactor vessel and internals project topical reports (BWRVIP)-14-A, “BWR Vessel and Internals Project, Evaluation of Crack Growth in BWR Stainless Steel RPV Internals,” BWRVIP-59-A, “BWR Vessel and Internals Project, Evaluation of Crack Growth in BWR Nickel-Base Austenitic Alloys in RPV Internals,” and BWRVIP-60-A, “BWR Vessel and Internals Project, Evaluation of Stress Corrosion Crack Growth in Low-Alloy Steel Vessel Materials in the BWR Environment,” for evaluation of crack growth in stainless steels, nickel alloys, and low-alloy steels, respectively. The staff reviewed the enhancement associated with the “monitoring and trending” program element, and finds that, when it is implemented, it will make the AMP adequate to manage the applicable aging effects.

Based on its audit, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M8. The staff finds that the AMP is adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.11 summarizes OE related to the BWR Penetrations program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24239A778), the staff conducted an independent 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 PEO. 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 BWR Penetrations program was evaluated.

UFSAR Supplement. LRA Section A.1.11 provides the UFSAR supplement for the BWR Penetrations program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Report Table 3.0-1. The staff also noted that the applicant committed to ongoing implementation of the existing BWR Penetrations program for managing the effects of aging for applicable components during the PEO. The staff also noted that the applicant committed to implementing the program enhancement 6 months prior to the PEO. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's BWR Penetrations 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 PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.5 BWR Vessel ID Attachment Welds

LRA Section B 2.13, as amended by letters dated June 27, 2024, and October 2, 2024 (ML24180A010 and ML24276A083, respectively) states that the BWR Vessel ID Attachment Welds Program is an existing program that will be consistent with the program elements in the GALL-LR Report AMP XI.M4, "BWR Vessel ID Attachment Welds," with the enhancement and exception identified in the LRA.

Staff Evaluation. During its audit (ML24239A778), 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," "acceptance criteria," and "corrective actions" program elements of the LRA of the applicant's program to the corresponding program elements of GALL-LR Report AMP XI.M4. The staff also reviewed the portions of the "detection of aging effects" and "monitoring and trending" program elements associated with the enhancement and exception 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 and exception follows:

Enhancement. LRA Section B.2.13 includes an enhancement to the "monitoring and trending" program element which relates to the use of industry guidance documents to enhance inspection effectiveness. Specifically, the applicant stated that the inservice inspections procedures will be revised to incorporate BWRVIP-14-A, BWRVIP- 59-A, and BWRVIP-60-A as guidelines for evaluation of crack growth in stainless steels, nickel alloys, and low-alloy steels, respectively. The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M4 and finds it acceptable because when it is implemented the applicant's AMP will be consistent with the recommendations of the GALL-LR Report AMP XI.M4.

Exception: LRA Section B.2.13 includes an exception to the "detection of aging effects" and "monitoring and trending" program elements that relates to the use of BWRVIP-48, Revision 1 in lieu of BWRVIP-48-A, which is recommended in GALL-LR Report AMP XI.M4. The applicant explained that the NRC staff-approved in letter dated January 29, 2021 (ML20363A006), an alternative to permit the use of BWRVIP-48, Revision 1, in lieu of the ASME Code Section XI inspection requirements for the duration of the fourth 10-year ISI interval, which is scheduled to expire on May 17, 2029. The staff noted that the applicant's current facility operating license (Docket No. 50-440, License Number NPF-58) expires at midnight on November 7, 2026, which is prior to the scheduled expiration of the fourth 10-year ISI interval. Thus, the staff's previous approval of the alternative to use BWRVIP-48, Revision 1, in lieu of the ASME Code Section XI inspection requirements would extend into the first 2.5 years of the PEO (i.e., year 40 through approximately year 42.5).

By letters dated June 27, 2024, and October 2, 2024, the applicant acknowledged it understood that (1) prior to entering the subsequent 10-year ISI intervals (i.e., fifth and sixth ISI interval), it would have to either comply with the ASME Code requirements and an NRC-approved BWRVIP-48 guidance, or request staff approval for an alternative to the approved guidance prior to the start of the subsequent 10-year ISI intervals; and (2) that BWRVIP-48, Revision 1, has not been generically approved by the NRC staff.

The staff reviewed this exception, as amended by letters dated June 27, 2024, and October 2, 2024 (ML24180A010 and ML24276A083, respectively), against the corresponding program elements in GALL-LR Report AMP XI.M4 and finds it acceptable because (1) the applicant's use of BWRVIP-48, Revision 1 was previously approved by the NRC staff for the fourth 10-year ISI interval, which overlaps approximately 2.5 years into the beginning of the PEO; and (2) following expiration of this previously NRC-approved alternative on May 17, 2029, the applicant's program will implement ASME Code Section XI required inspections and NRC-approved version of the BWRVIP-48 guidance (which at the time of the license renewal application is BWRVIP-48-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, supplements, and the applicant's response to a RAI, 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.M4. The staff also reviewed the exception between the applicant's program and GALL-LR Report XI.M4 associated with the "detection of aging effects," and "monitoring and trending," program elements, and its justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancement associated with the "monitoring and trending" program element and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

<u>*Review of License Renewal Applicant Action Items*</u>:

By letter dated October 2, 2024 (ML24276A083), the applicant stated BWRVIP-48, Revision 1, was inadvertently included in the list of BWRVIP documents in LRA Appendix C to be addressed since the revision of the document does not have an associated NRC SER. However, for completeness the applicant addressed the license renewal applicant action items from the SER for BWRVIP-48-A since it is the most recent NRC-approved version of BWRVIP-48 at the time of the applicant's license renewal application. The staff's review of these action items is documented below.

In the staff safety evaluation (ML010180493) for "BWR Vessel and Internals Project, Vessel [Inner Diameter] ID Attachment Weld Inspection and Flaw Evaluation Guidelines (BWRVIP-48)," the staff issued three license renewal applicant action items, which are summarized below:

(1) The license renewal applicant is to verify that its plant is bounded by the BWRVIP-48 report, otherwise the applicant will identify and evaluate any deviations on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).

(2) Those applicants for license renewal referencing the BWRVIP-48 report for the bracket attachments shall ensure that the programs and activities specified as necessary in the BWRVIP-48 report are summarily described in the UFSAR supplement.

(3) Applicants will ensure that the inspection strategy described in the BWRVIP-48 report does not conflict or result in any changes to their technical specifications, otherwise, the applicant will ensure that those changes are included in its application for license renewal.

The applicant’s responses to these license renewal applicant action items are summarized below along with the corresponding staff’s assessment of each:

(1) The applicant stated that Perry uses BWRVIP-48 as guidance for the inspection and evaluation of the bracket attachments. As discussed in LRA Section B.2.13, the bracket inspections are currently based on BWRVIP-48, Revision 1. The applicant’s use of BWRVIP-48, Revision 1 is an exception to the guidance in GALL-LR Report and the staff’s evaluation of this exception is documented above. The staff finds the applicant has adequately addressed license renewal applicant action item #1.

(2) LRA Section A.1.13 provides the required UFSAR supplement. The staff’s evaluation of the UFSAR supplement for the BWR Vessel ID Attachment Welds Program is documented below. The staff finds the applicant has adequately addressed license renewal applicant action item #2.

(3) The applicant stated that Perry currently uses BWRVIP-48 as guidance for inspection and evaluation of bracket attachments and no technical specification changes are required. The staff reviewed the Technical Specifications contained in applicant’s current facility operating license (Docket No. 50-440, License Number NPF-58) and confirmed the technical specifications changes are not required as a result of the BWR Vessel ID Attachment Welds Program. The staff finds the applicant has adequately addressed license renewal applicant action item #3.

Operating Experience. LRA Section B.2.13 summarizes operating experience related to the BWR Vessel ID Attachment Welds Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ML24239A778), 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 PEO.

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 BWR Vessel ID Attachment Welds Program was evaluated.

UFSAR Supplement. LRA Section A.1.13, as amended by letter dated October 2, 2024, provides the UFSAR supplement for the BWR Vessel ID Attachment Welds Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1.

In particular, the applicant affirmed, in part, that the BWR Vessel ID Attachment Welds Program follows the requirements of the ASME Code Section XI, Subsection IWB, Examination Category B-N-2 and enhanced consistent with the inspection and evaluation guidelines of an NRC-approved BWRVIP-48, BWR Vessel and Internals Project Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines. The staff noted that at the time of the license renewal application, BWRVIP-48-A is the latest NRC-approved version.

The staff noted that in general (1) BWRVIP topical reports are referenced in the UFSAR supplements for demonstrating that the effects of aging are adequately managed and time-limited aging analyses are adequately addressed during the PEO, and (2) that these BWRVIP topical reports are living documents. That is, these topical reports may be periodically updated based on new operating experience and data from research programs. These updates to BWRVIP topical reports may occur following the issuance of a renewed facility operating license and any revisions to the UFSAR supplement to make use of newly NRC-approved or updated topical reports must be made in accordance with established regulatory processes (e.g., 10 CFR 50.59, “Changes, tests and experiments”).

The staff also noted that the applicant committed to ongoing implementation of the existing BWR Vessel ID Attachment Welds Program for managing the effects of aging for applicable components during the PEO. The staff also noted that the applicant committed to, at least 6 months prior to entering the PEO, completing the following enhancement:

- The inservice inspections procedures will be revised to incorporate BWRVIP-14-A, BWRVIP-59-A, and BWRVIP-60-A as guidelines for evaluation of crack growth in stainless steels, nickel alloys, and low-alloy steels, respectively.

Conclusion. Based on its review of the applicant’s BWR Vessel ID Attachment Welds 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, with the exception and the enhancement when implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.6 BWR Vessel Internals

LRA Section B.2.14 states that the BWR Vessel Internals Program is an existing program that, with enhancements, will be consistent with the program elements in the GALL-LR Report AMP XI.M9, “BWR Vessel Internals.” The applicant amended this LRA section by letter dated May 30, 2024 (ML24151A637).

Staff Evaluation. During its audit, the staff reviewed the applicant’s claim of consistency with the GALL-LR Report. The staff compared the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” and “corrective actions” program elements of the LRA to the corresponding program elements of GALL-LR Report AMP XI.M9.

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

Enhancement 1. LRA Section B.2.14 includes an enhancement to the "monitoring and trending" program elements which relates to revising the applicant's implementing station procedures to incorporate BWRVIP-14-A, BWRVIP-59-A, and BWRVIP-60-A guidelines for evaluation of crack growth in stainless steel, nickel alloys, and low-alloy steels, respectively. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M9 and finds it acceptable because, when it is implemented, it will bring the implementing procedures into alignment with the guidance of the GALL-LR Report.

Enhancement 2. LRA Section B.2.14 includes an enhancement to the "scope of program" and "acceptance criteria" program elements which relates to evaluating the 60-year fluence for the six cast austenitic stainless-steel components identified in BWRVIP-234-A, Table 6-1 to determine if periodic inspections of those components are required, based on susceptibility to loss of fracture toughness due to thermal aging and neutron irradiation embrittlement. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M9 and finds it acceptable because when it is implemented it will ensure components which are susceptible to the loss of fracture toughness aging effects are effectively managed during the PEO.

Based on a review of the LRA, as modified by letter dated May 30, 2024 (ML24151A637), the staff finds that the "preventive actions," "parameters monitored or inspected," "detection of aging effects," 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.M9. In addition, the staff reviewed the enhancements associated with the "scope of program," "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.2.14 summarizes OE related to the BWR Vessel Internals Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results 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 PEO.

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 BWR Vessel Internals Program was evaluated.

UFSAR Supplement. LRA Section A.1.14 provides the UFSAR supplement for the BWR Vessel Internals Program. The staff reviewed this UFSAR supplement description of the program against the recommended description for this type of program as described in SRP-LR Table 3.0-1 and noted that the UFSAR supplement, as modified by Supplement 02 (ML24180A010), is consistent with the corresponding program description in SRP-LR Table 3.0-1.

The staff also noted that the applicant committed, no later than 6 months prior to the PEO, to update the implementing station procedures to incorporate BWRVIP-14-A, BWRVIP-59-A, and

BWRVIP-60-A guidelines for evaluation of crack growth in stainless steel, nickel alloys, and low-alloy steels, respectively, and to complete an evaluation of the 60-year fluence for the six cast austenitic stainless-steel components identified in BWRVIP-234-A, Table 6-1 to determine if periodic inspections of those components are required, based on susceptibility to loss of fracture toughness due to thermal aging and neutron irradiation embrittlement.

The staff finds that the information in the UFSAR supplement, as amended by letter dated June 27, 2024 (Supplement 2, ML24180A010), is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's BWR Vessel Internals 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 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 will be maintained consistent with the CLB for the PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.7 Closed Treatment Water Systems

LRA Section B.2.15 states that the Closed Treated Water Systems Program is an existing program that, with enhancements, will be consistent with the program elements in GALL-LR Report AMP XI.M21A, "Closed Treated Water Systems," as modified by LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation." The applicant amended this LRA section by letter dated June 27, 2024 (ML24180A010).

Staff Evaluation. During its audit (ML24239A778), 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 "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these two enhancements are discussed below.

Enhancement 1. LRA Section B.2.15 includes an enhancement to the "parameters monitored or inspected," "detection of aging effects," and "monitoring and trending" program elements which relates to ensuring aging effects are detected through periodic visual inspections whenever the system boundary is opened, by inspecting a representative sample of piping and components based on the likelihood of degradation, at an interval not to exceed once in 10 years. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M21A and finds it acceptable because when it is implemented it will be consistent with the recommendations of the GALL-LR Report.

Enhancement 2. LRA Section B.2.15 includes an enhancement to the “preventive actions” program element, which relates to changing the chemical treatment of the Building Heating System from a hydrazine-based regime to one more suitable to the elevated system temperatures experienced at Perry, in accordance with the EPRI Closed Cooling Water Chemistry Guidelines (Refences a and b). The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M21A and finds it acceptable because when it is implemented it will be consistent with the recommendations of the GALL-LR Report, to mitigate the aging effects of corrosion through water treatment.

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, 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. 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.2.15 summarizes OE related to the Closed Treated Water Systems Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24239A778), the staff reviewed search results 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 PEO.

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 Closed Treated Water Systems Program was evaluated.

UFSAR Supplement. LRA Section A.2.15 provides the UFSAR supplement for the Closed Treated Water Systems Program. The staff reviewed the UFSAR 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 the applicant committed to implement the enhancements to the existing Closed Treated Water Systems Program by May 08, 2026, for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s 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 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 functions will be maintained consistent with the CLB for the PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.8 Compressed Air Monitoring

LRA Section B.2.16 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 (ML24239A778), the staff reviewed 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" and "monitoring and trending" program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these enhancements is as follows.

Enhancement 1. LRA Section B.2.16 includes an enhancement to the "parameters monitored or inspected" and "detection of aging effects," program elements which relates to performing opportunistic inspections of accessible internal surfaces of piping, receivers, compressors, dryers, aftercoolers, and filters within the compressed air systems. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M24 and finds it acceptable because when it is implemented it will be consistent with the recommendations of the GALL-LR Report.

Enhancement 2. LRA Section B.2.16 includes an enhancement to the "monitoring and trending" program element to include a new monitoring and trending program that will be developed for periodic dew point readings, results of each opportunistic visual inspection, and annual air samples. The staff reviewed this enhancement, against the corresponding program elements in GALL-LR Report AMP XI.M24 and finds it acceptable because when it is implemented it will be consistent with the recommendations of the GALL-LR Report.

The staff conducted an audit to verify the applicant's claim of consistency with 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 the applicant 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" and "monitoring and trending" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.16 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 (ML24239A778), the staff reviewed search results 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 PEO.

The staff did not identify any OE indicating that the applicant should modify its proposed program beyond that incorporated during the development of the LRA. 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.

UFSAR Supplement. LRA Appendix A, Section A.1.16 provides the UFSAR for the Compressed Air Monitoring program. The staff reviewed this UFSAR description of the program and noted that it is consistent with the recommended description in GALL-LR Report Table XI-01. The staff also noted that Applicant committed to ongoing implementation of the existing Compressed Air Monitoring program for managing the effects of aging for applicable components during the PEO. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Compressed Air Monitoring 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 PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.9 Fatigue Monitoring

LRA Section B.2.19 states that the Fatigue Monitoring AMP is an existing program with enhancements that will be consistent with the program elements in GALL-LR Report (Revision 2) AMP X.M1, "Fatigue Monitoring." The applicant supplemented this LRA section by letter dated June 27, 2024 (Supplement 2, ML24180A010).

Staff Evaluation. During its audit (ML24239A778), 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/inspected," and "monitoring and trending" 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.2.19 includes an enhancement to the "scope of program" program element. The enhancement relates to updating the station implementing procedures to clarify the scope of the Fatigue Monitoring AMP that is addressed in the procedures. The applicant also explained that the enhancement is related to editorial changes to clarify the scope of the program and does not involve any technical changes in the scope of the implementing procedures.

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 make editorial changes to the implementing procedures to clarify the scope of the applicant's Fatigue Monitoring AMP, consistent with the scope of GALL-LR Report AMP X.M1.

Enhancement 2. LRA Section B.2.19 includes an enhancement to "scope of program," "preventive actions," "parameters monitored/inspected," and "monitoring and trending" program elements. The enhancement relates to augmenting the program fatigue monitoring software to include environmental fatigue correction factors (Fen multipliers) for the locations where monitoring the environmental fatigue has been determined to be applicable to ensure the 80-year environmentally adjusted cumulative fatigue factor (CUF_{en}) does not exceed the ASME Code, Section III limit (i.e., 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 includes the Fen multipliers to consider the environmental effects on fatigue and (2) the program monitors the CUF_{en} values to confirm that the CUFen values do not exceed the fatigue design limit (1.0) by performing corrective actions as needed. The potential corrective actions include the refinement of CUF_{en} values and repair and replacement activities for affected components.

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 environmental effects on fatigue and (2) the CUF_{en} values do not exceed the fatigue design limit (1.0) through the monitoring and trending of the CUF_{en} values and corrective actions as needed.

Enhancement 3. LRA Section B.2.19, as supplemented by letter dated June 27, 2024 (ML24180A010), includes an enhancement to the "scope of program" program element. The enhancement relates to incorporating the containment piping penetration bellows into the Fatigue Monitoring AMP. The program will manage the aging effects of fatigue for the containment piping penetration bellows.

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 include the containment piping penetration bellows in the scope of the program and will monitor the transient cycles of the bellows to ensure that the fatigue design limit is met for the period of extended operation.

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, the staff finds that the "scope of program," "preventive actions," "parameters monitored/inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements, 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/inspected," and "monitoring and trending" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.19 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 (ML24239A778), the staff conducted an independent 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) to 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 PEO. The staff did not identify any OE indicating that the applicant should modify its proposed program.

UFSAR Supplement. LRA Section A.1.19, as supplemented by letter dated June 27, 2024 (ML24180A010), provides the UFSAR supplement of the Fatigue Monitoring AMP. The staff also noted that the applicant committed to implement the program enhancements by May 8, 2026 (i.e., no later than 6 months prior to the PEO). The staff finds that the information in the UFSAR supplement is an adequate summary description of the program, consistent with the guidance in SRP-LR (Revision 2) Section 3.1.2.5.

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, with the enhancements, when implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.10 Fire Water System

LRA Section B.2.21 states that the Fire Water System program is an existing program with exceptions and enhancements that will be consistent with the program elements in the GALL-LR Report AMP XI.M27, "Fire Water System," as revised by LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation" (ML13227A361), and 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), except for the exceptions identified in the LRA. The applicant amended this LRA section by letters dated June 27, 2024 (Supplement 2, ML24180A010), November 19, 2024 (Response to RAI Set 3, ML24324A185), December 19, 2024 (Supplement 7, ML24354A265), and March 20, 2025 (Response to RAI Set 5, ML25079A062).

Staff Evaluation. During its audit (ML24239A778), 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" and "parameters monitored or inspected" program elements, the staff had questions regarding the replacement frequency for the coolant heat exchanger tube bundle on the diesel driven fire pump engine and the Fire Water System program enhancements and exceptions and issued RAI 10332-R1, Questions 1 and 2, and RAI 10505-R1, Questions 1 - 9. The staff's requests and the applicant's responses are documented in letters dated November 19, 2024, and March 20, 2025 (ML24324A185 and ML25079A062, respectively).

In its response to RAI 10332-R1, Question 1 (ML24324A185), the applicant stated that the diesel driven fire pump coolant heat exchanger tube bundle 14-year replacement frequency is based on plant-specific operating experience of no tube bundle replacements or tube leaks, operating experience and replacement frequency at another nuclear power plant, and the convenience of replacing the tube bundle in conjunction with the turbocharger maintenance. The applicant confirmed preventive maintenance activities performed in accordance with PAP-1910, “Fire Protection Program,” and PMI-0072, “Diesel Fire Service Pump Preventive Maintenance,” will continue during the PEO. Based on the October 2024 operating experience related to diesel driven fire pump coolant heat exchanger tube fouling, in its response to RAI 10505-R1, Question 9 (ML25079A062), the applicant revised Commitment No. 21.5 in LRA Table A.3 and *Enhancement 5* in LRA Section B.2.21 to include internal inspection of the diesel driven fire pump coolant heat exchanger tubes for fouling every 6 years with remediation of adverse conditions (e.g., cleaning or replacement of affected components). The applicant stated that the 6-year frequency aligns with the current approved Fire Protection Program 6-year maintenance evolution, and prior to the October 2024 operating experience there was no history of fouling or maintenance of the diesel driven fire pump coolant heat exchanger tubes since 2007 (approximately 17 years). In addition, the applicant stated that the heat exchanger was replaced in November 2024 and will be replaced 14 years from that inservice date.

As supplemented by letters dated June 27, 2024, December 19, 2024, and March 20, 2025 (ML24180A010, ML24354A265, and ML25079A062), LRA Section B.2.21 includes an enhancement to the “detection of aging effects” program element related to revising procedures or developing new procedures to require replacing the coolant heat exchanger tube bundle associated with the diesel driven fire pump every 14 years, internal visual inspection of the heat exchanger shell and channel for loss of material every 14 years, and inspection for internal tube fouling every 6 years with remediation of adverse conditions (e.g., cleaning or replacement of affected components) (see the discussion of *Enhancement 5* below). The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M27, as revised by LR-ISG-2012-02, and finds it acceptable as stated below.

The staff finds the applicant’s responses to RAI 10332-R1, Question 1, and RAI 10505-R1, Question 9, and *Enhancement 5* acceptable because (1) based on the plant-specific operating experience, replacing the diesel driven fire pump coolant heat exchanger tube bundle on a 14-year frequency provides reasonable assurance that the periodic replacement will occur prior to loss of intended function; (2) preventive maintenance activities in PAP-1910 and PMI-0072 will continue during the PEO, which could reasonably provide insight into the condition of the diesel driven fire pump coolant heat exchanger components, including the coolant heat exchanger tube bundle; (3) the diesel driven fire pump coolant heat exchanger shell and channel will be visually inspected internally for loss of material every 14 years in conjunction with tube bundle replacement; (4) as supplemented by letter dated March 20, 2025 (ML25079A062), the diesel driven fire pump coolant heat exchanger tubes will be inspected internally for fouling every 6 years with remediation of adverse conditions (e.g., cleaning or replacement of affected components), which could reasonably provide insight into fouling of the coolant heat exchanger tubes prior to the 14-year replacement frequency; (5) LRA Table 3.3.2-24 includes other heat exchanger components related to the diesel driven fire pump engine (i.e., channel, shell, flexible hose, muffler, and piping); and (6) when the enhancement is implemented, the Fire Water System program will include procedures that require the replacement and inspections described above.

In its response to RAI 10332-R1, Question 2 (ML24324A185), the applicant identified the exceptions and enhancements to the Fire Water System program. The staff finds the applicant's response acceptable because in accordance with 10 CFR 54.29(a), the applicant identified the actions that will be taken with respect to managing the effects of aging during the PEO. The staff's evaluations of the exceptions and enhancements are documented below.

In its response to RAI 10505-R1, Question 1 (ML25079A062), the applicant stated that loss of material due to wear is not an applicable aging effect for the fiberglass piping exposed internally to raw water in the Fire Protection system because the piping experiences stagnant flow more than 98 percent of the time and low flow velocities, the raw water source is from Lake Erie where silt is the primary particles, which is less abrasive than sand, and there has been no plant-specific operating experience of loss of material due to wear for fiberglass piping. The staff's evaluation of this response is in subsection "Fiberglass piping exposed to raw water," in SER Section 3.3.2.3.12.

For RAI 10505-R1, Question 2 (ML25079A062), the staff's evaluation of the applicant's response is in the discussion of *Exception 2* below.

For RAI 10505-R1, Question 3 (ML25079A062), the staff's evaluation of the applicant's response is in the discussion of *Exception 3* below.

In its response to RAI 10505-R1, Question 4 (ML25079A062), the applicant revised AMR items 3.3.1-64 and 3.3.1-66 in LRA Table 3.3.1; LRA Table 3.3.2-24 to credit the Open-Cycle Cooling Water System program for managing loss of material for the diesel driven and electric motor driven fire pump casing columns, suction bells, and suction strainer elements; and LRA Sections A.1.37 and B.2.37 to add an enhancement to the Open-Cycle Cooling Water System program for periodic maintenance inspections of the emergency service water (ESW) pump casings, ESW screen-wash pump casings, ESW traveling screens and the electric motor driven and diesel driven fire pump casings and suction strainers. The staff's evaluations of the changes to AMR items 3.3.1-64 and 3.3.1-66 in LRA Table 3.3.1, LRA Table 3.3.2-24, and the enhancement to the Open-Cycle Cooling Water System program are in SER Sections 3.3.2.1.1, and 3.0.3.2.22, "Open Cycle Cooling Water Program," respectively. For additional information see the discussion of *Exception 4* below.

For RAI 10505-R1, Question 5 (ML25079A062), the staff's evaluation of the applicant's response is in the discussion of *Exception 6* below.

For RAI 10505-R1, Question 6 (ML25079A062), the staff's evaluation of the applicant's response is in the discussion of *Exception 7* below.

In its response to RAI 10505-R1, Question 7 (ML25079A062), the applicant revised *Enhancement 1*(k) in LRA Section A.1.21, Commitment No. 21.1 in LRA Table A.3, and *Enhancement 1*(k) in LRA Section B.2.21 to remove and inspect the mainline strainers in water spray fixed systems for damaged and corroded parts every 5 years consistent with Section 10.2.1.7 of the 2011 Edition of NFPA 25. In addition, the applicant revised LRA Section B.2.21 to delete the exception to the "detection of aging effects" program element related to inspecting mainline strainers. The staff finds the applicant's response acceptable because the mainline strainers in water spray fixed systems will be removed and inspected for damaged and corroded parts every 5 years consistent with Section 10.2.1.7 of the 2011 Edition of NFPA 25. For additional information, see the discussion of *Enhancement 1*(k) below.

In its response to RAI 10505-R1, Question 8 (ML25079A062), the applicant stated that Section 14.2 of the 2011 Edition of NFPA 25 would not apply to open nozzle deluge systems, standpipe and hose systems, sprinkler heads, and dry pre-action systems because they are addressed by other requirements and program enhancements. As supplemented by letters dated December 19, 2024, and March 20, 2025 (ML24354A265 and ML25079A062), LRA Section B.2.21 includes an enhancement to the “detection of aging effects” program element related to adding documentation to meet Sections 14.2 and 14.3 of the 2011 Edition of NFPA 25 related to internal piping inspections and obstruction investigations (see the discussion of *Enhancement 1* (item 15) below). The staff reviewed this enhancement against the corresponding program element in the GALL-LR Report AMP XI.M27, as revised by LR-ISG-2012-02, and finds it acceptable as stated below.

The staff finds the applicant’s response and *Enhancement 1*(n) acceptable because (1) open spray deluge valves will be full flow trip tested every refueling outage (see the discussion of *Exception 6* below); (2) main drain tests on 20 percent of the standpipes and risers will be performed every refueling outage (every 24 months) so that 100 percent of all main drains will be tested every 10 years (see the discussion of *Exception 3* below); (3) sprinkler heads will be inspected every 18 months except sprinkler heads in a high radiation area will be inspected every refueling outage (every 24 months) (see the discussion of *Exception 1* below); (4) sprinkler heads will be replaced or tested in accordance with Section 5.3.1 of the 2011 Edition of NFPA 25; (5) portions of the water-based fire protection system components that are wetted but are normally dry will be tested in accordance with Section 14.2.1 of the 2011 Edition of NFPA 25 after system actuations and putting the system back inservice (see the discussion of *Enhancement 4* below); (6) when implemented, the Fire Water System program will be enhanced to perform internal pipe inspections in accordance with Section 14.2 of the 2011 Edition of NFPA 25, except for open nozzle deluge systems, standpipe and hose systems, sprinkler heads, and dry pre-action systems as discussed above; and (7) when implemented, the Fire Water System program will be enhanced to perform obstruction investigations in accordance with Section 14.3 of the 2011 Edition of NFPA 25, consistent with the recommendation in GALL-LR Report AMP XI.M27, as revised by LR-ISG-2012-02.

For RAI 10505-R1, Question 9 (ML25079A062), the staff’s evaluation of the applicant’s response is in the discussion of RAI 10332-R1, Question 1, above.

The staff also reviewed the portions of the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “acceptance criteria,” and “operating experience” 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 exception numbering below reflects the order they appear in the exception table in LRA Section B.2.21, as supplemented by letter dated March 20, 2025 (ML25079A062). While the applicant did not identify against which program element the exceptions are taken, the staff notes that they are all taken against the “detection of aging effects” program element. The enhancement numbering below reflects the numbering in LRA Table A.3, “License Renewal Commitments,” as supplemented by letter dated March 20, 2025 (ML25079A062). The associated commitment numbers from LRA Table A.3 are provided after each enhancement discussion. The staff’s evaluation of these exceptions and enhancements are as follows.

Exception 1. As supplemented by letter dated December 19, 2024 (ML24354A265), LRA Section B.2.21 includes an exception to the “detection of aging effects” program element related to sprinkler inspections. In lieu of annually inspecting sprinklers as specified in Section 5.2.1.1 of NFPA 25, the applicant will inspect the sprinklers every 18 months, except sprinklers in a high radiation area will be inspected every 24 months (every refueling cycle). The staff notes that Footnote 10 for Table XI.M27-1 in Volume 2 of NUREG-2191 would allow these inspections to be performed on a refueling outage interval if plant-specific operating experience has shown no loss of intended function of the specific component due to the aging effects being managed. The staff reviewed this exception against the corresponding program element in GALL-LR Report AMP XI.M27, as revised by LR-ISG-2012-02, and finds it acceptable because sprinklers will be inspected every 18 months, which does not exceed PNPP's refueling outage interval, and sprinklers in a high radiation area will be inspected every refueling outage (every 24 months). In addition, plant-specific operating experience does not warrant more frequent testing.

Exception 2. As supplemented by letter dated December 19, 2024 (ML24354A265), with additional clarification in response to RAI 10505-R1, Question 2 (ML25079A062), LRA Section B.2.21 includes an exception to the "detection of aging effects" program element related to flow testing automatic standpipe systems. In lieu of flow testing at the hydraulically most remote hose connections of each zone every 5 years as specified in Section 6.3.1.1 of the 2011 Edition of NFPA 25, the applicant will perform "main header flow testing in the main headers that supply the standpipe system to verify that the water supply provides the largest demand design flow plus 500 gpm for hose streams over the longest route and verifies friction losses are within values used to determine design flow at design pressure based upon the measured discharge pressure and flow of a single fire pump," will partially open hose station supply valves every 3 years to confirm no flow blockage, and will perform main drain tests on 20 percent of standpipes and risers every refueling outage (every 24 months). The applicant stated that the acceptance criteria for the main drain tests will ensure open flow and no obstructions by verifying valve operability and flow through valve and connections. In addition, the applicant also stated that it utilizes Class 2 standpipe systems, and the 2014 Edition of NFPA 25 only requires this testing for Class 1 and Class 3 standpipe systems.

In its response to RAI 10505-R1, Question 2, the applicant identified the total number of hose stations (105) that are flow tested every 3 years and the twelve different buildings the hose stations are in and stated that hose stations that are considered remote are flow tested because all in-scope hose stations are tested. The staff finds the applicant's response acceptable as stated below.

The staff reviewed this exception against the corresponding program element in GALL-LR Report AMP XI.M27, as revised by LR-ISG-2012-02, and the response to RAI 10505-R1, Question 2, and finds them acceptable because the proposed alternative testing is sufficient to establish reasonable assurance that flow blockage will be detected prior to a CLB intended function not being met. The staff based this conclusion on: (1) the alternative flow verifications, both in number, breadth of locations, and frequency provide insights concerning potential accumulation of corrosion products that are comparable to insights gained from the test recommended in GALL-LR Report AMP XI.M27, as revised by LR-ISG-2012-02; (2) in regard to the number of tests, flow is verified at 105 hose stations which are tested every 3 years; (3) in regard to the breadth of testing, tests are conducted on hose stations located in 12 different buildings with in-scope components; (4) in regard to the frequency of testing, the alternative tests are conducted more frequently than every 5 years; (5) hose stations that are considered remote are flow tested because all in-scope hose stations are tested; and (6) NFPA 25 (2014 Edition), an industry consensus document, has removed the requirement to conduct the test for the class of standpipe used at Perry.

Exception 3. As supplemented by letter dated December 19, 2024 (ML24354A265), LRA Section B.2.21 includes an exception to the "detection of aging effects" program element related to main drain testing. In lieu of performing annual main drain tests on all standpipe systems with automatic water supplies as specified in Section 6.3.1.5 of the 2011 Edition of NFPA 25, the applicant will perform main drain tests of 20 percent of standpipe systems, including those associated with automatic water suppression systems, every refueling outage (every 24 months). The applicant also indicated that hose stations are tested every 3 years for flow blockage and to verify valve position. The staff notes that conducting tests on 20 percent of a population is consistent with the extent of recommended tests in several sampling-based AMPs (e.g., XI.M38, “Internal Surfaces in Miscellaneous Piping and Ducting Components”).

In its response to RAI 10505-R1, Question 3 (ML25079A062), the applicant stated that main drain tests on 20 percent of the standpipes and risers will be performed every refueling outage (every 24 months) so that 100 percent of all main drains will be tested every 10 years. The staff finds the applicant’s response acceptable as stated below. As supplemented by letter dated December 19, 2024 (ML24354A265), LRA Section B.2.21 includes an enhancement to the “detection of aging effects” program element related to revising or developing procedures to require main drain testing of 20 percent of standpipe systems every refueling outage so that 100 percent of all main drains will be tested every 10 years (see the discussion of *Enhancement 1* (item 6) below). The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.M27, as revised by LR-ISG-2012-02, and finds it acceptable as stated below. In addition, as supplemented by letter dated December 19, 2024 (ML24354A265), LRA Section B.2.21 includes an exception (*Exception 5*) to the “detection of aging effects” program element related to main drain testing at water-based fire protection risers. In lieu of performing an annual main drain test at each water-based fire protection riser as specified in Section 13.2.5 of the 2011 Edition of NFPA 25, the applicant will perform main drain tests on 20 percent of standpipe systems every refueling outage (every 24 months). The staff reviewed this exception against the corresponding program element in GALL-LR Report AMP XI.M27, as revised by LR-ISG-2012-02, and finds it acceptable as stated below

The staff reviewed this exception, *Enhancement 1*(e), and *Exception 5* against the corresponding program element in GALL-LR Report AMP XI.M27, as revised by LR-ISG-2012-02, and the response to RAI 10505-R1, Question 3, and finds them acceptable because the number of main drain tests being conducted every refueling outage in lieu of annually is sufficient to establish a trend if potential flow blockage is occurring, all main drains will be tested every 10 years, and, when the enhancement is implemented, the Fire Water System program will include procedures that require main drain testing of 20 percent of standpipe systems every refueling outage so that 100 percent of all main drains are tested every 10 years.

Exception 4. As supplemented by letter dated December 19, 2024 (ML24354A265), LRA Section B.2.21 includes an exception to the “detection of aging effects” program element related to fire pump suction screen inspections. The applicant stated that the suction screens on the fire pumps do not require inspecting and clearing in accordance with Section 8.3.3.7 of the 2011 Edition of NFPA 25 after the waterflow portions of the annual test, after fire protection system activations, or during periods of unusual water supply conditions (e.g., floods) due to the supply inlet design and filtering of the water. The design includes traveling screens for removing submerged debris that have a smaller screen mesh size than the fire pump suction strainer. The applicant stated that the ESW traveling screens are monitored for differential level and the high-level difference is alarmed in the control room. In its response to RAI 10505-R1, Question 4 (ML25079A062), the applicant revised LRA Section A.1.37 and LRA Section B.2.37 to add an enhancement to the Open-Cycle Cooling Water System program for performing periodic maintenance inspections every operating cycle (24 months) of the external portions of components submerged in the ESW pump bay, including the ESW traveling screens for loss of material and flow blockage, the electric motor driven fire pump casing and its suction strainer for loss of material and flow blockage, and the diesel driven fire pump casing and its suction strainer for loss of material and flow blockage. LRA Table 3.3.2-24, as supplemented by letter dated July 27, 2024 (ML24180A010), credits the Fire Water System program for managing loss of material and flow blockage of the diesel driven and electric motor driven fire pump casing exposed internally to raw water.

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 the response to RAI 10505-R1, Question 4, and finds them acceptable because (1) the ESW traveling screens will be periodically inspected by the Open-Cycle Cooling Water System program for loss of material and flow blockage, which will provide insight on whether the screens are blocked or allowing debris to pass through to the fire pump suction strainer; (2) the ESW traveling screens will be monitored for differential level and the high-level difference is alarmed in the control room, which will provide insight on flow blockage of the screens; (3) the external portions of the electric motor driven fire pump casing and its suction strainer will be periodically inspected by the Open-Cycle Cooling Water System program for loss of material and flow blockage; (4) the external portions of the diesel driven fire pump casing and its suction strainer will be periodically inspected by the Open-Cycle Cooling Water System program for loss of material and flow blockage; (5) the Open-Cycle Cooling Water System program will be enhanced to include the periodic inspections for loss of material and flow blockage of the ESW traveling screens and the diesel driven and electric motor driven fire pump casing and suction strainer in periodic maintenance inspection documentation; and (6) plant-specific operating experience, as discussed in the response to RAI 10505-R1, Question 4, does not warrant inspecting more frequently than every operating cycle (every 24 months), by the Open-Cycle Cooling Water System. For additional information see SER Sections 3.3.2.1.1, and 3.0.3.2.22, “Open Cycle Cooling Water Program.”

Exception 5. As supplemented by letter dated December 19, 2024 (ML24354A265), LRA Section B.2.21 includes an exception to the “detection of aging effects” program element related to main drain testing at water-based fire protection risers. In lieu of performing an annual main drain test at each water-based fire protection riser, the applicant will perform main drain tests on 20 percent of standpipes and risers every refueling outage (every 24 months). The staff’s evaluation of this exception is documented above in its evaluation of *Exception 3*.

Exception 6. As supplemented by letter dated December 19, 2024 (ML24354A265), with additional clarification in response to RAI 10505-R1, Question 5 (ML25079A062), LRA Section B.2.21 includes an exception to the “detection of aging effects” program element related to trip testing at full flow deluge valves. In lieu of annually trip testing at full flow each deluge valve, the applicant will (1) trip test at full flow open spray deluge valves every refueling outage in accordance with Section 13.4.3.2.2.3 of the 2011 Edition of NFPA 25; (2) trip tested with the supply isolation valves closed every 18 months the deluge valves meeting Section 13.4.3.2.2.2 of the 2011 Edition of NFPA 25 (i.e., dry-pipe pre-action systems with closed sprinkler heads and ventilation filter deluge spray systems with open sprays); and (3) full flow test the spray system protecting the hydrogen seal oil system every 5 years to ensure it is not blocked and the sprays operate as designed and trip test the system with the supply isolation valve closed annually to ensure it operates, as stated the response to RAI 10505-R1, Question 5 (ML25079A062). The applicant stated that plugging of the spray nozzles of the spray system protecting the hydrogen seal oil system is unlikely because (1) the spray nozzles and piping are located indoors and “not subject to freezing, outdoor cycles, moisture, nor biological intrusion;” and (2) the system is drained after full flow testing and the upstream strainer is flushed prior to resetting the system, as stated in the response to RAI 10505-R1, Question 5.

The staff notes that Footnote 10 for Table XI.M27-1 in Volume 2 of NUREG-2191 would allow these inspections to be performed on a refueling outage interval if plant-specific operating experience has shown no loss of intended function of the specific component due to the aging effects being managed. While there is plant-specific operating experience of partial plugging of the outdoor open spray nozzles, the applicant stated that the spray patterns were acceptable, and the nozzles were cleaned. The applicant stated there has been no plant-specific operating experience related to plugging of the indoor hydrogen seal oil system spray nozzles. 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 the response to RAI 10505-R1, Question 5, and finds them acceptable because (1) the open spray deluge valves will be trip tested in accordance with Section 13.4.3.2.2.3 of the 2011 Edition of NFPA 25 every refueling outage (every 24 months) and plant-specific operating experience does not warrant more frequent testing; (2) the deluge valves meeting Section 13.4.3.2.2.2 of the 2011 Edition of NFPA 25 will be trip tested with the supply isolation valves closed every 18 months, which does not exceed PNPP’s refueling outage frequency, and plant-specific operating experience does not warrant more frequent testing; and (3) the frequency of the full flow test (every 5 years) and the trip test (annually) of the spray system protecting the hydrogen seal oil system is acceptable given there has been no plant-specific operating experience related to plugging, and the potential for plugging is limited by the system being located indoors, drained after testing, and the upstream strainer being flushed before resetting the system.

Exception 7. As supplemented by letter dated December 19, 2024 (ML24354A265) with clarification in response to RAI 10505-R1, Question 6 (ML25079A062), LRA Section B.2.21 includes an exception to the “detection of aging effects” program element related to observing discharge patterns of open spray nozzles. In lieu of observing water discharge patterns of the ventilation filter unit plenums in accordance with Section 13.4.3.2.2.5 of the 2011 Edition of NFPA 25, the applicant will visually inspect the charcoal filter plenum spray header/nozzle each time the charcoal is changed to ensure no debris has obstructed the spray nozzles. In its response to RAI 10505-R1, Question 6, the applicant stated that (1) there is no standard replacement frequency for the charcoal filters; (2) the periodic visual inspection procedure for the charcoal filter bed spray nozzles includes visual inspection of each spray nozzle to verify no obstructions, damage, or clogging and visual inspection of the header to verify piping is intact and there are no signs of distortion or damage; (3) there are eight systems with one or more charcoal spray headers in-scope of license renewal; and (4) 12 of the 16 plenums with charcoal beds have been inspected, when the charcoal was changed, one or more times over the past 20 years with none failing the acceptance criteria. The applicant stated that the operating experience of the 12 plenums can be extrapolated to the four plenums not inspected and noted that two of the four plenums are in systems where one or more plenums were inspected. The applicant also stated that spray nozzle plugging is minimized due to the open spray nozzles typically pointing downward and the upstream high efficiency particulate filters, and that loss of material of the spray nozzles and header is minimized due to the typically filtered and dehumidified air environment entering the charcoal beds.

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 the response to RAI 10505-R1, Question 6, and finds them acceptable because (1) when the charcoal is changed, the charcoal filter plenum spray nozzles will be visually inspected to verify no obstructions, damage, or clogging and the charcoal filter plenum header will be visually inspected to verify piping is intact and no signs of distortion or damage; (2) plant-specific operating experience, visual inspections of 12 plenums when the charcoal was changed, identified no instances of failed acceptance criteria; and (3) plugging of the charcoal filter plenum spray nozzles is minimized by their configuration and the upstream high efficiency particulate filters and loss of material of the charcoal filter spray nozzles and header is minimized by the typical air environment entering the charcoal beds.

Exception 8. As supplemented by letter dated December 19, 2024 (ML24354A265), LRA Section B.2.21 includes an exception to the "detection of aging effects" program element related to trip testing pre-action valves. In lieu of trip testing the pre-action valves fully open every 3 years as specified in Section 13.4.3.2.3 of the 2011 Edition of NFPA 25, the applicant will trip test the pre-action valves with the isolation valves (equivalent to the control valve) closed every 18 months. In addition, the applicant will inspect the downstream piping to ensure it is free of material that could block sprinklers. The applicant noted that the Unit 1 main turbine driven pump bearings pre-action system is disassembled at the bearing housing for periodic maintenance during refueling outages and if corrosion or inorganic material was found it would be entered into the corrective action program. The applicant stated that the inspections of the portions of the water-based fire protection system components that are normally dry but periodically wetted and can't be drained or allow water to collect as described in *Enhancement 4* below, establish a baseline for ensuring the piping doesn't contain material that could block sprinklers. The applicant stated that trip testing the pre-action valves with the control valve fully open would allow water into normally dry portions of the system and may wet critical equipment. Finally, the applicant stated that it meets Footnote 10 of Table XI.M27-1 in Volume 2 of NURG 2191, which allows inspections and tests be performed on a refueling outage interval if plant-specific operating experience shows no loss of intended function due to the aging effects being managed. 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 pre-action valves will be trip tested with the isolation valves closed every 18 months, which does not exceed PNPP's refueling outage frequency, and plant-specific operating experience does not warrant more frequent testing; (2) activities will be performed to ensure downstream piping is free of material that could block sprinklers; and (3) the staff notes that NUREG-2191 removed the recommendation to conduct testing in accordance with NFPA 25, Section 13.4.3.2.3.

Exception 9. As supplemented by letter dated December 19, 2024 (ML24354A265), LRA Section B.2.21 includes an exception to the "detection of aging effects" program element related to flushing mainline strainers until clear. The applicant stated that discharge cannot be directly viewed because the strainer flush lines are connected to the floor drain system piping. In addition, the applicant stated that the flush water flowrate is limited to prevent backup of floor drains. 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 flush water can be viewed through a sight glass on the flush connection; (2) full flow tests of each fixed open spray system performed every refueling outage includes flushing the associated mainline strainer; (3) strainers are cycled two turns to ensure debris removal during flushing; and (4) and plant-specific operating experience has demonstrated strainers have been maintained without significant blockage.

Enhancement 1. As supplemented by letters dated December 19, 2024, and March 20, 2025 (ML24354A265 and ML25079A062), LRA Section B.2.21 includes an enhancement to the "detection of aging effects" program element related to including inspections and tests consistent with Table 4a of Appendix L in LR-ISG-20212-02 as delineated below. (Note that the item numbering below reflects the bullets as they appear in LRA Table A.3, “License Renewal Commitments,” as supplemented by letter dated March 20, 2025 (ML25079A062)):

(a) Updating procedures to require visual inspection of all in-scope sprinklers, including sprinklers protecting safe shutdown equipment on an 18-month frequency.

(b) Revising periodic sprinkler inspection criteria to be consistent with Section 5.2.1.1.1 of the 2011 Edition of NFPA 25 to require sprinklers be free of corrosion, foreign materials, paint, and be installed in the correct orientation.

(c) Revising program instructions to require replacement of inoperable sprinklers when they show signs of leakage, corrosion, physical damage, loss of fluid in glass bulb, paint (unless painted by manufacturer), and incorrectly installed; and cleaning dust loaded sprinklers in accordance with Annex A of the 2011 Edition of NFPA 25.

(d) Replacing or testing sprinklers in accordance with Section 5.3.1 of the 2011 Edition of NFPA 25.

(e) Revise or develop procedures to require main drain testing of 20 percent of standpipe systems every refueling outage.

(f) Revising program documentation to indicate that tests generating maximum available flows are allowed when there are no means to conduct full flow tests of underground piping that supplies sprinkler, standpipe, and water spray systems consistent with Section 7.3.1.1 of the 2011 Edition of NFPA 25.

(g) Revising program documentation to require flow tests to be representative of those expected during a fire and to investigate indications of deteriorating pipe friction loss characteristics, to ensure the required flow and pressure are available for fire protection.

(h) Revising program documentation to require a 60-minute fire hydrant drainage limit consistent with Section 7.3.2.4 of the 2011 Edition of NFPA 25.

(i) Revising test instructions to state dry barrel hydrants that have plugged drains and are in areas subject to freezing need to be pumped after operation.

(j) Requiring identification and correction of the cause of any 10 percent reduction in full flow pressure observed during main drain testing.

(k) Revising program documentation to require mainline strainers in nozzles of water spray fixed systems be removed, inspected for damage and corroded parts, and cleaned every 5 years consistent with Section 10.2.1.7 of the 2011 Edition of NFPA 25; and adverse findings will be entered into the corrective action program for evaluating the need for an increased inspection frequency and for trending. The staff notes that the applicant clarified aspects of this enhancement in its response to RAI 10505-R1, Question 7, above.

(l) Revising program documentation to require flushing of mainline strainers after each actuation of a water spray fixed system.

(m) Revising program documentation to require draining and flushing the foam liquid storage tank every 10 years.

(n) Adding documentation to meet Sections 14.2 and 14.3 of the 2011 Edition of NFPA 25 related to internal piping inspections and obstruction investigations. The staff notes that the applicant clarified aspects of this enhancement in its response to RAI 10505-R1, Question 8.

The staff notes that Footnote 10 for Table XI.M27-1 in Volume 2 of NUREG-2191 would allow these inspections to be performed on a refueling outage interval if plant-specific operating experience has shown no loss of intended function of the specific component due to the aging effects being managed. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because when it is implemented the program's inspection and testing, as noted above in items a), b), c), d), f), g), h), i), j), k), l), and m) will be performed in accordance with the recommendations in GALL-LR Report AMP XI.M27, as revised by LR-ISG-2012-02. For Enhancement 1(a), plant-specific operating experience did not identify the need to increase the sprinkler inspections to annually. For Enhancement 1(e) see the discussion of *Exception 3* above. For Enhancement 1(n) see the discussion of RAI 10505-R1, Question 8 above. (Commitment No. 21.1)

Enhancement 2. As supplemented by letter dated December 19, 2024 (ML24354A265), LRA Section B.2.21 includes an enhancement to the "parameters monitored or inspected" and "detection of aging effects" program elements related to internal surfaces of underground or buried piping. The staff reviewed this enhancement against the corresponding program elements in the associated AMP and finds it acceptable because when it is implemented it will be consistent with the GALL-LR Report AMP XI.M27, as revised by LR-ISG-2012-02, recommendations for extrapolating inspection results from aboveground locations with similar environments and materials to evaluate the conditions of the underground or buried piping. (Commitment No. 21.2)

Enhancement 3. As supplemented by letter dated June 27, 2024 (ML24180A010), LRA Section B.2.21 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 and follow-up volumetric examinations will be consistent with GALL-LR Report AMP XI.M27, as revised by LR-ISG-2012-02. (Commitment No. 21.3)

Enhancement 4. As supplemented by letters dated June 27, 2024, December 19, 2024, and March 20, 2025 (ML24180A010, ML24354A265, and ML25079A062), LRA Section B.2.21 includes an enhancement to the "parameters monitored or inspected," "detection of aging effects," and "operating experience" program elements related to augmented tests and inspections of portions of the water-based fire protection system components that are normally dry but periodically wetted and can't be drained or allow water to collect. Specifically, the applicant will (1) inspect 100 percent of the piping segments that are normally dry but periodically wetted and can't be drained or allow water to collect 5 years prior to the PEO; (2) the segments will be cleaned and minimum wall thickness measurements will be taken if, during the 100 percent inspection, any of the segments are found to contain material that could block sprinklers; (3) results are entered into the corrective action program; (4) dry sprinkler system actuations will be monitored and recorded; and (5) prior to placing the system back into service, any dry sprinkler systems that actuate will be inspected, water eliminated, and inspected in accordance with Section 14.2.1 of the 2011 Edition of NFPA 25. The staff notes that GALL-LR Report AMP XI.M27, as revised by LR-ISG-2012-02, states, "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 are necessary." The staff reviewed this enhancement against the corresponding program elements 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 revised by LR-ISG-2012-02. (Commitment No. 21.4)

Enhancement 5. As supplemented by letters dated June 27, 2024, December 19, 2024, and March 20, 2025 (ML24180A010, ML24354A265, and ML25079A062), LRA Section B.2.21 includes an enhancement to the “detection of aging effects” program element related to revising procedures or developing new procedures related to the diesel driven fire pump coolant heat exchanger. The staff’s evaluation of this enhancement is documented above in its evaluation of the applicant’s response to RAI 10332-R1, Question 1. (Commitment No. 21.5)

Enhancement 6. As supplemented by letter dated December 19, 2024 (ML24354A265), LRA Section B.2.21 includes an enhancement to the “acceptance criteria” program element related to foreign organic or inorganic material to obstruct pipe or sprinklers. 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 be consistent with the recommendations in GALL-LR Report AMP XI.M27, as revised by LR-ISG-2012-02, to remove foreign organic or inorganic material, and to determine and correct their source. (Commitment No. 21.6)

Enhancement 7. As supplemented by letters dated June 27, 2024, and December 19, 2024 (ML24180A010 and ML24354A265), LRA Section B.2.21 includes an enhancement to “parameters monitored or inspected,” “detection of aging effects,” and “acceptance criteria” program elements related to the Fire Water System program managing recurring internal corrosion. The staff reviewed this enhancement against the corresponding program elements in the associated AMP and finds it acceptable because when it is implemented the program will be capable of managing recurring internal corrosion because it will (1) perform periodic nonintrusive pipe thickness measurements in above ground or underground (not buried), wetted, metallic Fire Water System piping every four years; (2) the four year sample will include at least three locations for a total of 100 feet of piping; (3) locations will be selected based on susceptibility to corrosion, proximity to safety related or high-risk equipment, and flow testing, periodic flushes, or prior wall thickness measurements show evidence of performance degradation; (4) the method will be used to detect localized degradation in pipe wall thickness (e.g., Low Frequency Electromagnetic Technique) and then followed up with ultrasonic testing or phased array testing; (5) significant findings are any wall thickness less than minimum wall or localized wall thickness more than 50 percent less when compared to its surroundings; and (6) significant findings are entered into the corrective action program to determine corrective actions. (Commitment No. 21.7)

Enhancement 8. As supplemented by letters dated June 27, 2024, and December 19, 2024 (ML24180A010 and ML24354A265), LRA Section B.2.21 includes an enhancement to the “preventive actions” program element related to augmenting the program to determine the corrosion mechanisms causing leaks, when practical, and entering the results into the corrective action program. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because when it is implemented the program, when practical, will determine the corrosion mechanism(s) for existing leaks not yet repaired and subsequent leaks, and the results will be entered into the corrective action program to determine future actions and adjustments to augmented inspection periods. (Commitment No. 21.8)

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, amendments, and the applicant's response to RAI 10332-R1, Questions 1 and 2, and RAI 10505-R1, Questions 1 - 9, 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 AMP XI.M27 are consistent with the corresponding program elements of GALL-LR Report AMP XI.M27, as revised by LR-ISG-2012-02 and LR-ISG-2013-01. The staff also reviewed the exceptions associated with the "detection of aging effects" program element, 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 "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.2.21 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 (ML24239A778), 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 PEO. In its response to RAI 10505-R1, Question 9 (ML25079A062), the applicant modified *Enhancement 5* (Commitment No. 21.5) to include internal inspection of the diesel driven fire pump coolant heat exchanger tubes for fouling every 6 years with remediation of adverse conditions (e.g., cleaning or replacement of affected components) based on the October 2024 operating experience related to diesel driven fire pump coolant heat exchanger tube fouling. 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.

UFSAR Supplement. As supplemented by letter dated March 20, 2025 (ML25079A062), LRA Section A.1.21 provides the UFSAR supplement for the Fire Water System program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in Table 3.0-1 of LR-ISG-2012-02. The staff also noted in LRA Table A.3 that the applicant committed to enhance the Fire Water System program by May 8, 2026. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Fire Water System program, the staff concludes that those program elements for which the applicant claimed consistency with the 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 PEO, 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 PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.11 Flow-Accelerated Corrosion Program

LRA Section B.2.22 states that the Flow-Accelerated Corrosion Program is an existing condition monitoring program that, with enhancement, 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." The applicant also stated that Perry's program complies with the NSAC-202L guidelines endorsed in NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report.

Staff Evaluation. During its audit, 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.M17.

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

Enhancement 1. LRA Section B.2.22 includes an enhancement to the "scope of program," "parameters monitored or inspected," and "detection of aging effects" program elements, relating to (1) the inclusion of pump casings and valve bodies (pressure-retaining portions) in susceptible systems and (2) the performance of opportunistic inspections during routine maintenance activities. The staff reviewed the changes associated with this enhancement, against the corresponding program elements in GALL-LR Report AMP XI.M17 and finds them acceptable because the applicant upgraded the associated portions of the program to be consistent with program guidance for the subsequent license renewal (i.e., 60–80 year) program. The staff notes that NUREG-2191 encompasses all the guidance applicable to initial license renewal, and that future applicants for initial license renewal may voluntarily choose to reference an AMP in the GALL-LR Report in their applications.

Based on a review of the LRA and as verified during its audit of the program, 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.M17, as modified by LR-ISG-2012-01. The staff also reviewed the enhancement associated with the "scope of program," "parameters monitored or inspected," and "detection of aging effects" program elements and finds that the proposed changes will make the AMP adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.22 summarizes operating experience related to the Flow-Accelerated Corrosion Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant operating experience information to: (1) identify examples in the applicant's corrective action program database where management of aging effects associated with the program had not been previously considered in the GALL-LR Report 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 PEO.

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 Flow-Accelerated Corrosion Program was evaluated.

UFSAR Supplement. LRA Section A.1.22 provides the UFSAR supplement for the Flow-Accelerated Corrosion Program. The staff reviewed this UFSAR 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 complete the enhancement discussed above by May 8, 2026. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Flow-Accelerated 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 reviewed the enhancement and finds that with the enhancement the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.12 Fuel Oil Chemistry

LRA Section B.2.23 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."

Staff Evaluation. During its audit (ML24239A778), the staff reviewed 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," 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 evaluation of these exceptions and enhancements is as follows.

Enhancement 1. LRA Section B.2.23 includes an enhancement to the "preventive actions" and "detection of aging effects" program elements which relates to additional information that will be placed in periodic maintenance tasks. Periodic Maintenance tasks for the Diesel Fire Pump Fuel Oil Storage Tank will be revised to reflect that the minimum required schedule for inspections to satisfy Aging Management Program requirements are consistent with a 10-year interval. The staff reviewed this enhancement, against the corresponding program elements in GALL-LR Report AMP XI.M30 and finds it acceptable because when it is implemented it will be consistent with the recommendations of the GALL-LR Report.

Enhancement 2. LRA Section B.2.23 includes an enhancement to the "detection of aging effects" program element which relates to the volumetric inspection procedure which will be performed if visual inspection is not possible, or evidence of degradation is observed during visual inspection. The staff reviewed this enhancement, against the corresponding program elements in GALL-LR Report AMP XI.M30 and finds it acceptable because when it is implemented it will be consistent with the recommendations of the GALL-LR Report.

The staff conducted an audit to verify the applicant's claim of consistency with 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 the applicant claimed consistency with the GALL-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M30. 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.2.23 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 (ML24239A778), the staff reviewed search results 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 PEO.

The staff did not identify any OE indicating that applicant should modify its proposed program beyond that incorporated during the development of the LRA. 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.

UFSAR Supplement. LRA Appendix A, Section A.1.23 provides the UFSAR supplement for the Fuel Oil Chemistry program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-LR Report Table XI-01. The staff also noted that Applicant committed to ongoing implementation of the existing Fuel Oil Chemistry program for managing the effects of aging for applicable components during the PEO. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Fuel Oil 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 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 PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.13 Non-EQ Inaccessible Power Cables

LRA Section B.2.32 states that the Non-EQ Inaccessible Power Cables Program is an existing program that, with enhancements, will be consistent with the program elements in the GALL-LR Report AMP XI.E3, "Inaccessible Power Cables Not Subject 10 CFR 50.49 Environmental Qualification Requirements."

Staff Evaluation. During its audit (ML24239A778), 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.E3.

The staff also reviewed the portions of the "preventive actions," "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 evaluation of these enhancements are as follows.

Enhancement 1. LRA Section B.2.32 includes an enhancement to the "preventive actions" and "parameters monitored/inspected" program elements which relates to the installation of dewatering sump pumps and alarms in all electrical manholes containing cabling with a license renewal intended function. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.E3 and finds it acceptable because when it is implemented it will be consistent with AMP XI.E3 and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of the inaccessible power cables within the scope of the AMP will be maintained consistent with CLB.

Enhancement 2. LRA Section B.2.32 includes an enhancement to the "preventive actions" program element which relates to the implementation of daily operator rounds to confirm sump pumps and associated alarms are operable. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI. E3 and finds it acceptable because when it is implemented it will be consistent with AMP XI.E3 and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of the inaccessible power cables within the scope of the AMP will be maintained consistent with CLB.

Enhancement 3. LRA Section B.2.32 includes an enhancement to the "preventive actions" element which relates to the performance of inspections at least annually to determine that cables are not wetted or submerged, that cables/splices and cable support structures are intact, and that sump pumps and associated alarms operate properly. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.E3 and finds it acceptable because when it is implemented it will be consistent with AMP XI.E3 and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of the inaccessible power cables within the scope of the AMP will be maintained consistent with CLB.

Enhancement 4. LRA Section B.2.32 includes an enhancement to the "parameters monitored/inspected" and "detection of aging effects" program elements which relates to the enhancement of maintenance plans to ensure that all underground in-scope cables greater than 400V are tested every 6 years and after any exposure to significant moisture (i.e., wetting or submergence lasting more than a few days). The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.E3 and finds it acceptable because when it is implemented it will be consistent with AMP XI.E3 and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of the inaccessible power cables within the scope of the AMP will be maintained consistent with CLB.

Operating Experience. LRA Section B.2.32 summarizes OE related to the Non-EQ Inaccessible Power Cables Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed 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 PEO. 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 Non-EQ Inaccessible Power Cables Program was evaluated.

UFSAR Supplement. LRA Section A.1.32 provides the UFSAR supplement for Non-EQ Inaccessible Power Cables Program. The staff reviewed this UFSAR 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 complete the following enhancements to the existing Non-EQ Inaccessible Power Cables Program by May 8, 2026, for managing the effects of aging for applicable components:

(1) Dewatering sump pumps and alarms will be installed in all electrical manholes containing cable with a license renewal intended function.

(2) Daily operator rounds will confirm that sump pumps and associated alarms are operable. When the high-water-level alarm has been on 2 days in a row, the need for supplemental pumps will be evaluated. When a high level has occurred three days in a row, supplemental pumps will be used, as needed, and an engineering evaluation of affected power cable ≥400 V in that manhole will be performed. The evaluation may use testing as a diagnostic tool but will consider the significance of the inspection results, the functionality of affected component, potential reportability of the event, the extent of the concern, the potential causes for not meeting the inspection criteria, the corrective actions required, and the likelihood of recurrence.

(3) Inspections will be conducted at least annually to determine that cables are not wetted or submerged, that cables/splices and cable support structures are intact, and that sump pumps and associated alarms operate properly.

(4) Maintenance plans will be enhanced to ensure all underground in-scope cable ≥400 V is tested every 6 years and after any exposure to significant moisture (wetting or submergence lasting more than a few days).

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

Conclusion. Based on its review of the applicant's Non-EQ Inaccessible Power Cables 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 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 PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.14 Non-EQ Insulated Cables and Connections

LRA Section B.2.34 states that the Non-EQ Insulated Cables and Connections Program is an existing program that, with enhancements, will be consistent with the program elements in the GALL-LR Report AMP XI.E1, “Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.” The applicant supplemented this LRA section with a letter dated October 2, 2024 (ML24276A083).

Staff Evaluation. During its audit (ML24239A778), 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.E1.

The staff also reviewed the portions of the “parameters monitored or inspected” program element associated with an enhancement to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of this enhancement is as follows.

Enhancement 1. LRA Section B.2.34 includes an enhancement to the “parameters monitored or inspected,” program element which relates to the inclusion of a plant-specific procedure for plant walkdowns of adverse localized environments. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.E1 and finds it acceptable because when it is implemented it will be consistent with AMP XI.E1 and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of the electrical insulation cables and connections within the scope of the AMP will be maintained consistent with CLB.

Operating Experience. LRA Section B.2.34 summarizes OE related to the Non-EQ Insulated Cables and Connections Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results 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 PEO. 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 Non-EQ Insulated Cables and Connections Program was evaluated.

UFSAR Supplement. LRA Section A.1.34 provides the UFSAR supplement for the Non-EQ Insulated Cables and Connections Program. The staff reviewed this UFSAR 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 enhance its existing program to include a plant-specific procedure for plant walkdowns of adverse localized environments by May 8, 2026, for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Non-EQ Insulated Cables and Connections 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, with the enhancement when implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.15 Protective Coating Monitoring and Maintenance

The LRA states that AMP B.2.38, "Protective Coating Monitoring and Maintenance," is an existing program that, with enhancement, will be consistent with the program elements in NUREG-1801, Section XI.S8, "Protective Coating Monitoring and Maintenance."

Staff Evaluation. During its audit (ML24239A778), the staff reviewed the applicant's claim of consistency with the GALL 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 "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements associated with the enhancement to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of the enhancement is as follows.

Enhancement 1. LRA Section B.2.38 includes an enhancement to ensure that the Protective Coating and Monitoring and Maintenance Program complies with ASTM 5163-08. This enhancement will affect the "parameters monitored or trended," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.S8 and finds it acceptable because when it is implemented it will be consistent with the recommendations in the GALL-LR Report.

Operating Experience. LRA Section B.2.38 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 (ML24239A778), the staff conducted an independent 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 PEO. 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.

UFSAR Supplement. LRA Section A.1.38 provides the FSAR supplement for the Protective Coating Monitoring and Maintenance program. The staff reviewed this UFSAR 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 PEO. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Protective Coating Monitoring and Maintenance 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 PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.16 Reactor Head Closure Stud Bolting

LRA Section B.2.39 states that the Reactor Head Closure Stud Bolting AMP 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," except for the exception identified in the LRA. The applicant amended this LRA section by letter dated 06 27 2024 (ML24180A010).

Staff Evaluation. During its audit (ML24239A778), 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" program element associated with an exception and enhancement to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of the exception and enhancement are as follows:

Exception 1. LRA section B.2.39 includes an exception to the "preventive actions" program element related to the suggestion to limit the yield strength of the reactor head closure studs to less than 150 kilo-pounds per square inch (ksi). GALL-LR Report AMP XI.M3 places limits on the yield strength values of the reactor head closure studs to reduce susceptibility of the studs to SCC or intergranular stress corrosion cracking (IGSCC), which is more likely to occur as material strength increases beyond the limited values. The applicant stated the reactor head closure studs are assumed to have an actual yield strength of greater than 150 ksi. The applicant is therefore taking exception to the recommendation in the GALL-LR Report AMP XI. M3 that specifies an actual measured yield strength less than 150 ksi of the existing reactor head closure studs.

The staff reviewed this exception against the corresponding program elements in GALL-LR Report AMP XI.M3 and finds it acceptable for the following reasons:

(1) There were no relevant indications identified by ISI 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, using acceptable stud surface treatments, and using stable lubricants are met.

(4) Implementation of the enhancement (evaluated in the next paragraph) will ensure that any replacement bolts will have the yield strength necessary to be consistent with the recommendations in GALL-LR Report AMP XI.M3.

Enhancement 1. LRA Section B.2.39 includes an enhancement to the “preventive actions” program element, which relates to the procurement of new reactor head closure studs to limit yield strength to less than 150 ksi. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M3 and finds it acceptable because when it is implemented it will bring the “preventive actions” program element in line with the suggested material properties to reduce the potential for SCC or IGSCC of the reactor head closure studs.

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 exception and the enhancement associated with the “preventive actions” program element and the justification, and finds that the AMP, with the exception and enhancement, is adequate to manage the applicable aging effects.

Operating Experience. LRA Section B.2.39 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 (ML24239A778), the staff reviewed search results 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 PEO. 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 Reactor Head Closure Stud Bolting AMP was evaluated.

UFSAR Supplement. LRA Section A.1.39 provides the UFSAR supplement for the Reactor Head Closure Stud Bolting Aging Management Program. The staff reviewed this UFSAR 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 for managing the effects of aging for applicable components during the PEO. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s Reactor Head Closure Stud Bolting AMP, the 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 enhancement and finds that, with the exception and enhancement 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 PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.17 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants

LRA Section B.2.41 describes the existing Regulatory Guide (RG) 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants" as consistent, with enhancements, with GALL-LR Report AMP XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants."

The LRA states that the existing program consists of periodic inspections based on RG 1.127, Rev. 1 guidance for the intake and discharge control structures, the associated intake and discharge tunnels, and other water-control structures associated with the ESW system. Program inspections include concrete and steel structures and components associated with the ESW system, predominantly from the multi-port intake structure through the ESW pumphouse, including intake and alternate intake tunnels, associated tunnel riser shafts, sluice gates, screens, discharge tunnel, and discharge structure.

The LRA also states that the program will be enhanced to include managing the aging effects associated with the ESW swale, and the flood mitigation features of the major stream, remnant minor stream, and the diversion stream channel.

<u>Staff Evaluation</u>. During its audit (ML24239A778), the staff reviewed the applicant's claim of consistency with the GALL-LR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-LR Report AMP XI.S7. The staff also reviewed the portions of the "scope of program," "preventive actions," "parameters monitored or inspected," "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 evaluation of these enhancements follows.

<u>Enhancement 1</u>. LRA Section B.2.41 includes an enhancement to the "scope of program." Specifically, the enhancement states:

> The scope of the program will be enhanced to manage aging effects associated with the ESW swale, and the flood mitigating features of the major stream, major stream culvert, remnant minor stream, and the diversion stream channel and diversion stream berm. The program implementing procedure will also include a listing of these earthen structures that are within the scope of license renewal. The program implementing procedure will also include a listing of existing procedures/instructions that are credited to manage the aging effects of water-control structures that are within the scope of this aging management program. Parameters monitored will include settlement, depressions, sink holes, slope stability (e.g., irregularities in alignment and variances from originally constructed slopes), seepage, proper functioning of drainage systems, and degradation of slope protection features.
>
> The aging effects associated with concrete are loss of material, cracking, and various changes in material properties (that is, loss of bond, increase in porosity and permeability, reduction of strength, and differential settlement). The aging effects associated with earthen structures (rock, stone and soil) are loss of form and loss of material. The aging effects associated with wooden clamps supporting the electrical cables in manholes are a change in material properties due to weathering, chemical degradation, insect infestation, repeated wetting and drying, fungal decay.

The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S7 and finds it acceptable because when it is implemented it will address additional structures within the scope of license renewal that are not covered by other structural AMPs. This enhancement makes the applicant's "scope of program" program element consistent with the recommendations provided in GALL-LR Report AMP XI.S7 to monitor and assess the impact of age-related degradation on in-scope structures, and to provide assurance that the age-related degradation can be detected and quantified before there is a loss of intended function(s).

Enhancement 2. LRA Section B.2.41 includes an enhancement to the "preventive action." Specifically, the enhancement states that the program will be enhanced to include the preventive actions delineated in NUREG-1339 and in EPRI NP-5769, NP-5067, and TR-104213 that emphasize proper selection of bolting material, installation torque or tension, and the use of lubricants and sealants for high strength bolting (actual measured yield strength greater than or equal to 150 kilo-pounds per square inch (ksi)).

The applicant also stated that they will revise plant procedures to include the preventive actions for storage of high strength bolting (actual measured yield strength greater than or equal to 150 ksi) from Section 2 of Research Council for Structural Connections publication, Specification for Structural Joints Using ASTM A325 or A490 Bolts.

The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S7 and finds it acceptable because when it is implemented it will include preventive actions for storage, as recommended by the GALL-LR Report, to ensure bolting integrity.

Enhancement 3. LRA Section B.2.41 includes an enhancement to the "parameters monitored or inspected." Specifically, the enhancement states:

> The program will be enhanced to include monitoring and inspection of the major stream culvert, and the flood mitigation features of the major stream, remnant minor stream, the diversion stream berm and channel, and the ESW swale. The program implementing procedure will also include a listing of these earthen structures that are within the scope of license renewal. The program implementing procedure will also include a listing of existing procedures/instructions that are credited to manage the aging effects of water-control structures that are within the scope of this aging management program. Parameters monitored will include settlement, depressions, sink holes, slope stability (e.g., irregularities in alignment and variances from originally constructed slopes), seepage, proper functioning of drainage systems, and degradation of slope protection features. The applicant also stated that steel components are monitored for rust, erosion, corrosion, cavitation, and weld cracks.

The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.S7 and finds it acceptable because when it is implemented it will ensure that aging degradation leading to loss of intended function in the foundations (soil, concrete, etc.), steel structures and components will be detected and the extent of degradation determined, consistent with the recommendations provided in the "parameters monitored or inspected" program element of GALL-LR Report AMP XI.S7.

Enhancement 4. LRA Section B.2.41 includes an enhancement to the - "detection of aging effects." Specifically, the enhancement states:

The program will be enhanced to include monitoring and inspection of earthen embankment structures associated with the major stream, remnant minor stream and the new diversion stream channel including the inline spillway structure at the outfall of the new channel. The berm inspections will include the following items:

- identify if there are any wet areas, erosion, or slides
- identify if there are obstructions in the stream that could partially block or prevent flow
- identify bare spots needing re-vegetation
- locate any riprap or erosion protection that has been displaced
- identify cracks that may indicate potential excessive settlement (>1 foot) or slope instability
- identify any burrowing rodent holes that could impact the performance or stability of the berm

The staff reviewed this enhancement against the corresponding program element in GALL-LR Report AMP XI.S7 and finds it acceptable because when it is implemented it will ensure that aging degradation leading to loss of intended function of earthen embankment structures associated with the major stream, remnant minor stream and the new diversion stream channel including the inline spillway structure at the outfall of the new channel. The staff also find that the sampling and chemical analysis of ground water at least once every five years is included in the Structural Monitoring Program (AMP XI.S6), and with the recommendations provided in the "detection of aging effects" program element of GALL-LR Report AMP XI.S7.

Based on its audit, the staff finds that program elements 1 through 6 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 "scope of program," "preventive actions," "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.

<u>Operating Experience</u>. LRA Section B.2.41 summarizes OE related to the Regulatory Guide (RG) 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants." The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24239A778), the staff conducted an independent 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 PEO. 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 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program was evaluated.

<u>UFSAR Supplement</u>. LRA Section A.1.41 provides the UFSAR supplement for the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program. The staff reviewed this UFSAR 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 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program for managing the effects of aging for applicable components during the PEO.

<u>Conclusion</u>. On the basis of its audit and review of the applicant's RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program, the staff determines that those program elements for which the applicant claimed consistency with the GALL-LR Report are consistent. Also, the staff reviewed the enhancements and concluded that their implementation prior to the PEO will make the AMP adequate to manage the applicable aging effects. Based on its review of the applicant's RG 1.127, 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 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 PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.18 Selective Leaching

LRA Section B.2.42 states that the Selective Leaching Program is a new program that will be consistent with the program elements in the GALL-LR Report AMP XI.M33, "Selective Leaching," as revised by LR-ISG-2011-03, "Changes To The Generic Aging Lessons Learned (GALL) Report Revision 2 Aging Management Program XI.M41, 'Buried And Underground Piping And Tanks,'" and LR-ISG-2015-01, "Changes to Buried and Underground Piping and Tank Recommendations," except for the exception identified in the LRA. The applicant amended this LRA section by letter dated September 5, 2024 (ML24249A123). The staff noted that changes provided in the September 5, 2024, letter superseded changes in the July 3, 2024, (ML24185A092) and August 8, 2024, (ML24221A093) letters.

<u>Staff Evaluation</u>. During its audit (ML24239A778), 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.M33, as revised by LR-ISG-2011-03 and LR-ISG-2015-01.

The staff also reviewed the portions 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 follows.

<u>*Exception 1*</u>. As amended by letter dated September 5, 2024, LRA Section B.2.42 includes an exception to the "scope of program" program element related to not managing loss of material due to selective leaching for materials exposed to contaminated fuel oil and water-contaminated lube oil. During its review, the staff noted water-contaminated fuel and lube oil environments were removed from the scope of AMP XI.M33 with the issuance of the GALL-LR Report. The staff reviewed this exception and finds it acceptable because although it is not consistent with license renewal guidance, it is consistent with subsequent license renewal guidance.

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.M33, as revised by LR-ISG-2011-03 and LR-ISG-2015-01. The staff also reviewed the exception between the applicant's program and GALL-LR Report AMP XI.M33 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.

Operating Experience. As amended by letter dated September 5, 2024, LRA Section B.2.42 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 (ML24239A778), the staff reviewed search results 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 PEO.

The staff identified OE related to (1) gray cast iron components exposed to raw water, (2) gray cast iron components exposed to soil, and (3) ductile iron components exposed to soil for which it determined the need for additional information. However, prior to the issuance of an RAI, the applicant provided the Plant-Specific Periodic Inspections for Selective Leaching Program by letter dated September 5, 2024, to manage loss of material due to selective leaching for these material and environment combinations. The staff's evaluation of the Plant-Specific Periodic Inspections for Selective Leaching Program is documented in SE Section 3.0.3.3.1. 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 Selective Leaching Program was evaluated.

UFSAR Supplement. As amended by letter dated September 5, 2024, LRA Section A.1.42 provides the UFSAR supplement for the Selective Leaching Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted the applicant committed to implement the new Selective Leaching Program within five years of, and no later than 6 months prior to, the PEO for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's 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 also reviewed the exception and finds that with the exception 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 PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.19 Structures Monitoring

LRA Section B.2.43 states that the Structures Monitoring program is an existing program with enhancements that will be consistent, with the program elements in the GALL-LR Report AMP, XI.S6, "Structures Monitoring." The applicant amended this LRA section by letters dated July 24, 2024, October 31, 2024, and November 19, 2024, December 19, 2024, and February 5, 2025.

Staff Evaluation. During its audit (ML24239A778), 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.

The staff also reviewed the portions of the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of 35 enhancements is as follows.

Enhancement 1. LRA Section B.2.43 includes an enhancement to the "scope of program" program element which relates to enhancing the program implementing procedure to include an attachment listing names and/or unique identifiers of structures and structural bulk commodities (including plant systems containing the bulk commodities) within the scope of the Structures Monitoring program. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), 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 include all the structures and structural bulk commodities within the scope of the program.

Enhancement 2. LRA Section B.2.43 includes an enhancement to the "scope of program" program element which relates to enhancing the program implementing procedure to include an attachment listing the supporting procedures, instructions, and maintenance plans that are credited to manage the aging effects of structures and structural bulk commodities within the scope of the Structures Monitoring program. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented it will provide guidance for the applicant to monitor all of the structures and structural bulk commodities within the scope of the program.

Enhancement 3. LRA Section B.2.43 includes an enhancement to the "scope of program" program element which relates to enhancing the program to include the porous concrete sub-foundation and the porous concrete pipe associated with the plant underdrain system. The staff reviewed UFSAR Section 2.4.13.5.1 and UFSAR Figures 2.4-68, "plot plan – porous concrete underdrain system," Figure 2.4-69, "plot plan – gravity discharge system," and Figure 2.4-70, "cross sections – pressure relief underdrain system," and finds that the plant underdrain system consists of a porous concrete blanket, nominally one foot thick, which underlies all of the structures of the nuclear island. Between some of the buildings and around the perimeter of the

nuclear island, the blanket is increased in thickness to incorporate a one foot diameter, porous concrete pipe. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150) and LRA Supplement 7 (ML24354A265), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented it will expand the scope of the program to include these components determined to be in-scope for license renewal.

Enhancement 4. LRA Section B.2.43 includes an enhancement to the "scope of program" program element which relates to enhancing the program implementing procedure to include in-scope nonsafety-related/non-seismic masonry walls. The staff reviewed LRA Section B.2.43 and finds that the scope of the Structures Monitoring program includes the in-scope nonsafety-related/non-seismic masonry walls. In addition, the staff reviewed this enhancement, as modified by the applicant's response to Question 1 of RAI 10327-R1 (ML24324A185), LRA Supplement 3 (ML24206A150), and LRA Supplement 7 (ML24354A265), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented it will expand the scope of the program to include in-scope nonsafety-related/non-seismic masonry walls determined to be in-scope for license renewal, which is consistent with the GALL-LR Report AMP XI.S5.

Enhancement 5. LRA Section B.2.43 includes an enhancement to the “scope of program” program element which relates to enhancing the program to include plant storm drain piping. The staff reviewed LRA Section 2.3.3.58, “storm drain and sewer” and finds that plant storm drain piping consists of steel (corrugated metal), reinforced concrete and polymer piping. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented it will expand the scope of the program to include plant storm drain piping determined to be in-scope for license renewal.

Enhancement 6. LRA Section B.2.43 includes an enhancement to the “scope of program” program element which relates to enhancing the program implementing procedure to include unimpregnated and impregnated (with elastomer) fiberglass fabric. The staff reviewed this enhancement, as modified by LRA Supplement 7 (ML24354A265), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented it will expand the scope of the program to include unimpregnated and impregnated (with elastomer) fiberglass fabric determined to be in-scope for license renewal.

Enhancement 7. LRA Section B.2.43 includes an enhancement to the “scope of program” program element which relates to enhancing the program to inspect accessible areas of concrete for signs of alkali-silica reaction (ASR). The staff reviewed this enhancement, as confirmed by the applicant’s response to RCI-10331-R1 (ML24305A134) and modified by LRA Supplement 3 (ML24206A150) and LRA Supplement 7 (ML24354A265), 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 monitor or inspect concrete components for potential ASR.

Enhancement 8. LRA Section B.2.43 includes an enhancement to the “preventive actions” program element which relates to enhancing the program to include preventive actions for proper selection of bolting material, installation torque or tension, and the use of lubricants and sealants for high strength bolting. 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 preventive actions are in accordance with applicable industry guidelines and to ensure that structural bolting integrity is maintained.

Enhancement 9. LRA Section B.2.43 includes an enhancement to the “preventive actions” program element which relates to enhancing the program to include preventive actions for storage, lubricants, and stress corrosion cracking potential consistent with the requirements of Section 2 of Research Council for Structural Connections publication “Specification for Structural Joints Using ASTM A325 or A490 Bolts,” and prohibiting the use of molybdenum disulfide (MoS2) from structural high strength bolts. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), 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 that preventive actions are in accordance with applicable industry guidelines to maintain structural bolting integrity during the PEO, and no MoS2 will be applied to structural high strength bolts within the scope of license renewal.

Enhancement 10. LRA Section B.2.43 includes an enhancement to the “preventive actions” program element which relates to enhancing the program to include a preventive action for cleaning and inspection of storm drain piping. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented the program will clean and inspect storm drain piping on a frequency not to exceed 5 years to ensure that its intended function is maintained.

Enhancement 11. LRA Section B.2.43 includes an enhancement to the “parameters monitored or inspected” program element which relates to enhancing the program implementing procedures to include the following parameters monitored or inspected for the porous concrete sub-foundation such as: (1) loss of material; (2) change in material properties; (3) increase in porosity and permeability, loss of strength; and (4) reduction of foundation strength and cracking due to differential settlement and erosion of the porous concrete sub-foundation. The staff reviewed this enhancement, as modified by the applicant’s response to Question 2 of RAI 10327-R1 (ML24324A185), LRA Supplement 3 (ML24206A150), and LRA Supplement 7 (ML24354A265), 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 monitor these aging effects of the porous concrete sub-foundation.

Enhancement 12. LRA Section B.2.43 includes an enhancement to the “parameters monitored or inspected” program element which relates to enhancing the program to monitor ground water chemistry and access its impact on below-grade concrete. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), 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 monitor ground water chemistry for pH, chlorides, and sulfates and to access its impact, if any, on below-grade concrete.

Enhancement 13. LRA Section B.2.43 includes an enhancement to the “parameters monitored or inspected” program element which relates to enhancing the program to monitor the aging effect of cracking due to SCC for high strength structural bolts. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), 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 monitor high strength structural bolts greater than 1 inch in diameter by supplementing visual inspections with volumetric or surface examinations to detect cracking due to SCC.

Enhancement 14. LRA Section B.2.43 includes an enhancement to the “parameters monitored or inspected” program element which relates to enhancing the program to include parameters monitored or inspected for accessible sliding surfaces. 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 detect significant loss of material due to wear or corrosion, debris, or dirt for accessible sliding surfaces.

Enhancement 15. LRA Section B.2.43 includes an enhancement to the “parameters monitored or inspected” program element which relates to enhancing the program to include parameters monitored or inspected for elastomeric components. 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 monitor elastomeric components supplemented by feel or manipulation for cracking, loss of material and hardening.

Enhancement 16. LRA Section B.2.43 includes an enhancement to the “parameters monitored or inspected” program element which relates to enhancing the program to include parameters monitored or inspected for plant storm drain piping. The staff reviewed LRA Section 2.3.3.58, “storm drain and sewer,” UFSAR Figure 2.4-3, “topography and storm drain composite,” and the applicant’s responses to Question 3 of RAI-10327-R1 (ML ML24324A185), and finds that: (1) the plant storm drain system is nonsafety related; (2) the materials for the plant storm drain piping include steel (corrugated metal), reinforced concrete and polymer; and (3) the plant storm drain piping is basically gravity pipe subject to very little internal pressure. Flow in the plant storm drain piping is mostly non-existent and when there is flow it is low velocity and not abrasive. The staff reviewed the aging effects of the plant storm drain piping described in the applicant’s responses to Question 3 of RAI-10327-R1 (ML24324A185) and Question 1 of RAI 10470 R-2 (ML25036A154) and considered whether the aging effects proposed by the applicant constitute all the applicable aging effects for this component, material, and environment description. The staff reviewed aging effects of the plant storm drain reinforced concrete and steel (corrugated metal) piping and finds that they are consistent with aging effects of concrete and steel components described in the GALL-LR Report (e.g., NUREG-1801 Items, III.A3.TP-67, III.A3.TP-212, III.A3.TP-108, and III.B4.TP-6.) The staff also reviewed the aging effects of the storm drain polymer piping and finds that they are consistent with the GALL-LR Report (e.g., NUREG-2191 Item V.A.E-477b). The staff notes that flow blockage in the storm drain piping is an applicable aging effect. Based on its review of the LRA, the GALL-LR Report and the NUREG-2191 guidance, the staff finds that the applicant has identified all credible aging effects for these component and material combinations.

The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150) and the applicant’s responses to Question 3 of RAI-10327-R1 (ML ML24324A185) and Question 1 of RAI 10470 R-2 (ML25036A154), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented the program will monitor unacceptable flow blockage in the storm drain piping, and also the following aging effects during opportunist excavations: (1) loss of material in steel (corrugated metal), concrete and polymer piping; (2) loss of material, cracking and blistering in polymer piping; and (3) cracking, change in material properties, increase in porosity and permeability; loss of strength, increase in porosity and permeability; cracking; loss of material (spalling, scaling), and loss of material (corrosion of embedded steel reinforcing) in concrete piping.

Enhancement 17. LRA Section B.2.43 includes an enhancement to the “parameters monitored or inspected” program element which relates to enhancing the program to include parameters monitored or inspected for the in-scope concrete structures. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150) and the applicant’s response to Question 1 of RAI 10470 R-2 (ML25036A154), 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 monitor the in-scope concrete structure for loss of material, cracking, change in material properties, increase in porosity and permeability; loss of strength, increase in porosity and permeability; cracking; loss of material (spalling, scaling), and loss of material due to corrosion of embedded steel reinforcing.

Enhancement 18. LRA Section B.2.43 includes an enhancement to the “parameters monitored or inspected” program element which relates to enhancing the program implementing documents to include parameters monitored or inspected for accessible areas of concrete for the signs of ASR. The staff reviewed this enhancement, as confirmed by the applicant’s response to RCI-10331-R1 (ML24305A134) and modified by LRA Supplement 7 (ML24354A265), 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 NUREG-2192 recommendations to monitor visual indications of aggregate reactions, such as “map” or “patterned” cracking, alkali-silica gel, exudations, surface staining, expansion causing structural deformation, relative movement or displacement, or misalignment/distortion of attached components.

Enhancement 19. LRA Section B.2.43 includes an enhancement to the “parameters monitored or inspected” program element which relates to enhancing the program implementing procedure to include parameters monitored or inspected for the in-scope masonry walls. The applicant claimed in its response to Question 1 of RAI-10327-R1 (ML24324A185) that cracking due to restraint shrinkage, creep, and aggressive environment is a not applicable aging effect for the in-scope nonsafety-related/non-seismic masonry walls and revised AMR item 3.5.1-70 to be not applicable in the LRA Supplement 7 (ML24354A265). The staff reviewed the applicant’s claim and finds it acceptable because: (1) masonry walls are located in the Fuel Oil Pump House and Spent Fuel Dry Storage Electrical Building that are isolated nonsafety-related, non-seismic Category I structures; (2) in-scope masonry walls do not meet the criteria of I.E. Bulletin 80-11; (3) Perry is located in an area with moderate rainfall and where the outdoor environment is not subject to industry air pollution or salt spray per LRA Section 3.6.2.2.2, therefore, the in-scope masonry walls are not subject to an aggressive environment; and d) there are no lateral restraints to the in-scope masonry walls and PNNP has no plant-specific operating experience related to cracking due to restraint shrinkage, creep, and aggressive environment. The staff reviewed the applicant’s response to Question 1 of RAI-10327-R1 (ML24324A185) and finds it acceptable because the applicant identified all the applicable aging effects of the in-scope masonry walls such as loss of material (spalling, scaling), change in material properties and cracking due to freeze-thaw, which are consistent with NUREG-1801 Item III.A5.TP-34.

The staff reviewed this enhancement, as modified by the applicant’s response to Question 1 of RAI-10327-R1 (ML24324A185) and LRA Supplement 7 (ML24354A265), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented the program will monitor the in-scope masonry walls for loss of material (spalling, scaling), change in material properties and cracking due to freeze-thaw, which is consistent with the GALL-LR Report AMP XI.S5.

Enhancement 20. LRA Section B.2.43 includes an enhancement to the “parameters monitored or inspected” program element which relates to enhancing the program implementing procedure to include parameters monitored or inspected for unimpregnated and impregnated (with elastomer) fiberglass fabric. The staff reviewed the aging effects of the unimpregnated and impregnated (with elastomer) fiberglass fabric described in the applicant’s responses to Question 5 of RAI-10327-R1 (ML24324A185) and LRA Supplement 7 (ML24354A265) 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 notes that NUREG-2191 addresses the same aging effects for a similar material and environment combination in V.E.E-477a, which states that the aging effects of hardening or loss of strength due to polymeric degradation (i.e., change in material properties); loss of material due to peeling, delamination, wear; cracking or blistering due to exposure to ultraviolet light, ozone, radiation, or chemical attack for polymetric piping and ducting components and seals exposed to air and condensation environments, among other applicable environments, are managed by the Structures Monitoring program. The staff further notes that NUREG-2191 addresses the same aging effects for fiberglass piping and ducting components exposed to air (i.e., VII.I.A-720). Based on its review of the LRA and the NUREG-2191 guidance, the staff finds that the applicant has identified all credible aging effects for this component, material, and environment combination.

The staff reviewed this enhancement, as modified by the applicant's response to Question 5 of RAI-10327-R1 (ML24324A185) and LRA Supplement 7 (ML24354A265), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented the program will monitor the unimpregnated and impregnated (with elastomer) fiberglass fabric for loss of material, separation, cracking/delamination, and change in material properties and visible deterioration.

Enhancement 21. LRA Section B.2.43 includes an enhancement to the "parameters monitored or inspected" program element which relates to enhancing the program implementing procedure to include parameters monitored or inspected for wooden clamps, which are consistent with NUREG-1801 Item III.A6.TP-223. The staff reviewed this enhancement, as modified by the applicant-initiated LRA update in the response to RAI 10470 R-2 (ML25036A154), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented the program will monitor the wooden clamps for loss of material and change in material properties.

Enhancement 22. LRA Section B.2.43 includes an enhancement to the "detect of aging effects" program element which relates to monitoring groundwater chemistry parameters. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), 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 monitor groundwater chemistry at a frequency not to exceed 5 years.

Enhancement 23. LRA Section B.2.43 includes an enhancement to the "detection of aging effects" program element which relates to enhancing the program to monitor the structures and structural components within the Structures Monitoring program. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), 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 monitor the structures and structural components within the Structures Monitoring program at a frequency not to exceed 5 years.

Enhancement 24. LRA Section B.2.43 includes an enhancement to the "detection of aging effects" program element which relates to enhancing the program to inspect the plant storm drain piping. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented the program will monitor the plant storm drain piping as follows: (1) 100 percent of internal surfaces by either direct visual observation or remote visual (camera) at one-time or spread out of various locations at least every 5 years; (2) external surfaces of the plant storm drain piping by direct visual observation during opportunistic excavations; (3) measurement of the steel piping thickness over a general area and not a point measurement reflective of a local pit or gouge either directly measured or non-destructive examination methods utilized; (4) storm drain system inspections following offsite agency confirmation that an earthquake has occurred in the area of the plant for any sign of ground settlement that could be an indication of storm drain piping collapse to ensure the integrity of the piping; and (5) internal inspections of the storm drain system for assurance of continued functionality immediately (within 30 days) following the occurrence of significant natural phenomena, such as large floods, earthquakes, hurricanes, tornadoes, and intense local rainfalls.

Enhancement 25. LRA Section B.2.43 includes an enhancement to the "detection of aging effects" program element which relates to enhancing the program implementing procedures to require evaluation of the acceptability of inaccessible areas and examination of representative samples of the exposed portions of below-grade concrete. The staff reviewed this enhancement, as confirmed by the applicant's response to RCI-10331-R1 (ML24305A134) and modified by LRA Supplement 7 (ML24354A265), 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 conduct evaluation of 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 and examine representative samples of the exposed portions of the below-grade concrete, when excavated for any reason.

Enhancement 26. LRA Section B.2.43 includes an enhancement to the "acceptance criteria" program element which relates to updating plant implementing procedures to prescribe quantitative acceptance criteria based on applicable codes and standards and consider industry and plant-specific operating experience. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), 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 include the acceptance criteria derived from applicable design bases codes and standards, considering industry and plant operating experience.

Enhancement 27. LRA Section B.2.43 includes an enhancement to the "acceptance criteria" program element which relates to updating the plant implementing procedures to include acceptance criteria for loose bolts or nuts and cracked high strength bolts. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), 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 accept loose bolts or nuts and cracked high strength based on engineering evaluation.

Enhancement 28. LRA Section B.2.43 includes an enhancement to the "acceptance criteria" program element which relates to updating the plant implementing procedures to include acceptance criteria for structural sealants. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), 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 accept structural sealants if the observed loss of material, cracking, and hardening will not result in loss of sealing.

Enhancement 29. LRA Section B.2.43 includes an enhancement to the "acceptance criteria" program element which relates to updating the plant implementing procedures to include acceptance criteria for elastomeric vibration isolation elements. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), 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 accept elastomeric vibration isolation elements if there is no loss of material, cracking, or hardening that could lead to the reduction or loss of isolation function.

Enhancement 30. LRA Section B.2.43 includes an enhancement to the “acceptance criteria” program element which relates to updating the plant implementing procedures to include acceptance criteria for sliding surfaces. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), 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 no indications of excessive loss of material due to corrosion or wear and no debris or dirt that could restrict or prevent sliding of the surfaces as required by design for sliding surfaces.

Enhancement 31. LRA Section B.2.43 includes an enhancement to the “acceptance criteria” program element which relates to enhancing the program to require qualifications of personnel performing inspections and evaluations. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), 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 require that personnel performing inspections and evaluations meet the qualifications specified within ACI 349.3R-02.

Enhancement 32. LRA Section B.2.43 includes an enhancement to the “acceptance criteria” program element which relates to updating the plant implementing documents to prescribe the acceptance criteria for flow blockage in plant storm drain piping. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented the program will monitor the flow blockage in plant storm drain piping against its acceptance criteria of 10 percent flow capacity reduction based on cross-section geometry.

Enhancement 33. LRA Section B.2.43 includes an enhancement to the “acceptance criteria” program element which relates to updating the plant implementing documents to prescribe the acceptance criteria for storm drain piping corrugated metal pipe. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented the program will monitor the plant storm drain piping corrugated metal pipe wall thickness against its acceptance criteria of no less than 50 percent of the original thickness.

Enhancement 34. LRA Section B.2.43 includes an enhancement to the “acceptance criteria” program element which relates to updating the plant implementing documents to initiate a condition report to document an evaluation of effect of the condition for acceptability on the intended function of the masonry wall when cracking or separation are observed. The staff reviewed this enhancement, as modified by the applicant’s response to Question 1 of RAI-10327-R1 (ML24324A185), against the corresponding program element in GALL-LR Report AMP XI.S6 and finds it acceptable because when it is implemented the program will monitor cracking or separation for the in-scope masonry walls for not invalidating the evaluation basis or impacting the wall’s intended function, which is consistent with the GALL-LR Report AMP XI.S5.

Enhancement 35. LRA Section B.2.43 includes an enhancement to the “acceptance criteria” program element which relates to including acceptance criteria for indication of leaching of calcium hydroxide. The staff reviewed this enhancement, as modified by LRA Supplement 3 (ML24206A150), 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 acceptance criteria for indication of leaching of calcium hydroxide will be as follows: groundwater parameters are no longer be considered non-aggressive if they exceed: pH<5.5, chlorides > 500ppm, or sulfates > 1500ppm.

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 3 (ML24206A150), LRA Supplement 7 (ML24354A265), and the applicant's responses to RCI-10331-R1 (ML24305A134), RAI-10327-R1 (ML24324A185), and RAI 10472 R-2 (ML25036A154), 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.2.43 summarizes operating experience related to the Structures Monitoring program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ML24239A778), the staff conducted a review of the plant operating experience 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 PEO. 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, as amended, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Structures Monitoring program was evaluated.

UFSAR Supplement. LRA Appendix A, Section A.1.43 provides the UFSAR supplement for the Structures Monitoring program. The staff reviewed this UFSAR supplement description of the program, as amended by LRA Supplement 3 (ML24206A150), LRA Supplement 7 (ML24354A265), and the applicant's responses to RAI - Set 4 (ML25036A154), 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 PEO. The staff also noted that the applicant committed to implement AMP enhancements for license renewal on May 8, 2026. The staff finds that the information in the UFSAR 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 enhancements, and finds that, with the enhancements when implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR 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).

3.0.3.2.20 Water Chemistry

LRA Section B.2.44 states that the Water Chemistry program is an existing program that will be consistent with the program elements in the GALL-LR Report AMP XI.M2, “Water Chemistry,” except for the exception identified in the LRA.

Staff Evaluation. During its audit (ML24239A778), 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,” 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 1. LRA Section B.2.44 includes an exception to the “scope of program,” program element related to referencing BWRVIP-190, “BWR Water Chemistry Guidelines, Revision 1, 2019 Interim Guidance,” which is the most recent version of this guidance. The GALL-LR Report references BWRVIP-190, “BWR Vessels and Internals Project: BWR Water Chemistry Guidelines-2008 Revision.” The staff finds this acceptable because the GALL-LR report XI.M2 was modified by SLR-ISG-2021-02-MECHANICAL to allow reference to BWRVIP-190, “BWR Water Chemistry Guidelines, Revision 1,” and the 2019 Interim guidance updates this guidance based on recent OE.

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, 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.

Operating Experience. LRA Section B.2.44 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 ML24239A778), the staff reviewed search results 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 PEO. 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.

UFSAR Supplement. LRA Section A.1.44 provides the UFSAR supplement for the Water Chemistry program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1.

The staff also noted that the applicant committed to ongoing implementation of the existing Water Chemistry program for managing the effects of aging for applicable components during the PEO. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's 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 finds that, with the exception 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 PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.21 Internal Coatings/Linings for in-Scope Piping, Piping Components, Heat Exchangers, and Tanks

LRA Section B.2.27 states that the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program is a new program that will be consistent with the program elements in the GALL-LR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," as added 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," except for the exceptions identified in the LRA. The applicant amended this LRA section by Supplement 2 dated June 27, 2024 (ML24180A010) and letter dated October 2, 2024 (ML24276A083).

Staff Evaluation. During its audit (ML24239A778), 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 of the applicant's program to the corresponding program elements of GALL-LR Report AMP XI.M42.

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 the exceptions to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these two exceptions follows.

Exception 1. LRA Section B.2.27, as modified by Supplement 2 dated June 27, 2024, includes an exception to the "detection of aging effects" program element related to baseline visual inspections of in-scope component internal coating/linings required to be performed in the 10-year period prior to the PEO. Specifically, the applicant noted that the high pressure core spray (HPCS) Division 3 Fuel Oil Day Tank was last visually inspected in 2010 but would not be visually inspected in the 10-year period prior to the PEO based on the results of the visual inspection of the similarly fabricated HPCS Division 3 Fuel Oil Storage Tank in 2022 and based on the cleaning and inspection of downstream fuel oil pump suction strainers proposed to be performed prior to the PEO. The applicant did not give explicit acceptance criteria for findings from the strainer inspections but stated that adverse results will inform the scope and schedule for day tank inspections. The staff notes that this exception also is associated with "parameters monitored or inspected," "monitoring and trending," and "acceptance criteria" program elements.

The staff reviewed this exception, as modified by response to RAI 10181-R1 (ML24276A083), against the corresponding program elements in GALL-LR Report AMP XI.42 and finds it acceptable for the following reasons:

- The similarity in tank base material, coating type, coating application and environment make visual inspection of the HPCS Division 3 Fuel Oil Storage Tank a suitable proxy for visual inspection of the HPCS Division 3 Fuel Oil Day Tank.
- Inspection of the downstream fuel oil pump suction strainers will provide objective evidence if integrity of the coating/lining is not maintained.

<u>*Exception 2*</u>. LRA Section B.2.27, as modified by Supplement 2 dated June 27, 2024, includes an exception to the “monitoring and trending” program element related to the frequency of visual inspections required for in-scope component internal coating/linings during the PEO. Specifically, the applicant proposes not to visually inspect the HPCS Division 3 Fuel Oil Day Tank during the PEO. The applicant instead proposes that the larger HPCS Division 3 Fuel Oil Storage Tank will be used as a leading indicator that will inform the scope and schedule of the HPCS Division 3 Fuel Oil Day Tank inspections. In addition, the applicant also proposes that the HPCS diesel engine fuel oil pump suction strainers will be inspected when the strainers are cleaned, and no less frequently than every 6 years. Finally, the applicant proposes that the inspection findings from the HPCS diesel engine fuel oil pump suction strainer inspections will be used to inform the scope and schedule of the HPCS Division 3 Fuel Oil Day Tank inspections. The applicant did not give explicit acceptance criteria for findings from the strainer inspections but stated that the leading indicators will inform the scope and schedule for day tank inspections. The staff notes that this exception is also associated with “parameters monitored or inspected,” “detection of aging effects,” and “acceptance criteria” program elements.

The staff reviewed this exception, as modified by the response to RAI 10181-R1, against the corresponding program elements in GALL-LR Report AMP XI.42 and finds it acceptable for the following reasons:

- The similarity in tank base material, coating type, coating application and environment make the HPCS fuel oil storage tank a suitable proxy for visual inspection of the HPCS fuel oil day tank.
- The applicant will monitor downstream of the HPCS fuel oil day tank for the presence of degraded coating particles in the diesel engine fuel oil pump strainers.
- The applicant’s proposed monitoring frequency of the HPCS diesel engine fuel oil pump strainers is at a frequency consistent with the GALL-LR Report AMP XI.M42 inspection frequency Category A for internal coatings where no peeling, delamination, blisters, or rusting are observed during inspections.
- Inspection of the downstream fuel oil pump suction strainers will provide objective evidence if integrity of the coating/lining is not maintained.

Based on a review of the LRA, amendments, and the applicant’s response to RAI 10181-R1, 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.M42. The staff also reviewed the exceptions associated with the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” 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.2.3.40 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 (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 PEO. 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.

UFSAR Supplement. LRA Section A.2.2.40 provides the UFSAR supplement for the Metal Enclosed Bus Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in 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 6 months before the PEO or no later than the last refueling outage before the PEO for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's 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 PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.22 Open-Cycle Cooling Water System

LRA Section B.2.37 states that the Open-Cycle Cooling Water System program is an existing program that, with an enhancement, will be consistent with the program elements in the GALL-LR Report AMP XI.M20, "Open Cycle Cooling Water System," and the additional guidance in LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation." The applicant amended this LRA section by letter dated October 21, 2024 (ML24295A352) and March 20, 2025 (ML25079A062).

Staff Evaluation. During its audit (ML24239A778), the staff reviewed the applicant's claim of consistency with the GALL-LR Report and LR-ISG-2012-02. 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 and LR-ISG-2012-02.

The "monitoring and trending" program element, as modified by response to RAI 10183-R1 (ML24260A266) and Supplement 5 (ML24295A352), is acceptable because the applicant enhanced the implementing procedures for heat exchanger thermal performance testing to require that monitoring and trending be performed in a manner that is consistent with the corresponding program element in the GALL-LR Report. In addition, in its response to RAI 10505-R1, Question 4 (ML25079A062), the applicant revised LRA Section A.1.37, Item No. 37 in LRA Table A.3, and LRA Section B.2.37. These changes are acceptable because the enhanced inspections being performed on components submerged in the ESW pump bay are consistent with the corresponding program element in the GALL-LR Report. The staff's evaluation of this one enhancement is discussed below.

Enhancement 1. As amended by letter dated October 21, 2024, LRA Section B.2.37 includes an enhancement to the "monitoring and trending" program element, which relates to revising the implementing procedures for heat exchanger thermal performance testing to (1) provide the work order and planned date for the next scheduled test or cleaning, (2) project the date for no margin to the acceptance criteria based on the current trend if two or more test results are available, and (3) initiate a condition report if the projected date for no margin will occur before the planned date for the next heat exchanger test or cleaning. The staff reviewed this enhancement, as modified by the response to RAI 10183-R1 and Supplement 5, against the corresponding program elements in GALL-LR Report AMP XI.M20 and finds it acceptable because when it is implemented it will be consistent with the corresponding program element in the GALL-LR Report.

Enhancement 2. As amended by letter dated March 20, 2025, LRA Section B.2.37 includes an enhancement to the "monitoring and trending" program element, which relates to revising the Open-Cycle Cooling Water program documentation to include periodic maintenance inspections of the following external portions of components submerged in the ESW pump bay: (1) the ESW pump casings for loss of material, (2) the ESW screen-wash pump casings for loss of material, (3) the ESW traveling screens for loss of material and flow blockage, (4) the motor driven fire pump casing and its suction strainer for loss of material and flow blockage, and (5) the diesel driven fire pump casing and its suction strainer for loss of material and flow blockage. The inspections covered by this enhancement will be performed at a minimum frequency of once per operating cycle. The staff reviewed this enhancement against the corresponding program elements in GALL-LR Report AMP XI.M20 and finds it acceptable because when it is implemented it will be consistent with the corresponding program element in the GALL-LR Report.

Based on the review of the LRA, the applicant's response to RAI 10183-R1, and Supplement 5, 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 enhancement associated with the "monitoring and trending" program element and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. As amended by letters dated October 21, 2024, and March 20, 2025, LRA Section B.2.37 summarizes OE related to the Open-Cycle Cooling Water System program. The staff reviewed OE information in the application and during the audit. Based on its audit and review of the application, and review of the applicant's response to RAI 10183-R1, Supplement 5, and the supplement provided via letter on March 20, 2025, 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.

UFSAR Supplement. As amended by letters dated October 21, 2024, and March 20, 2025, LRA Section A.1.37 provides the UFSAR supplement for the Open-Cycle Cooling Water System program. The staff reviewed this UFSAR 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 the applicant committed to implement the enhancement to the Open-Cycle Cooling Water

System program by May 8, 2026, for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Open-Cycle Cooling Water System 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 functions will be maintained consistent with the CLB for the PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.23 Buried and Underground Piping and Tanks

LRA Section B.2.8 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 the GALL-LR Report AMP XI.M41, "Buried and Underground Piping and Tanks," as revised by LR-ISG-2015-01, "Changes to Buried and Underground Piping and Tank Recommendations," except for the exception identified in the LRA (the exception was not included in the initial submittal of the LRA and was added by the applicant with the issuance of Supplement No. 2). The applicant amended this LRA section by letters dated June 27, 2024 (ML24180A010) and September 16, 2024 (ML24260A266).

Staff Evaluation. During its audit (ML24239A778), 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 revised by LR-ISG-2015-01.

The staff also reviewed the portions of the "preventive actions," "parameters monitored or inspected," "detection of aging effects," "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 these ten enhancements are discussed below.

Exception 1. As added by letter dated June 27, 2024, LRA Section B.2.8 includes an exception to the "preventive actions" program element related to the condensate transfer and storage system stainless steel buried piping not being externally coated, which resulted in the issuance of RAI B.2.8-1 (ML24227A956). The staff reviewed this exception and the applicant's response to RAI B.2.8-1 (ML24260A266) and finds it acceptable because (1) the potential for external corrosion is minimized because the subject buried piping is provided with an alternative preventive action to that recommended in GALL-LR Report Table XI.M41-1, "Preventive Actions for Buried and Underground Piping and Tanks," for buried stainless steel (i.e., cathodic protection is provided instead of external coatings), and (2) volumetric inspections conducted on approximately 16 feet of the subject piping in 2013 found no unacceptable areas of wall thinning or other defects, demonstrating the effectiveness of cathodic protection and/or an external environment that is non-aggressive to stainless steel.

Enhancement 1. As amended by letter dated September 16, 2024, LRA Section B.2.8 includes an enhancement to the "parameters monitored or inspected" program element which relates to the qualifications of coating inspectors who will evaluate the type and extent of coating degradation. The staff noted that this enhancement (1) is also associated with the "acceptance criteria" program element of GALL-LR Report AMP XI.M41 and (2) was added in response to RAI B.2.8-2 (ML24260A266) described in Enhancement No. 2 below. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 2, 3, 4, 5, 7, 8, 9, and 10 are implemented, the "parameters monitored or inspected" and "acceptance criteria" program elements will be consistent with the corresponding program elements in GALL-LR Report AMP XI.M41.

Enhancement 2. As amended by letter dated June 27, 2024, LRA Section B.2.8 includes an enhancement to the "acceptance criteria" program element that relates to performing an extent of condition evaluation where damage to the coating has been evaluated as significant and the damage was caused by nonconforming backfill. The staff noted that this enhancement is also associated with the "corrective actions" program element of GALL-LR Report AMP XI.M41. In addition, the staff noted that the applicant's response to RAI B.2.8-2 added Enhancement No. 1 which clarified that the qualifications of coating inspectors who will evaluate the type and extent of coating degradation will be consistent with recommendations outlined in GALL-LR Report AMP XI.M41, as revised by LR-ISG-2015-01. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 1, 3, 4, 5, 6, 8, 9, and 10 are implemented, the "acceptance criteria" and "corrective actions" program elements will be consistent with the corresponding program elements in GALL-LR Report AMP XI.M41.

Enhancement 3. As amended by letter dated June 27, 2024, LRA Section B.2.8 includes an enhancement to the "acceptance criteria" program element which relates to (1) determining remaining wall thickness if metallic piping or tanks show evidence of corrosion to ensure that the minimum wall thickness is maintained and (2) extrapolating wall thickness to the end of the PEO to determine if an expansion of sample size is required. The staff noted that this enhancement is also associated with the "corrective actions" program element of GALL-LR Report AMP XI.M41. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 1, 2, 4, 5, 6, 8, 9, and 10 are implemented, the "acceptance criteria" and "corrective actions" program elements will be consistent with the corresponding program elements in GALL-LR Report AMP XI.M41.

Enhancement 4. As amended by letter dated June 27, 2024, LRA Section B.2.8 includes an enhancement to the "acceptance criteria" program element which relates to performing an expansion of sample size as prescribed by LR-ISG-2015-01 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. The staff noted that this enhancement also is associated with the "corrective actions" program element of GALL-LR Report AMP XI.M41. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 1, 2, 3, 5, 6, 8, 9, and 10 are implemented, the "acceptance criteria" and "corrective actions" program elements will be consistent with the corresponding program elements in GALL-LR Report AMP XI.M41.

Enhancement 5. As amended by letter dated June 27, 2024, LRA Section B.2.8 includes an enhancement to the "parameters monitored or inspected" program element which relates to identifying and correcting sources of leakage detected during pressure tests. The staff noted that this enhancement also is associated with the "corrective actions" program element of GALL-LR Report AMP XI.M41. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 1, 2, 3, 4, 6, 7 and 10 are implemented, the “parameters monitored or inspected” and “corrective actions” program elements will be consistent with the corresponding program elements in GALL-LR Report AMP XI.M41.

Enhancement 6. As amended by letter dated June 27, 2024, LRA Section B.2.8 includes an enhancement to the “detection of aging effects” program element which relates to conducting a flow test or system leak rate test by the end of the next refueling outage or as directed by the CLB, whichever is shorter, when unexplained changes in jockey pump activity (or equivalent equipment or parameter) are observed. The staff noted that this enhancement is also associated with the “corrective actions” program element of GALL-LR Report AMP XI.M41. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 2, 3, 4, 5, 7, and 10 are implemented, the “detection of aging effects” and “corrective actions” program elements will be consistent with the corresponding program elements in GALL-LR Report AMP XI.M41.

Enhancement 7. As amended by letter dated June 27, 2024, LRA Section B.2.8 includes an enhancement to the “detection of aging effects” program element which relates to performing visual inspections of stainless-steel piping for cracking when the surface is exposed. The staff noted that this enhancement is also associated with the “parameters monitored or inspected” program element of GALL-LR Report AMP XI.M41. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 1, 5, and 6 are implemented, the “parameters monitored or inspected” and “detection of aging effects” program elements will be consistent with the corresponding program elements in GALL-LR Report AMP XI.M41.

Enhancement 8. As amended by letter dated June 27, 2024, LRA Section B.2.8 includes an enhancement to the “acceptance criteria” program element which relates to using an instant-off criteria of -850 mV with a maximum of -1200 mV for steel piping cathodic protection. The staff noted that the limiting critical potential of -1200 mV is associated with the “preventive actions” program element of GALL-LR Report AMP XI.M41. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 1, 2, 3, 4, 9 and 10 are implemented, the “preventive actions” and “acceptance criteria” program elements will be consistent with the corresponding program elements in GALL-LR Report AMP XI.M41.

Enhancement 9. As amended by letters dated June 27, 2024, and September 16, 2024, LRA Section B.2.8 includes an enhancement to the “acceptance criteria” program element which relates to the use of alternative cathodic protection acceptance criteria for steel piping. The staff noted that the applicant’s response to RAI B.2.8-2 clarified that the qualifications of individuals that will determine the installation locations of electrical resistance corrosion rate probes and the methods of use will be consistent with recommendations outlined in GALL-LR Report AMP XI.M41, as revised by LR-ISG-2015-01. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 1, 2, 3, 4, 8 and 10 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 June 27, 2024, LRA Section B.2.8 includes an enhancement to the “acceptance criteria” program element which relates to entering unacceptable cathodic protection survey results into the plant corrective action program. The staff noted that this enhancement is also associated with the “corrective actions” program element of GALL-LR Report AMP XI.M41. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 1, 2, 3, 4, 5, 6, 8 and 9 are implemented, the “acceptance criteria” and “corrective actions” program elements will be consistent with the corresponding program elements in GALL-LR Report AMP XI.M41.

Based on a review of the LRA (as amended) and the applicant’s responses to RAIs B.2.8-1 and B.2.8-2, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-LR Report are consistent with the corresponding program elements of GALL-LR Report AMP XI.M41, as revised by LR-ISG-2015-01. The staff also reviewed the exception between the applicant’s program and GALL-LR Report XI.M41 associated with the “preventive actions” program element, and its justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “acceptance criteria,” and “corrective actions” program elements and finds that when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. As amended by letter dated June 27, 2024, LRA Section B.2.8 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 (ML24239A778), the staff reviewed search results 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 PEO.

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 Buried and Underground Piping and Tanks Program was evaluated.

UFSAR Supplement. As amended by letters dated June 27, 2024, and September 16, 2024, LRA Section A.1.8 provides the UFSAR supplement for the Buried and Underground Piping and Tanks Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in SRP-LR Table 3.0-1. The staff also noted that the applicant committed to the implementation of enhancements to the existing Buried and Underground Piping and Tanks Program prior to May 8, 2026, for managing the effects of aging for applicable components during the PEO. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s Buried and Underground Piping and Tanks 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 with the exception and the enhancements implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed to maintain the intended functions consistent with the CLB for the PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.24 ASME Section XI, Subsection IWL

LRA Section B.2.6 states that the ASME Section XI, Subsection IWL Aging Management Program 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.” The applicant amended this LRA section by letter dated July 24, 2024 (ML24206A150).

Staff Evaluation. During its audit (ML24239A778), 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. 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 two enhancements is as follows.

Enhancement 1. LRA Section B.2.6 includes an enhancement to the “parameters monitored or inspected” program element which relates to recording areas of concrete deterioration and distress in accordance with the guidance provided in ACI 349.3R-02 (Reapproved 2010) consistent with 10 CFR 50.55a ASME Section XI, Subsection IWL-2510, Edition 2013, which is the Code for the current 10 year interval. The staff reviewed this enhancement, as modified by Supplement 3 (ML24206A150), against the corresponding program elements in GALL-LR Report AMP XI.S2 and finds it acceptable because when the program is implemented it will be consistent with the GALL-LR Report recommendation to examine concrete surfaces for conditions indicative of degradation, such as those defined in ACI 201.1R and ACI 349.3R.

Enhancement 2. LRA Section B.2.6 includes an enhancement to the “acceptance criteria” program element which relates to using the quantitative acceptance criteria for concrete deterioration and distress provided in Chapter 5 of ACI 349.3R-02 (Reapproved 2010) consistent with 10 CFR 50.55a ASME Section XI, Subsection IWL-2510, Edition 2013, which is the Code for the current 10 year interval. The staff reviewed this enhancement, as modified by Supplement 3 (ML24206A150), against the corresponding program elements in GALL-LR Report AMP XI.S2 and finds it acceptable because when the program is implemented it will be consistent with the GALL-LR Report recommendation to consider the guidance provided in IWL-2510, which references ACI 201.1R and ACI 349.3R for identification of concrete degradation.

Based on a review of the LRA and Supplement 3 (ML24206A150), 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” 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.2.6 summarizes operating experience related to the ASME Section XI, Subsection IWL Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report, 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 PEO. The staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit, the review of the application, the applicant's response (ML24324A185) to staff RAI, and the staff's evaluation documented in Section 3.5.2.2.1.8 of this SE, the staff finds that the conditions and operating experience at the plant are bounded by those for which the ASME Section XI, Subsection IWL Program was evaluated.

UFSAR Supplement. LRA Section A.1.6 provides the UFSAR supplement for the ASME Section XI, Subsection IWL Program. The staff reviewed this UFSAR 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 IWL AMP for managing the effects of aging for applicable components during the PEO. Additionally, the staff observed that the applicant committed to implementing the enhancements (Commitment 6) by May 8, 2026, which is prior to the start of the PEO. The staff finds that the information in the UFSAR supplement, as amended by letter dated July 24, 2024, is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's ASME Section XI, Subsection IWL 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 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 PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3 AMP (Plant-Specific Periodic Inspections for Selective Leaching Program)

3.0.3.3.1 Plant-Specific Periodic Inspections for Selective Leaching Program

As added by letter dated September 5, 2024 (Supplement 4, ML24249A123), LRA Section B.2.45 describes the new Plant-Specific Periodic Inspections for Selective Leaching Program as plant-specific. The staff noted that changes related to LRA Section B.2.45 provided in the September 5, 2024, letter superseded changes related to LRA Section B.2.45 provided in the August 8, 2024 (ML24221A093) letter. In addition, the staff noted that LRA Section B.2.45 was subsequently amended by letter dated December 12, 2024 (Supplement 7, ML24354A265) in response to RAIs described below.

Staff Evaluation. GALL-LR Report AMP XI.M33, "Selective Leaching," recommends (1) one-time inspections to demonstrate the absence of selective leaching or (2) a plant-specific AMP for materials and environments where selective leaching is currently occurring. The applicant and staff identified three populations (i.e., materials and environment combinations) where selective leaching is occurring, and the applicant provided the Plant-Specific Periodic Inspections for Selective Leaching Program by letter dated September 5, 2024, to manage loss of material due to selective leaching for these populations. The three populations being managed using this plant-specific AMP are (1) gray cast iron components exposed to raw water; (2) gray cast iron components exposed to soil, and (3) ductile iron components exposed to soil.

For plant-specific programs, the staff typically reviews 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 against the acceptance criteria for the corresponding elements as stated in SRP-LR Section A.1.2.3. However, with the issuance of GALL-SLR Report AMP XI.M33, “Selective Leaching,” the staff provided a framework to manage this aging mechanism through periodic inspections, as opposed to the GALL-LR Report AMP XI.M33 framework which recommends one-time inspections to demonstrate that this aging effect is not occurring. In addition, the staff noted the applicant developed the Plant-Specific Periodic Inspections for Selective Leaching Program based on the guidance provided in GALL-SLR Report AMP XI.M33. Therefore, instead of comparing the program elements listed above to corresponding elements as stated in SRP-LR Section A.1.2.3, the staff compared the program elements of the applicant’s program to the corresponding program elements of GALL-SLR Report AMP XI.M33. The staff’s review of the “confirmation process” and “administrative controls,” and compliance with Criterion XVI, “Corrective Action,” of 10 CFR Part 50, Appendix B of the “corrective action” programs elements are documented in SE Section 3.0.4.

For the “detection of aging effects” and “acceptance criteria” program elements, the staff determined the need for additional information, resulting in the issuance of RAI B.2.45-1 (ML24276A129). The applicant’s response to RAI B.2.45-1 (ML24324A185) and Supplement No. 7 (ML24354A265) is acceptable because the applicant revised LRA Section B.2.45 to reflect that (1) mechanical examination techniques will augment visual inspections for ductile iron components, (2) two destructive examinations will be performed during each inspection period for populations with more than 35 1-foot axial lengths of piping, and (3) no credit is taken for the material properties of the de-alloyed portion of the component when performing an evaluation to show that system design requirements are met.

Based on a review of the amended LRA and the applicant’s response to RAI B.2.45-1, 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-SLR Report AMP XI.M33, and therefore, the staff finds them acceptable.

<u>Operating Experience</u>. As added by letter dated September 5, 2024, LRA Section B.2.45 summarizes OE related to the Plant-Specific Periodic Inspections for Selective Leaching Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24239A778), the staff reviewed search results 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 PEO.

The staff did not identify any additional OE indicating that the applicant should modify its proposed program beyond that incorporated during the development of and staff review of the amended LRA. 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 Plant-Specific Periodic Inspections for Selective Leaching Program was evaluated.

<u>UFSAR Supplement</u>. As added by letter dated September 5, 2024, LRA Section A.1.45 provides the UFSAR supplement for the Plant-Specific Periodic Inspections for Selective Leaching Program. The staff reviewed this UFSAR supplement description of the program

against the recommended description for this type of program as described in GALL-SLR Report Table XI-01 and noted that it is not consistent with the staff guidance, resulting in the issuance of RAI A.1.45-1 (ML24276A129). In its response to RAI A.1.45-1 (ML24324A185) and Supplement No. 7 (ML24354A265), the applicant addressed the staff's concern by revising LRA Section A.1.45 to reflect that additional inspections will be performed when acceptance criteria are not met such that it is determined that the affected component should be replaced prior to the end of the PEO. Therefore, the UFSAR supplement for the Plant-Specific Periodic Inspections for Selective Leaching Program, as modified by the response to RAI A.1.45-1 and Supplement No. 7, is consistent with the corresponding program description in GALL-SLR Report Table XI-01. The staff also noted the applicant committed to implement the new Plant-Specific Periodic Inspections for Selective Leaching Program at least 6 months prior to the PEO for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

<u>Conclusion.</u> Based on its technical review of the applicant's Plant-Specific Periodic Inspections for Selective Leaching Program, 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 PEO, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.4 QA Program Attributes Integral to Aging Management Programs

The regulations at 10 CFR 54.21(a)(3) require 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 PEO. 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:

(1) Corrective Actions – Corrective actions, including root cause determination and prevention of recurrence, should be timely.

(2) Confirmation Process – Confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective.

(3) 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 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 PEO.

(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 PEO. 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, "Updated Final Safety Analysis Report Supplement," Section A.1, "Summary Descriptions of Aging Management Programs and Activities," and LRA Appendix B, "Aging Management Programs," Section B.1.3, "Quality Assurance Program and Administrative Controls," describe the elements of corrective actions, confirmation process, and administrative controls applied to the AMPs for both safety-related and nonsafety-related components.

LRA Appendix A, Section A.1, states, in part, the following:

The three elements of an effective aging management program that are common to each of the aging management programs are corrective actions, confirmation process, and administrative controls. These elements are included in the Quality Assurance Program Manual for the Perry, which implements the requirements of 10 CFR 50, Appendix B. The corrective actions, confirmation process, and administrative controls in the Quality Assurance Program Manual to be applied to the credited aging management programs and activities for the structures and components determined to require aging management, are consistent with the related discussions in the Appendix on Quality Assurance for Aging Management Programs in NUREG1801.

LRA Appendix B, Section B.1.3, states, in part, the following:

The Quality Assurance Program implements the requirements of 10 CFR 50, Appendix B, and is consistent with the summary in Appendix A.2, Quality Assurance for Aging Management Programs (Branch Technical Position IQMB-1) of NUREG-1800. The Quality Assurance Program includes the elements of corrective action, confirmation process, and administrative controls, and is applicable to the safety-related and nonsafety-related systems, structures, components (SSCs), and commodity groups that are subject to AMR.

Generically, the three elements are applicable as follows:

Corrective Actions:

Corrective actions are implemented through the Perry corrective action program that satisfies the requirements of 10 CFR 50, Appendix B, Criterion XVI. Conditions adverse to quality, an all-inclusive term used in reference to failures, malfunctions, deficiencies, defective items, and non-conformances are identified, reported to management, and corrected. In the case of significant conditions adverse to quality, measures are implemented to ensure that the root cause is determined and that corrective actions are taken to preclude recurrence. Nonsafety-related

SSCs that are subject to aging management during the PEOs are captured under the corrective action program as Conditions Adverse to Regulatory Compliance (CARC).

The corrective action program is the subject of periodic NRC examination and Perry self-assessment and audit. The current program is, therefore, adequate for aging management considerations.

Confirmation Process:

The focus of the confirmation process is on the follow-up actions taken to verify effective implementation of corrective actions and to preclude repetition of significant conditions adverse to quality. The corrective action program includes the requirement that measures be taken to preclude repetition of significant conditions adverse to quality. These measures include actions to verify effective implementation of proposed corrective actions. The confirmation process is part of the corrective action program and, for significant conditions adverse to quality, includes:

- reviews to assure proposed actions are adequate,
- tracking and reporting of open corrective actions,
- identification of root cause, and
- reviews of corrective action effectiveness.

Corrective action program effectiveness reviews are conducted to ensure that corrective actions have been completed and to identify any repetition of events. The corrective action program is also monitored for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions will result in the initiation of follow-up actions in the corrective action program.

Administrative Controls:

Administrative controls that govern aging management activities are established within the document control procedures that implement: (1) industry standards related to administrative controls and quality assurance for the operational phase of nuclear power plants, and (2) the requirements of 10 CFR 50, Appendix B, Criterion VI.

Plant policies, directives, and procedures are written and controlled to specify and manage various activities, particularly those related to compliance with 10 CFR 50, Appendix B. The phrase “administrative control” refers to the adherence to policies, directives, and procedures, and includes the formal review and approval process that plant policies, directives, and procedures undergo as they are issued (and subsequently revised). The individual documents (i.e., the plant policies, directives, and procedures), in conjunction with the plant’s Quality Assurance Program documents, provide the overall administrative framework to ensure regulatory requirements are met.

3.0.4.2 Staff Evaluation

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

3.0.4.3 Conclusion

On the basis of the staff's review of LRA Appendix A, Section A.1, 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 BTPs RLSB-1 and IQMB-1 and that the QA attributes will be maintained such that the applicant will adequately manage aging in a way that maintains intended function(s) consistent with the CLBs for the PEO, 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 "Summary Descriptions of Aging Management Programs and Activities" and LRA Appendix B, Section B.1.4, "Operating Experience," describe the consideration of OE for AMPs. These sections state that the applicant systematically reviews plant-specific and industry OE concerning aging management and age-related degradation to ensure that the license renewal AMPs will be effective in managing the aging effects for which they are credited. OE for the programs credited with managing the effects of aging are reviewed to identify corrective actions that may result in program enhancements.

3.0.5.2 Staff Evaluation

3.0.5.2.1 Overview

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

3.0.5.2.2 Consideration of Future Operating Experience

The staff reviewed LRA Appendix A, Section A.1, and LRA Appendix B, Section B.1.4, to determine how the applicant will use future OE to ensure that the AMPs are effective. The staff evaluated the applicant's OE review activities as described in the LRA.

3.0.5.2.3 Acceptability of Existing Programs

SRP-LR Section A.4.2, "Position," describes existing programs generally acceptable to the staff for the capture, processing, and evaluation of OE 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-LR Section A.4.2 also states that, as part of meeting the requirements of NUREG 0737, item I.C.5, the applicant’s OE program should rely on active participation in the Institute of Nuclear Power Operations (INPO) OE program (formerly the INPO Significant Event Evaluation and Information Network (SEE IN)) endorsed in Generic Letter 82 04, “Use of INPO SEE-IN Program,” dated March 9, 1982.

LRA Appendix A, Section A.1, and LRA Appendix B, Section B.1.4, state that the applicant uses its OE program to systematically capture and review OE from plant-specific and industry sources. The LRA also states that the OE program meets the requirements of NUREG 0737. The LRA further states that the OE program interfaces and relies on active participation in the INPO OE program. Based on this information, the staff finds that the applicant’s OE program is consistent with the programs described in SRP-LR 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-LR Section A.4.2 states that the programs and procedures relied upon to meet the requirements of 10 CFR Part 50, Appendix B, and NUREG 0737, item I.C.5, should not preclude the consideration of OE in age-related degradation and aging management.

LRA Appendix A, Section A.1, and LRA Appendix B, Section B.1.4, state that OE 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 OE program, which is consistent with NUREG-0737, item I.C.5. The LRA also states that the ongoing evaluation of OE includes a review of corrective actions, which may result in program enhancements. The LRA further states that trending reports, program health reports, assessments, and corrective actions program items were reviewed to determine whether aging effects have been identified on applicable components.

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

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

LRA Appendix A, Section A.1, and LRA Appendix B, Section B.1.3, state that the applicant’s QA program includes nonsafety-related SCs, which the staff finds consistent with the guidance in SRP-LR Section A.2 and therefore consistent with SRP-LR Section A.4.2 as well. SE Section 3.0.4 documents the staff’s evaluation of LRA Appendix A, Section A.1.4, and LRA Appendix B, Section B.1.3, relative to the application of the QA program to nonsafety-related SSCs.

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

LRA Appendix B, Section B.1.4, states that the sources of external OE include the INPO OE program, license renewal interim staff guidance documents, and other NRC review and guidance documentation.

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

SRP-LR Section A.4.2 states that all incoming plant-specific and industry OE should be screened to determine whether it involves age-related degradation or impacts on aging management activities.

LRA Appendix A, Section A.1, and LRA Appendix B, Section B.1.4, state that internal and external OE is captured and systematically reviewed on an ongoing basis and that the OE program provides for evaluation of site-specific and industry OE items that are screened to determine whether they involve lessons learned that may impact AMPs. Items are evaluated, and affected AMPs are either enhanced or new AMPs are developed, as appropriate, when it is determined that the effects of aging are not adequately managed. Based on the review, the staff finds that the applicant's OE review processes will include screening of all new OE to identify and evaluate items that can impact aging management activities. Because the applicant's screening of incoming OE is consistent with the guidance in SRP-LR Section A.4.2, the staff finds the OE program acceptable.

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

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

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

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

LRA Appendix A, Section A.1, and Appendix B, Section B.1.4, state that the applicant's program requires that, when evaluations indicate that the effects of aging are not being adequately managed, the affected AMPs are either enhanced or new AMPs are developed, as appropriate.

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

Evaluation of AMP Implementation Results. SRP-LR 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-LR 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-LR Section A.4.2 states that actions should be initiated within the plant corrective actions program to either enhance the AMPs or develop and implement new AMPs if these evaluations indicate that the effects of aging may not be adequately managed.

LRA Appendix B, Section B.1.4, states that internal OE is found in condition reports, issue reports, OE reports, trending reports, program and system health reports, and program assessments. In addition, LRA Appendix A, Section A.1, and LRA Appendix B, Section B.1.4, state that either AMPs are enhanced or new AMPs developed, as appropriate, when it is determined through the evaluation of OE that the effects of aging may not be adequately managed. LRA Appendix B, Section B1.4, states that the OE program also meets the requirements of NEI 14-12, "Aging Management Program Effectiveness," (ML15090A665) issued December 2014, for periodic program assessments.

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

Training. SRP-LR 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 OE. SRP-LR Section A.4.2 also states that the training should be periodic and include provisions to accommodate the turnover of plant personnel.

LRA Appendix A, Section A1,and LRA Appendix B, Section B.1.4 states that the OE program provides training to those responsible for activities including screening, evaluating, and processing OE items related to aging management and age-related degradation.

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

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

LRA Appendix A, Section A.1.5, and LRA Appendix B, Section B.1.4, state that the applicant's OE program actively participates in the INPO OE program. Based on the review, the staff finds that the applicant's reporting of OE to the industry is consistent with the guidance in SRP-LR Section 4.2; therefore, the staff finds this aspect of the OE program acceptable.

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

LRA Appendix B, Section B.1.4, states that the applicant's self-assessment process provides for periodic evaluation of the effectiveness of the OE program described in the UFSAR supplement. LRA Appendix A, Section A.1, and LRA Appendix B, Section B.1.4, state that the OE program will be implemented on an ongoing basis throughout the term of the renewed license. LRA Appendix A, Section A.1, provides the UFSAR supplement summary description of the applicant's enhanced programmatic activities for the ongoing review of OE. Upon issuance of the renewed license in accordance with 10 CFR 54.3(c), this summary description will be incorporated into the CLBs, and at that time, the applicant will be obligated to conduct its OE review activities accordingly.

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

3.0.5.2.5 Conclusion

Based on the review of the LRA, the staff determined that the applicant's programmatic activities for the ongoing review of OE are acceptable for (1) systematic review of plant-specific and industry OE to ensure that license renewal AMPs are, and will continue to be, effective in managing the aging effects for which they are credited and (2) enhancement of AMPs or the development of new AMPs when it is determined through the evaluation of OE that the effects of aging may not be adequately managed. Based on the review, the staff finds that the applicant's OE review activities are consistent with the guidance in SRP-LR Section 4.2; therefore, the staff finds the applicant's programmatic activities for the ongoing review of OE acceptable.

3.0.5.3 UFSAR Supplement

In accordance with 10 CFR 54.21(d), the UFSAR supplement must, in part, contain a summary description of the programs and activities for managing the effects of aging. LRA Appendix A, Sections A.1, provides the UFSAR supplement summary description of the applicant's programmatic activities for the ongoing review of OE that will ensure that plant-specific and industry OE related to aging management will be used effectively.

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

3.0.5.4 Conclusion

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

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

3.1.1 Summary of Technical Information in the Application

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
3.1.1-1	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.1)
3.1.1-2	Not applicable to boiling water reactors (BWRs) (see SE Section 3.2.2.2.2)
3.1.1-3	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.1)
3.1.1-4	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.1)
3.1.1-5	Not applicable to BWRs
3.1.1-6	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.1)
3.1.1-7	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.1)
3.1.1-8	Not applicable to BWRs
3.1.1-9	Not applicable to BWRs
3.1.1-10	Not applicable to BWRs
3.1.1-11	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.1)
3.1.1-12	Not applicable to BWRs
3.1.1-13	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.3.1)
3.1.1-14	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.3.2)
3.1.1-15	Not applicable to Perry (see SE Section 3.1.2.2.3.3)
3.1.1-16	Not applicable to Perry (see SE Section 3.1.2.2.4.1)
3.1.1-17	Not applicable to Perry (see SE Section 3.1.2.2.4.2)
3.1.1-18	Not applicable to BWRs (see SE Section 3.1.2.2.5)
3.1.1-19	Not applicable to BWRs
3.1.1-20	Not applicable to Perry (see SE Section 3.1.2.2.6)
3.1.1-21	Not applicable to Perry (see SE Section 3.1.2.2.7)
3.1.1-22	Not applicable to BWRs

Component Group (SRP-LR Item No.)	Staff Evaluation
3.1.1-23	Not applicable to BWRs
3.1.1-24	Not applicable to BWRs
3.1.1-25	Not applicable to BWRs
3.1.1-26	Not applicable to BWRs
3.1.1-27	Not applicable to BWRs
3.1.1-28	Not applicable to BWRs
3.1.1-29	Consistent with the GALL-LR Report
3.1.1-30	Consistent with the GALL-LR Report
3.1.1-31	Not applicable to BWRs
3.1.1-32	Not applicable to BWRs
3.1.1-33	Not applicable to BWRs
3.1.1-34	Not applicable to BWRs
3.1.1-35	Not applicable to BWRs
3.1.1-36	Not applicable to BWRs
3.1.1-37	Not applicable to BWRs
3.1.1-38	Consistent with the GALL-LR Report
3.1.1-39	Consistent with the GALL-LR Report
3.1.1-40	Not applicable to BWRs
3.1.1-40x	Not applicable to BWRs
3.1.1-41	Not applicable to Perry
3.1.1-42	Not applicable to BWRs
3.1.1-43	Consistent with the GALL-LR Report
3.1.1-44	Not applicable to BWRs
3.1.1-45	Not applicable to BWRs
3.1.1-46	Not applicable to BWRs
3.1.1-47	Not applicable to BWRs
3.1.1-48	Not applicable to BWRs
3.1.1-49	Not applicable to BWRs
3.1.1-50	Not applicable to Perry
3.1.1-51	Not applicable to BWRs
3.1.1-51a	Not applicable to BWRs
3.1.1-51b	Not applicable to BWRs
3.1.1-52	Not applicable to BWRs
3.1.1-52a	Not applicable to BWRs
3.1.1-52b	Not applicable to BWRs
3.1.1-52c	Not applicable to BWRs
3.1.1-53	Not applicable to BWRs
3.1.1-53a	Not applicable to BWRs
3.1.1-53b	Not applicable to BWRs
3.1.1-53c	Not applicable to BWRs
3.1.1-54	Not applicable to BWRs
3.1.1-55	Not applicable to BWRs
3.1.1-55a	Not applicable to BWRs

Component Group (SRP-LR Item No.)	Staff Evaluation
3.1.1-55b	Not applicable to BWRs
3.1.1-55c	Not applicable to BWRs
3.1.1-56	Not applicable to BWRs
3.1.1-57	This item number is not used in the SRP-LR or the GALL-LR Report
3.1.1-58	Not applicable to BWRs
3.1.1-59	Not applicable to BWRs
3.1.1-60	Consistent with the GALL-LR Report
3.1.1-61	Not applicable to BWRs
3.1.1-62	Not applicable to BWRs
3.1.1-63	Consistent with the GALL-LR Report
3.1.1-64	Not applicable to BWRs
3.1.1-65	Not applicable to BWRs
3.1.1-66	Not applicable to BWRs
3.1.1-67	Consistent with the GALL-LR Report
3.1.1-68	Not applicable to BWRs
3.1.1-69	Not applicable to BWRs
3.1.1-70	Not applicable to BWRs
3.1.1-71	Not applicable to BWRs
3.1.1-72	Not applicable to BWRs
3.1.1-73	Not applicable to BWRs
3.1.1-74	Not applicable to BWRs
3.1.1-75	Not applicable to BWRs
3.1.1-76	Not applicable to BWRs
3.1.1-77	Not applicable to BWRs
3.1.1-78	Not applicable to BWRs
3.1.1-79	Consistent with the GALL-LR Report (see SE Section 3.1.2.2.2)
3.1.1-80	Not applicable to BWRs
3.1.1-81	Not applicable to BWRs
3.1.1-82	Not applicable to BWRs
3.1.1-83	Not applicable to BWRs
3.1.1-84	Consistent with the GALL-LR Report
3.1.1-85	Consistent with the GALL-LR Report
3.1.1-86	Not applicable to BWRs
3.1.1-87	Not applicable to BWRs
3.1-1-88	Not applicable to BWRs
3.1.1-89	Not applicable to BWRs
3.1.1-90	Not applicable to BWRs
3.1-1-91	Consistent with the GALL-LR Report
3.1.1-92	Not applicable to BWRs
3.1.1-93	Not applicable to BWRs
3.1.1-94	Consistent with the GALL-LR Report
3.1.1-95	Consistent with the GALL-LR Report
3.1.1-96	Consistent with the GALL-LR Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.1.1-97	Consistent with the GALL-LR Report
3.1.1-98	Consistent with the GALL-LR Report
3.1.1-99	Consistent with the GALL-LR Report
3.1.1-100	Consistent with the GALL-LR Report
3.1.1-101	Consistent with the GALL-LR Report
3.1.1-102	Consistent with the GALL-LR Report
3.1.1-103	Consistent with the GALL-LR Report
3.1.1-104	Consistent with the GALL-LR Report
3.1.1-105	Not applicable to Perry
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 Perry

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

(1) SE Section 3.1.2.1 discusses AMR results for components that the applicant stated are either not applicable to Perry 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. The remaining subsections document the review of components that required additional information or otherwise required further explanation.

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

(3) SE Section 3.1.2.3 discusses AMR results for components that the applicant stated are not consistent with, or not addressed in, the GALL-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 NRC staff's review of AMR results listed in LRA Tables 3.1.2-1 through 3.1.2-6 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. For AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in Section 3.1.2.1.2 below.

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

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

For LRA Table 3.1.1 items 3.1.1-15, 3.1.1-16, 3.1.1-17, 3.1.1-20, 3.1.1-21, 3.1.1-41, 3.1.1-57, 3.1.1-105, 3.1.1-108, 3.1.1-109, and 3.1.1-110, the applicant claims that the corresponding AMR items in the GALL-LR Report are neither used nor applicable to Perry. The NRC staff reviewed the LRA and UFSAR and confirmed that the applicant's LRA does not have any AMR results that are applicable for these items.

For LRA Table 3.1.1 items 3.1.1-2, 3.1.1-5, 3.1.1-08 through 10, 3.1.1-18, 3.1.1-19, 3.1.1-22 through 28, 3.1.1-31 through 37, 3.1.1-40, 3.1.1-40x, 3.1.1-42, 3.1.1-44 through 56, 3.1.1-58, 3.1.1-59, 3.1.1-61, 3.1.1-62, 3.1.1-64 through 66, 3.1.1-68 through 83, 3.1.1-86 through 90, 3.1.1-92, and 3.1.1-93, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable because the associated items are applicable only to pressurized-water reactors (PWRs) while Perry is a BWR unit. The NRC staff reviewed the SRP-LR Report, confirmed that these items apply only to PWRs, and finds that these items are not applicable to Perry because the nuclear power plant is a BWR.

The applicant claimed that item 3.2.1-10 is not applicable because Perry does not have cast austenitic stainless-steel (CASS) components in engineered safety features systems exposed to treated water (borated) >250°C (>482°F) or treated water >250°C (>482°F). The NRC staff reviewed the LRA and UFSAR and verified the applicant's claim.

For Table 1 item 3.1.1-31, which addresses loss of material due to general (steel only), pitting, and crevice corrosion that could occur in steel and stainless-steel BWR isolation condenser components exposed to reactor coolant. The applicant claimed that it is not applicable to Perry. The staff reviewed the LRA and UFSAR and confirmed that the combination of aging effect, material, and environment represented by Table 1 item 3.1.1-31 does not exist at the site because the Perry design does not include a BWR isolation condenser. Therefore, there are no AMR results that are applicable for this item.

For LRA Table 3.1.1- items 3.1.1-19, 3.1.1-33, 3.1.1-35, 3.1.1-36, 3.1.1-40, 3.1.1-41, 3.1.1-42, 3.1.1-44, and 3.1.1-46, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable to Perry. 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 acceptable.

The applicant claimed that item 3.1.1-50 is not applicable because Perry does not have CASS ASME Code Class 1 piping, piping components, piping elements, and control rod drive pressure housings exposed to reactor coolant that is >250°C (>482°F), except the pump casings and valve bodies addressed in item 3.1.1-38. The NRC staff reviewed both the LRA and UFSAR and verified the applicant's claim.

3.1.2.1.2 Loss of Material Due to Pitting and Crevice Corrosion

LRA Table 3.1.1, AMR item 3.1.1-79, addresses loss of material due to pitting and crevice corrosion for stainless steel, steel with nickel-alloy or stainless-steel cladding, and nickel-alloy reactor coolant pressure boundary components exposed to reactor coolant. For the LRA Table 2 AMR item that cites generic note E and plant-specific note 104, the LRA credits the Main Steam Line Flow Restrictors Erosion Analysis documented in LRA section 4.6.2 to address loss of material due to erosion for the main steam line flow restrictors.

Based on its review of components associated with AMR item 3.1.1-79 for which the applicant cited generic note E, the staff finds the applicant's proposal to address the loss of material due to erosion with the Main Steam Line Flow Restrictors Erosion Analysis to be an acceptable approach, and the staff's evaluation of this TLAA is documented in SE Section 4.6.2.

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 reactor vessel internals 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 3.1.1-1, 3.1.1-3, 3.1.1-4, 3.1.1-6, 3.1.1-7, and 3.1.1-11. The LRA section indicates that the TLAA on cumulative fatigue damage in the reactor vessel, reactor vessel internals, and reactor coolant system components is evaluated in accordance with 10 CFR 4.21(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 TLAA for reactor vessel, reactor vessel internals, and reactor coolant system components is documented in Section 4.3 of the SE.

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

LRA Section 3.1.2.2.2, items 1 and 2, address loss of material due to general, pitting, and crevice corrosion in the steel PWR steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam and loss of material due to general, pitting, and crevice corrosion in the steel PWR steam generator shell assembly exposed to secondary feedwater and steam, respectively. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.1.2.2.2 and finds it acceptable because the SRP-LR criteria apply only to PWR steam generators.

3.1.2.2.3 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement

<u>Item 1</u>. LRA Section 3.1.2.2.3, item 1, associated with LRA Table 3.1.1, item 3.1.1-13, indicates that loss of fracture toughness due to neutron irradiation embrittlement is an aging effect and mechanism evaluated for the reactor vessel beltline shell and welds by a TLAA. The TLAA evaluation of neutron irradiation embrittlement is discussed in LRA Section 4.2, "Reactor Vessel Neutron Embrittlement Analyses." This is consistent with SRP-LR Section 3.1.2.2.3.1, and is, therefore, acceptable. The staff's evaluation of the TLAAs for loss of fracture toughness due to neutron irradiation embrittlement is documented in Section 4.2 of this SE.

<u>Item 2</u>. LRA Section 3.1.2.2.3, item 2, associated with LRA Table 3.1.1, item 3.1.1-14, addresses loss of fracture toughness due to neutron irradiation of the reactor pressure vessel beltline materials exposed to reactor coolant and neutron flux. The applicant states it is a participant in the Boiling Water Reactor Vessel and Internals Project Integrated Surveillance

Program. This program monitors changes in the fracture toughness properties of ferritic materials in the reactor pressure vessel beltline region. As described in LRA Section B.2.40, the Reactor Vessel Surveillance Program is consistent with the program described in GALL Report XI.M31, Reactor Vessel Surveillance. 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 reactor pressure vessel beltline region using the Reactor Vessel Surveillance Program is acceptable because it is consistent with AMR item IV.A2.RP-227 in the GALL 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 PEO, as required by 10 CFR 54.21(a)(3).

<u>Item 3</u>. LRA Section 3.1.2.2.3, item 3, associated with LRA Table 3.1.1 AMR item 3.1.1-15, addresses loss of fracture toughness for Babcock & Wilcox (B&W) reactor internals exposed to neutron flux, which will be managed by the B&W Owners Group Report BAW-2248. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.1.2.2.3.3. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.1.2.2.3.3 and finds this item is not applicable because (1) this item is only applicable to B&W designed reactors and (2) the UFSAR identifies that the reactor at the applicant's facility is a boiling water reactor design.

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

<u>Item 1</u>. LRA Section 3.1.2.2.4, item 1, associated with LRA Table 3.1-1, item 3.1.1-16, addresses cracking due to SCC and intergranular stress corrosion cracking (IGSCC) in stainless-steel and nickel-alloy BWR top head vessel flange leak detection lines. The applicant stated that this item is not applicable because it only applies to stainless-steel and nickel-alloy vessel flange leak detection lines. The applicant further stated that the vessel flange leak detection lines at Perry are fabricated from carbon steel, and therefore not susceptible to SCC or IGSCC. The staff evaluated the applicant's claim and finds it acceptable because the staff verified that the vessel flange leak detection lines at Perry are fabricated from carbon steel, which is not susceptible to SCC and IGSCC.

<u>Item 2</u>. LRA Section 3.1.2.2.4, item 2, associated with LRA Table 3.1.1, item 3.1.1-17, addresses cracking due to SCC and IGSCC that could occur in stainless-steel BWR isolation condenser components exposed to reactor coolant. The applicant stated that this item is not applicable. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.1.2.2.4.2 and finds this item is not applicable to Perry because a review of the UFSAR confirmed that the Perry design does not include a BWR isolation condenser.

3.1.2.2.5 Crack Growth Due to Cyclic Loading

LRA Section 3.1.2.2.5, associated with LRA Table 3.1.1, item 3.1.1-18, addresses crack growth due to cyclic loading for reactor pressure vessel shell forgings clad with stainless steel using a high heat input welding process. The applicant stated that this item is not applicable. The NRC staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.1.2.2.5 and finds this item is not applicable to Perry because (1) this item is only applicable to PWRs and (2) the UFSAR identifies that the reactor at the Perry facility is a BWR design.

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, AMR item 3.1.1-19, addresses cracking due to SCC in the PWR stainless-steel reactor vessel flange leak detection lines and bottom-mounted instrument guide tubes exposed to reactor coolant. The applicant claimed that this item is not applicable, as it applies to PWRs only. The NRC staff reviewed the applicant's non-applicability claim against the criteria in SRP-LR Section 3.1.2.2.6, item 1. The NRC staff finds that the applicant's non-applicability claim for components associated with LRA Table 3.1.1, AMR item 3.1.1-19 is acceptable because this item corresponds to SRP-LR Table 3.1-1, AMR item 19, which applies only to PWRs, and Perry is a BWR.

LRA Section 3.1.2.2.6, item 2, associated with LRA Table 3.1.1, AMR item 3.1.1-20, addresses cracking due to SCC in the PWR ASME Code Class 1 CASS reactor coolant system piping, piping components, and piping elements exposed to reactor coolant. The applicant claimed that this item is not applicable, as it applies to PWRs only. The NRC staff reviewed the applicant's non-applicability claim against the criteria in SRP-LR Section 3.1.2.2.6, item 2. The NRC staff finds that the applicant's non-applicability claim for components associated with LRA Table 3.1.1, AMR item 3.1.1-20 is acceptable because this item corresponds to SRP-LR Table 3.1-1, AMR item 20, which applies only to PWRs, and Perry is a BWR.

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 3.1.1-21, addresses cracking due to cyclic loading that could occur in steel and stainless-steel BWR isolation condenser components exposed to reactor coolant. The applicant stated that this item is not applicable. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.1.2.2.7 and finds this item is not applicable to Perry because a review of the UFSAR confirmed that the Perry design does not include a BWR isolation condenser.

3.1.2.2.8 Loss of Material Due to Erosion

LRA Section 3.1.2.2.8, addresses loss of material due erosion in steel steam generator feedwater impingement plates and supports exposed to secondary feedwater. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.2.2.2.8 and finds it acceptable because the SRP-LR criteria apply only to PWR steel steam generator impingement plates and supports.

3.1.2.2.9 Cracking due to Stress Corrosion Cracking and Irradiation-Assisted Stress Corrosion Cracking

LRA Section 3.1.2.2.9 addresses cracking due to stress corrosion cracking and irradiation-assisted stress corrosion cracking in stainless-steel and nickel-alloy primary and expansion PWR reactor vessel internal components. The applicant stated that this item was removed per LR-ISG-2011-04. The staff confirmed the applicant's claim in Appendix A, Section 2, of LR-ISG-2011-04. In addition, the staff noted that Section 3.1.2.2.9 of the SRP-LR applies only to PWRs. Therefore, the staff finds the applicant's statement acceptable.

3.1.2.2.10 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

LRA Section 3.1.2.2.10 addresses loss of fracture toughness due to neutron embrittlement, change in dimension due to void swelling, loss of preload due to stress relaxation, or loss of material due to wear in stainless-steel and nickel-alloy primary and expansion PWR reactor vessel internal components. The applicant stated that this item was removed per LR-ISG-2011-04. The staff confirmed the applicant's claim in Appendix A, Section 2, of LR-ISG-2011-04. In addition, the staff noted that Section 3.1.2.2.10 of the SRP-LR applies only to PWRs. Therefore, the staff finds the applicant's statement acceptable.

3.1.2.2.11 Cracking Due to Primary Water Stress Corrosion Cracking

LRA Section 3.1.2.2.11 addresses cracking due to primary water stress corrosion cracking in steam generator divider plate assemblies fabricated of Alloy 600 and steam generator nickel-alloy tube-to-tubesheet welds exposed to reactor coolant. The applicant stated that this item was removed per LR-ISG-2011-04. The staff confirmed the applicant's claim in Appendix A, Section 2, of LR-ISG-2011-04. In addition, the staff noted that Section 3.1.2.2.11 of the SRP-LR applies only to PWRs. Therefore, the staff finds the applicant's statement acceptable.

3.1.2.2.12 Cracking Due to Fatigue

LRA Section 3.1.2.2.12 addresses cracking due to fatigue as an aging effect that can occur in the core support barrel assembly, fuel alignment plate in the upper internals assembly, and core support plate lower support structure in PWR internals. The applicant stated that this item was removed per LR-ISG-2011-04. The staff confirmed the applicant's claim in Appendix A, Section 2, of LR-ISG-2011-04. In addition, the staff noted that Section 3.1.2.2.12 of the SRP-LR applies only to PWRs. Therefore, the staff finds the applicant's statement acceptable.

3.1.2.2.13 Cracking Due to Stress Corrosion Cracking and Fatigue

LRA Section 3.1.2.2.13 addresses cracking due to stress corrosion cracking and fatigue in nickel alloy control rod guide tube assemblies, guide tube support pins exposed to reactor coolant and neutron flux. The applicant stated that this item was removed per LR-ISG-2011-04. The staff confirmed the applicant's claim in Appendix A, Section 2, of LR-ISG-2011-04. In addition, the staff noted that Section 3.1.2.2.13 of the SRP-LR applies only to PWRs. Therefore, the staff finds the applicant's statement acceptable.

3.1.2.2.14 Loss of Material due to Wear

LRA Section 3.1.2.2.14 addresses loss of material due to wear in nickel alloy control rod guide tube assemblies, guide tube support pins and in Zircaloy-4 in-core instrumentation lower thimble tubes exposed to reactor coolant and neutron flux. The applicant stated that this item was removed per LR-ISG-2011-04. The staff confirmed the applicant's claim in Appendix A, Section 2, of LR-ISG-2011-04. In addition, the staff noted that Section 3.1.2.2.14 of the SRP-LR applies only to PWRs. Therefore, the staff finds the applicant's statement acceptable.

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 quality assurance (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 3.1.2-6 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 PEO. 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 types, material, and environment combinations are acceptable because it aligned with the staff's current guidance for LR. The following section documents the staff's evaluation.

3.1.2.3.1 Nuclear Boiler System

<u>Stainless-Steel Flexible Hoses Exposed to Uncontrolled Indoor Air</u>. LRA Tables 3.1.2-2, 3.3.2-4, 3.3.1-15a, 3.3.2-43, and 3.3.2-54, as modified by letters dated January 27, 2025 (ML25027A327), and April 22, 2025 (ML25112A167), state that cracking of stainless-steel flexible hoses exposed to uncontrolled indoor air will be managed by the External Surfaces Monitoring of Mechanical Components Program. The AMR items cite generic note H and plant-specific notes 111 and 344, which state that cracking due to various causes (e.g., chloride induced stress corrosion cracking, installation-initiated cracking exacerbated by chloride induced stress corrosion cracking, and cycle fatigue) is assigned to this row. These plant-specific notes also indicate that the flexible hoses will be periodically replaced. The applicant addressed issues related to chloride induced stress corrosion cracking of stainless-steel flexible hoses in its response to RAI-10276-R1, dated October 2, 2024 (ML24276A083).

Based on the applicant's change to periodic replacements of the associated stainless-steel flexible hoses, the staff determined that these components are no longer subject to an aging management review, as delineated in 10 CFR 54.21(a)(1)(ii). Consequently, the evaluation of the associated AMR items is not required. The staff noted that the applicant provided its bases for the initial replacement frequencies (ranging from 6 to 10 years) in the above letters. In conjunction with the applicant's corrective actions to address leak testing methodologies and additional installation precautions for the associated flexible hoses, the staff found that adequate justifications for the replacement frequencies were provided.

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 engineered safety feature 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
3.2.1-1	Consistent with the GALL-LR Report (see SE Section 3.2.2.2.1)
3.2.1-2	Not applicable to BWRs
3.2.1-3	Not applicable to BWRs
3.2.1-4	Not applicable to Perry (see SE Section 3.2.2.2.3)
3.2.1-5	Not applicable to BWRs
3.2.1-6	Not applicable to BWRs (see SE Section 3.2.2.2.5)
3.2.1-7	Not applicable to Perry (see SE Section 3.2.2.2.6)
3.2.1-8	Not applicable to BWRs
3.2.1-9	Not applicable to BWRs
3.2.1-10	Not applicable to Perry
3.2.1-11	Consistent with the GALL-LR Report
3.2.1-12	Consistent with the GALL-LR Report
3.2.1-13	Consistent with the GALL-LR Report
3.2.1-14	Not applicable to Perry
3.2.1-15	Consistent with the GALL-LR Report
3.2.1-16	Consistent with the GALL-LR Report
3.2.1-17	Consistent with the GALL-LR Report (see SE Section 3.2.2.2.3.1)
3.2.1-18	Not applicable to Perry (addressed by items 3.2.1-16 and 3.2.1-17)
3.2.1-19	Consistent with the GALL-LR Report
3.2.1-20	Not applicable to BWRs
3.2.1-21	Not applicable to BWRs
3.2.1-22	Not applicable to BWRs
3.2.1-23	Consistent with the GALL-LR Report
3.2.1-24	Not applicable to BWRs
3.2.1-25	Consistent with the GALL-LR Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.2.1-26	Consistent with the GALL-LR Report
3.2.1-27	Not applicable to Perry
3.2.1-28	Not applicable to Perry
3.2.1-29	Not applicable to Perry
3.2.1-30	Consistent with the GALL-LR Report
3.2.1-31	Consistent with the GALL-LR Report
3.2.1-32	Not applicable to Perry
3.2.1-33	Not applicable to Perry
3.2.1-34	Not applicable to Perry
3.2.1-35	Not applicable to BWRs
3.2.1-36	Not applicable to BWRs
3.2.1-37	Not applicable to Perry
3.2.1-38	Consistent with the GALL-LR Report
3.2.1-39	Not applicable to Perry (addressed by LRA Table 3.2-1, item 3.2.1-69)
3.2.1-40	Consistent with the GALL-LR Report
3.2.1-41	Not applicable to Perry
3.2.1-42	Not applicable to Perry
3.2.1-43	Not applicable to Perry
3.2.1-44	Consistent with the GALL-LR Report
3.2.1-45	Not applicable to BWRs
3.2.1-46	Not applicable to Perry
3.2.1-47	Not applicable to BWRs
3.2-1-48	Consistent with the GALL-LR Report
3.2.1-49	Consistent with the GALL-LR Report
3.2.1-50	Consistent with the GALL-LR Report
3.2.1-51	Consistent with the GALL-LR Report
3.2.1-52	Not applicable to Perry
3.2.1-53	Not applicable to Perry
3.2.1-53x	Not applicable to Perry
3.2.1-54	Not applicable to Perry (addressed by LRA Table 3.2-1, item 3.4-1, 11)
3.2.1-55	Not applicable to Perry
3.2.1-56	Consistent with the GALL-LR Report
3.2.1-57	Consistent with the GALL-LR Report
3.2.1-58	Not applicable to BWRs
3.2.1-59	Not applicable to Perry
3.2.1-60	Consistent with the GALL-LR Report
3.2.1-61	Not applicable to Perry
3.2.1-62	Not applicable to Perry
3.2.1-63	Consistent with the GALL-LR Report
3.2.1-64	Not applicable to Perry
3.2.1-65	Consistent with the GALL-LR Report
3.2.1-66	Not applicable to Perry (see SE Section 3.2.2.2.9)
3.2.1-67	Not applicable to Perry

Component Group (SRP-LR Item No.)	Staff Evaluation
3.2.1-68	Not applicable to Perry
3.2.1-69	Consistent with the GALL-LR Report
3.2.1-70	Not applicable to Perry
3.2.1-71	Consistent with the GALL-LR Report
3.2.1-72	Not applicable to Perry
3.2.1-73	Not applicable to Perry
3.2.1-74	Not applicable to Perry

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

(1) SE Section 3.2.2.1 discusses AMR results for components that the applicant stated are either not applicable to Perry 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 3.2.2.2.2 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 3.2.2-9 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.

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

For LRA Table 3.2.1 items 3.2.1-4, 3.2.1-7, 3.2.1-10, 3.2.1-14, 3.2.1-18, 3.1.2-27 through 29, 3.2.1-32 through 34, 3.2.1-37, 3.2.1-39, 3.2.1-41 through 43, 3.2.1-46, 3.2.1-52 through 55, 3.2.1-59, 3.2.1-61, 3.2.1-62, 3.2.1-64, 3.2.1-66 through 68, 3.2.1-70, and 3.2.1-72 through 74, the applicant claims that the corresponding AMR items in the GALL-LR Report are neither used nor applicable Perry. The NRC staff reviewed the LRA and UFSAR and confirmed that the applicant's LRA does not have any AMR results that are applicable for these items.

For LRA Table 3.1.1- items 3.2.1-2, 3.2.1-3, 3.2.1-5, 3.2.1-6, 3.2.1-8, 3.2.1-9, 3.2.1-20 through 22, 3.2.1-24, 3.2.1-35, 3.2.1-36, 3.2.1-45, 3.2.1-47, and 3.2.1-58, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable because the associated items are applicable only to PWRs while Perry is a BWR unit. The NRC staff reviewed the SRP-LR Report, confirmed that these items apply only to PWRs, and finds that these items are not applicable to Perry because the nuclear power plant is a BWR.

The applicant claimed that item 3.2.1-10 is not applicable because Perry does not have CASS components in the engineered safety features systems exposed to treated water (borated) >250°C (>482°F) or treated water >250°C (>482°F). The NRC staff reviewed the LRA and UFSAR and verified the applicant's claim.

3.2.2.1.2 Loss of Material Due to General Corrosion

LRA Table 3.2.1, AMR item 3.2.1-44, addresses loss of material due to general corrosion for steel piping and ducting exposed internally to air-indoor-uncontrolled. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the External Surfaces Monitoring of Mechanical Components Program to manage the aging effect for steel piping, pump casings, and heat exchange shells in the emergency closed cooling system. The AMR items cite plant-specific note 307, which states "[c]omponents provide only structural support, and are isolated, with internal environment of air. Internal aging effects are expected to be similar to those visible externally."

During its review the staff noted the following:

(1) The subject components are exposed to the same environment externally and internally.

(2) GALL-LR AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," as amended by LR-ISG-2012-02, "Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation," states the program may be credited with managing loss of material from internal surfaces of metallic components for cases in which material and environment combinations are the same for internal and external surfaces such that external surface condition is representative of internal surface condition.

Based on its review of components associated with AMR item 3.2.1-44 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components Program acceptable because it is consistent with guidance provided in GALL-LR AMP XI.M36, as amended by LR-ISG-2012-02.

3.2.2.1.3 Loss of Material Due to Pitting, Crevice Corrosion

LRA Table 3.2.1 item 3.2.1-17, as modified by letter dated June 27, 2024 (ML24180A010), addresses loss of material due to pitting, crevice corrosion for aluminum and stainless-steel piping, piping components, and piping elements exposed to treated water. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the Bolting Integrity program to manage aging effects. In LRA Table 3.2.2-9 "Suppression Pool System," item 3.2.1-17 addresses loss of material for stainless-steel bolting exposed to a treated water external environment. Based on its review of the components associated with item 3.2.1-17, which cites generic note E in

Table 3.2.2-9, the staff finds the applicant's proposal of using the Bolting Integrity program acceptable because the associated periodic inspections will be able to detect loss of material for these components.

3.2.2.1.4 Loss of Material Due to General Corrosion

LRA Table 3.2.1, item 3.2.1-40 addresses loss of material due to general corrosion of external surfaces for steel piping and components exposed to uncontrolled indoor air. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program for managing loss of material for the reactor vessel support skirt, in lieu of the External Surfaces Monitoring of Mechanical Components Program.

Based on its review of the component associated with item 3.3.1-40, for which the applicant cited generic note E, the staff finds the applicant's proposal, to manage the effects of aging using the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, acceptable because the periodic visual inspections performed by the cited program can identify and manage loss of material on the reactor vessel support skirt prior to a loss of intended function.

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 engineered safety feature 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 3.2.1-1, indicates that the TLAA on cumulative fatigue damage in the components of engineered safety features is evaluated in accordance with 10 CFR 54.21(c) and is addressed in LRA Section 4.3. 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 engineered safety features is documented in Section 4.3 of this SE.

3.2.2.2.2 Loss of Material Due to Cladding Breach

LRA Section 3.2.2.2.2, associated with LRA Table 3.2.1, AMR item 3.2.1-2, addresses loss of material due to cladding breach for steel pump casings with stainless-steel cladding exposed to treated borated water. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.2.2.2.2 and Table 3.2-1 and finds it acceptable because the SRP-LR criteria apply only to PWR steel pump casings.

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 UFSAR, the engineered safety feature systems do not include partially encased stainless-steel tanks exposed to this environment.

Item 2. LRA Section 3.2.2.2.3.2, as supplemented by letter dated June 27, 2024 (ML24180A010), associated with LRA Table 3.2.1, AMR item 3.2.1-4, addresses loss of material due to pitting and crevice corrosion for stainless-steel piping, piping components, piping elements, and tanks exposed to outdoor air. The applicant stated that this item is not applicable because there are no stainless-steel piping, piping components or elements, or tanks exposed to outdoor air in the engineered safety features systems. The applicant also stated that there was no plant-specific OE indicating accumulation of salt contamination from the outdoor air. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.2.2.2.3.2 and finds it acceptable because based on a review of the UFSAR and LRA there are no stainless-steel components exposed to outdoor air in the engineered safety features systems.

3.2.2.2.4 Loss of Material Due to Erosion

LRA Section 3.2.2.2.4 addresses loss of material due erosion in stainless-steel, high-pressure safety injection pump mini-flow recirculation orifices exposed to treated borated water. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.2.2.2.4 and finds it acceptable because the SRP-LR criteria apply only to PWR high-pressure safety injection pump mini-flow recirculation orifices.

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 3.2.1-6, 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 uncontrolled indoor air. As clarified for subsequent license renewal in NUREG-2221, "Technical Bases for Changes in the Subsequent License Renewal Guidance Documents NUREG–2191 and NUREG–2192," Table 2-18, "Changes to Existing GALL Report Revision 2 Chapter V AMR Items and Technical Bases," the source of the fouling could be corrosion products generated from alternate wetting and drying of drywell and suppression chamber metallic piping and piping components upstream of the nozzles and orifices. In Supplement 2 (ML24180A010) the applicant revised LRA Section 3.2.2.2.5 and Table 3.2.1, item 3.2.1-6, to clarify that the steel containment spray piping exposed to indoor uncontrolled air will be managed using AMR item 3.2.1-44 with the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The staff finds this acceptable because that program includes inspections capable of detecting loss of material in steel piping.

Based on the programs identified, the staff concludes that the applicant's programs meet the SRP-LR Section 3.2.2.2.5 criteria. For those AMR items associated with LRA Section 3.2.2.2.5, the staff concludes that the LRA is consistent with the GALL 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 PEO as required by 10 CFR 54.21(a)(3).

3.2.2.2.6 Cracking Due to Stress Corrosion Cracking

LRA Section 3.2.2.2.6, as supplemented by letter dated June 27, 2024 (ML24180A010), associated with LRA Table 3.2-1, AMR item 3.2.1-7, 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 because there are no stainless-steel pipes, piping components or elements, or tanks exposed to outdoor air in the engineered safety features systems. The applicant also stated that there was no plant-specific OE indicating accumulation of salt contamination from the outdoor air. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.2.2.2.6 and finds it acceptable because based on a review of the UFSAR and LRA there are no stainless-steel components exposed to outdoor air in the engineered safety features systems.

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, associated with LRA Table 3.2.1, item 3.2.1-66, addresses loss of material due to recurring internal corrosion for metallic piping components exposed to multiple water environments. The application states that this item is not applicable based on a review of plant-specific OE, which did not identify internal corrosion in any engineered safety features systems at a frequency provided in LR-ISG-2012-02 for recurring internal corrosion. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.2.2.2.9, as modified by LR-ISG-2012-02, and finds it acceptable because its independent reviews of Perry's OE database did not identify issues in the engineered safety features systems that met the threshold for recurring internal corrosion.

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 3.2.2-9 that are not consistent with, or not addressed in, the GALL-LR Report.

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

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 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
3.3.1-1	Consistent with the GALL-LR Report (see SE Section 3.3.2.2.1)
3.3.1-2	Consistent with the GALL-LR Report (see SE Section 3.3.2.2.1)
3.3.1-3	Not applicable to BWRs (see SE Section 3.3.2.2.2)
3.3.1-4	Not applicable to Perry (see SE Section 3.3.2.2.3)
3.3.1-5	Not applicable to BWRs (see SE Section 3.3.2.2.4)
3.3.1-6	Not applicable to Perry (see SE Section 3.3.2.2.5)
3.3.1-7	Not applicable to BWRs
3.3.1-8	Not applicable to BWRs
3.3.1-9	Not applicable to BWRs
3.3.1-10	Not applicable to Perry
3.3.1-11	Not applicable to Perry
3.3.1-12	Consistent with the GALL-LR Report
3.3.1-13	Not applicable to Perry
3.3.1-14	Consistent with the GALL-LR Report
3.3.1-15	Consistent with the GALL-LR Report
3.3.1-16	Consistent with the GALL-LR Report
3.3.1-17	Consistent with the GALL-LR Report
3.3.1-18	Not applicable to Perry
3.3.1-19	Not applicable to Perry
3.3.1-20	Consistent with the GALL-LR Report
3.3.1-21	Consistent with the GALL-LR Report
3.3.1-22	Consistent with the GALL-LR Report
3.3.1-23	Not applicable to Perry (addressed by item 3.3.1-25)
3.3.1-24	Consistent with the GALL-LR Report
3.3.1-25	Consistent with the GALL-LR Report
3.3.1-26	Not applicable to Perry (addressed in Sections 2.3.3 and 3.3)
3.3.1-27	Consistent with the GALL-LR Report
3.3.1-28	Not applicable to BWRs
3.3.1-29	Not applicable to BWRs
3.3.1-30	Not applicable to Perry (addressed by items 3.3.1-128 and 3.3.1-139)
3.3.1-30x	Consistent with the GALL-LR Report
3.3.1-31	Not applicable to Perry (addressed by items 3.3.1-128 and 3.3.1-139)
3.3.1-32	Not applicable to Perry
3.3.1-32x	Not applicable to Perry
3.3.1-33	Not applicable to Perry (addressed by items 3.3.1-128 and 3.3.1-139)
3.3.1-34	Not applicable to Perry (addressed by item 3.3.1-36)
3.3.1-35	Not applicable to Perry (addressed by item 3.3.1-36)

Component Group (SRP-LR Item No.)	Staff Evaluation
3.3.1-36	Consistent with the GALL-LR Report
3.3.1-37	Consistent with the GALL-LR Report
3.3.1-38	Consistent with the GALL-LR Report
3.3.1-39	Not applicable to Perry (addressed by item 3.3.1-40)
3.3.1-40	Consistent with the GALL-LR Report
3.3.1-41	Not applicable to Perry (addressed by item 3.3.1-40)
3.3.1-42	Consistent with the GALL-LR Report
3.3.1-43	Consistent with the GALL-LR Report
3.3.1-44	Not applicable to Perry
3.3.1-45	Consistent with the GALL-LR Report
3.3.1-46	Consistent with the GALL-LR Report
3.3.1-47	Consistent with the GALL-LR Report
3.3.1-48	Not applicable to Perry
3.3.1-49	Consistent with the GALL-LR Report
3.3.1-50	Consistent with the GALL-LR Report
3.3.1-51	Not applicable to Perry
3.3.1-52	Consistent with the GALL-LR Report
3.3.1-53	Not applicable to Perry (addressed by LRA Table 3.3-1, item 3.3.1-52)
3.3.1-54	Not applicable to Perry (addressed by LRA Table 3.3-1, items 3.3.1-89 and 3.3.1-114)
3.3.1-55	Not applicable to Perry (addressed by LRA Table 3.3-1, items 3.3.1-95 and 3.3.1-121)
3.3.1-56	Not applicable to Perry (addressed by LRA Table 3.3-1, items 3.3.1-95 and 3.3.1-120)
3.3.1-57	Consistent with the GALL-LR Report
3.3.1-58	Consistent with the GALL-LR Report
3.3.1-59	Consistent with the GALL-LR Report
3.3.1-60	Consistent with the GALL-LR Report
3.3.1-61	Consistent with the GALL-LR Report
3.3.1-62	Consistent with the GALL-LR Report
3.3.1-63	Consistent with the GALL-LR Report
3.3.1-64	Consistent with the GALL-LR Report
3.3.1-65	Not applicable to Perry
3.3.1-66	Consistent with the GALL-LR Report
3.3.1-67	Not applicable to Perry
3.3.1-68	Not applicable to Perry
3.3.1-69	Consistent with the GALL-LR Report
3.3.1-70	Consistent with the GALL-LR Report (See SE Section 3.3.2.1.3)
3.3.1-71	Consistent with the GALL-LR Report (See SE Section 3.3.2.1.3)
3.3.1-72	Consistent with the GALL-LR Report
3.3.1-73	Not applicable to Perry
3.3.1-74	Not applicable to Perry
3.3.1-75	Not applicable to Perry
3.3.1-76	Consistent with the GALL-LR Report (See SE Section 3.5.2.1.3)

Component Group (SRP-LR Item No.)	Staff Evaluation
3.3.1-77	Not applicable to Perry
3.3.1-78	Consistent with the GALL-LR Report
3.3.1-79	Consistent with the GALL-LR Report
3.3.1-80	Consistent with the GALL-LR Report
3.3.1-81	Consistent with the GALL-LR Report
3.3.1-82	Consistent with the GALL-LR Report
3.3.1-83	Consistent with the GALL-LR Report (See SE Section 3.3.2.1.6)
3.3.1-84	This item number is not used in the SRP-LR or the GALL-LR Report
3.3.1-85	Not applicable to Perry
3.3.1-86	Not applicable to Perry
3.3.1-87	This item number is not used in the SRP-LR or the GALL-LR Report
3.3.1-88	Consistent with the GALL-LR Report (See SE Section 3.3.2.1.7)
3.3.1-89	Consistent with the GALL-LR Report
3.3.1-90	Consistent with the GALL-LR Report
3.3.1-91	Consistent with the GALL-LR Report
3.3.1-92	Consistent with the GALL-LR Report
3.3.1-93	Consistent with the GALL-LR Report
3.3.1-94	Not applicable to Perry
3.3.1-95	Consistent with the GALL-LR Report
3.3.1-96	Consistent with the GALL-LR Report
3.3.1-97	Consistent with the GALL-LR Report (See SE Section 3.3.2.1.2)
3.3.1-98	Consistent with the GALL-LR Report
3.3.1-99	Consistent with the GALL-LR Report
3.3.1-100	Consistent with the GALL-LR Report (See SE Section 3.3.2.1.2)
3.3.1-101	Consistent with the GALL-LR Report
3.3.1-102	Consistent with the GALL-LR Report
3.3.1-103	Not applicable to Perry
3.3.1-104	Consistent with the GALL-LR Report (See SE Section 3.3.2.3.3)
3.3.1-105	Not applicable to Perry
3.3.1-106	Consistent with the GALL-LR Report
3.3.1-107	Consistent with the GALL-LR Report
3.3.1-108	Not applicable to Perry
3.3.1-109	Consistent with the GALL-LR Report
3.3.1-109x	Consistent with the GALL-LR Report
3.3.1-110	Not applicable to Perry (addressed by LRA Table 3.3-1, item 3.3.1-20; and LRA Table 3.4-1, item 3.4.1-11)
3.3.1-111	Consistent with the GALL-LR Report
3.3.1-112	Consistent with the GALL-LR Report
3.3.1-113	Consistent with the GALL-LR Report (See SE Section 3.3.2.1.8)
3.3.1-114	Consistent with the GALL-LR Report
3.3.1-115	Not applicable to BWRs
3.3.1-116	Consistent with the GALL-LR Report (See SE Section 3.3.2.3.2)
3.3.1-117	Consistent with the GALL-LR Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.3.1-118	Not applicable to Perry
3.3.1-119	Consistent with the GALL-LR Report (See SE Section 3.3.2.3.4)
3.3.1-120	Not used (addressed by LRA Table 3.3-1, item 3.3.1-20; and LRA Table 3.4-1, item 3.4.1-11)
3.3.1-121	Consistent with the GALL-LR Report
3.3.1-122	Not applicable to Perry
3.3.1-123	Not applicable to Perry
3.3.1-124	Not applicable to Perry
3.3.1-125	Not used (addressed by item 3.3.1-25)
3.3.1-126	Consistent with the GALL-LR Report
3.3.1-127	Consistent with the GALL-LR Report (see SE Section 3.3.2.2.8)
3.3.1-128	Not applicable to Perry
3.3.1-129	Not applicable to Perry
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 Perry
3.3.1-134	Consistent with the GALL-LR Report
3.3.1-135	Not applicable to Perry
3.3.1-136	Not applicable to Perry
3.3.1-137	Not applicable to Perry
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 NRC staff's review of component groups, as described in SE Section 3.0.2.2, is summarized in the following three sections:

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

(2) SE Section 3.3.2.2 discusses AMR results for which the GALL-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 3.3.2.3 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 3.3.2-63 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.

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

For LRA Table 3.3.1 items 3.3.1-4, 3.3.1-6, 3.3.1-10, 3.3.1-11, 3.3.1-13, 3.1.3-18, 3.3.1-19, 3.3.1-23, 3.3.1-26, 3.3.1-30; 3.3.1-31 through 35, 3.3.1-39, 3.3.1-41, 3.3.1-44, 3.3.1-48, 3.3.1-51; 3.3.1-53 through 56, 3.3.1-65, 3.3.1-67, 3.3.1-68, 3.3.1-73 through 75; 3.3.1-77, 3.3.1-84 through 87, 3.3.1-94, 3.3.1-103, 3.3.1-105, 3.3.1-108, 3.3.1-110, 3.3.1-118, 3.3.1-120, 3.3.1-122 through 125, 3.3.1-128, 3.3.1-129, 3.3.1-133 and 3.3.1-134 through 135, the applicant claims that the corresponding AMR items in the GALL-LR Report are neither used nor applicable Perry. The NRC staff reviewed the LRA and UFSAR and confirmed that the applicant's LRA does not have any AMR results that are applicable for these items.

For LRA Table 3.3.1- items 3.3.1-3, 3.3.1-5, 3.3.1-7 through 9; 3.3.1-28, 3.3.1-29 and 3.3.1-115, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable because the associated items are applicable only to PWRs while Perry is a BWR unit. The NRC staff reviewed the SRP-LR Report, confirmed that these items apply only to PWRs, and finds that these items are not applicable to Perry because the nuclear power plant is a BWR.

LRA Table 3.3-1, AMR item 3.3.1-53 addresses loss of material due to wear for steel cranes rails exposed to indoor air and uncontrolled (external). The applicant stated that this item is not used. The staff evaluated the applicant's claim and finds it acceptable because loss of material for crane rails is addressed under AMR item 3.3.1-52.

For stainless-steel piping and piping components addressed by AMR item 3.3.1-124, exposed to treated water >60°C (>140°F) or treated borated water >60°C (>140°F) the applicant used AMR items 3.3.1-20 and 3.4.1-11. The staff finds the applicant's use of these alternate AMR items appropriate since the materials and aging effects and the AMPs credited to manage them are identical.

LRA Table 3.3.1, AMR item 3.3.1-64 addresses loss of material due to general, pitting, crevice, and microbiologically influenced corrosion; fouling that leads to corrosion; and flow blockage due to fouling for steel and copper alloy piping, piping components, and piping elements exposed to raw water. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Open-Cycle Cooling Water System AMP to manage the aging effect for steel, copper alloy <15 percent Zn, and gray cast iron (with internal coating/lining) pump casings exposed to raw water.

Based on its review of components associated with AMR item 3.3.1-64 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 AMP acceptable because managing loss of material in accordance with the provision of the Open-Cycle Cooling Water System AMP is consistent with the GALL.

LRA Table 3.3.1, AMR item 3.3.1-66 addresses loss of material due to pitting and crevice corrosion; fouling that leads to corrosion; and flow blockage due to fouling for stainless-steel piping, piping components, and piping elements exposed to raw water. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the Open-Cycle Cooling Water System AMP to manage the aging effect for stainless-steel pump casings exposed to raw water.

Based on its review of components associated with AMR item 3.3.1-66 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 AMP acceptable because managing loss of material in accordance with the provision of the Open-Cycle Cooling Water System AMP is consistent with the GALL.

For LRA Table 3.3-1, items 3.3.1-94 the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable. 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.

3.3.2.1.2 Loss of Material Due to General, Pitting, Crevice and Microbiologically Influenced Corrosion

LRA Table 3.3.1, AMR items 3.3.1-100 and 3.3.1-97 addresses Loss of material for Stainless Steel and steel drain components respectively, exposed to lubricating oil. For the LRA Table 2 AMR items 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 and stainless-steel drain components. The AMR items cite plant-specific note E, 327, which state "Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program. Represents miscellaneous floor drains, equipment drains pans, and funnels with leakage boundary intended function highlighted on system boundary drawings."

Based on its review of components associated with AMR items 3.3.1-100 and 3.3.1-97 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 if loss of material due to pitting or crevice corrosion has occurred and if it is sufficient to potentially affect the intended function of systems, structure, and components, the AMP credited (Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP) will be acceptable (as described in reference NUREG- 2192 Section 3.2.2.2.2 Loss of Material Due to Pitting and Crevice in Stainless steel and Nickel Alloys) for the steel floor and equipment drain pans and funnels in the floor and equipment drain system exposed to lube oil.

3.3.2.1.3 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion; Fouling that Leads to Corrosion

LRA Table 3.3.1 and AMR items 3.3.1-70 and 3.3.1-71 address loss of material due to general, pitting, crevice, and microbiologically influenced corrosion; and fouling that leads to corrosion for steel and stainless-steel drains exposed to fuel oil. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the LRA AMP Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components to manage the aging effect for steel and stainless steel for steel floor and equipment drains system. The AMR item cites plant-specific note E, 327, which states “Consistent with NUREG-1801 item for material, environment, and aging effect, but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program. Represents miscellaneous floor drains, equipment drains pans, and funnels with leakage boundary intended function highlighted on system boundary drawings.”

Based on its review of components associated with AMR items 3.3.1-70 and 3.3.1-71 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, if loss of material due to pitting or crevice corrosion has occurred and if it’s sufficient to potentially affect the intended function of systems, structure, and components, the AMP credited (Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP) will be acceptable (as described in reference NUREG- 2192 Section 3.2.2.2.2 Loss of Material Due to Pitting and Crevice in Stainless steel and Nickel Alloys) for the steel floor and equipment drain pans and funnels in the floor and equipment drain system exposed to fuel oil.

3.3.2.1.4 Loss of Material Due to General (steel only), Pitting, Or Crevice Corrosion; Cracking Due to Stress Corrosion Cracking (stainless steel and aluminum only)

LRA Table 3.3.1, AMR item 3.3.1-128 addresses loss of material due to general (steel only), pitting, or crevice corrosion and cracking due to stress corrosion cracking (stainless steel and aluminum only) for steel, stainless-steel, or aluminum tanks (within the scope of Chapter XI.M29, “Aboveground Metallic Tanks”) exposed to soil or concrete, or the following external environments: air-outdoor, air-indoor uncontrolled, moist air, and condensation. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the Buried and Underground Piping and Tanks Program to manage cracking due to stress corrosion cracking for stainless-steel piping exposed to soil in the fire protection system.

During its audit, the staff requested a discussion with respect to why cracking is being managed for buried stainless steel in the fire protection system but not in the condensate transfer and storage system. By letter dated June 27, 2024 (ML24180A010), the applicant revised the Buried and Underground Piping and Tanks Program (and corresponding UFSAR supplement description of the program) to clarify that visual inspections of stainless-steel piping for cracking will be performed when the surface is exposed, addressing the staff’s concern. 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 Buried and Underground Piping and Tanks Program acceptable because as noted in SRP-LR Table 3.3-1, item 144, this program can adequately manage cracking due to stress corrosion cracking for stainless-steel piping exposed to soil.

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

Item 1. LRA Table 3.3.1 item 3.3.1-21 addresses loss of material due to pitting, crevice corrosion for steel piping, piping components and piping elements exposed to treated water. Item 3.3.1-25, as modified by letter dated June 27, 2024 (ML24180A010), addresses loss material due to pitting, crevice corrosion for stainless steel; steel with stainless-steel cladding and aluminum piping, piping components and piping elements and heat exchanger components exposed to treated water and sodium pentaborate solution. For LRA Table 2 AMR items that cite generic note E, the LRA either credits the Bolting Integrity program or the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting program to manage the aging effects.

In LRA Table 3.3.2-27 "Fuel Storage and Fuel Pool Cooling and Cleanup," item 3.3.1-25 addresses loss of material for stainless-steel bolting exposed to a treated water external environment. Plant-specific note 324 states, "Bolting Integrity Program is enhanced to perform visual inspection of submerged bolting for ESW/ESW screen-wash pumps, diesel/motor fire pumps, Suppression Pool Suction Strainer, and Spent Fuel Rack Grid Structure for loss of material and loss of preload." Based on its review of the components associated with item 3.3.1-25, which cite generic note E in Table 3.3.2-27, the staff finds the applicant's proposal of using the Bolting Integrity program acceptable because the associated periodic inspections will be able to detect loss of material for these components.

In LRA Table 3.3.2-56 "Standby Liquid Control System," item 3.3.1-21 addresses loss of material for steel piping and valve bodies exposed to treated water internal and sodium pentaborate solution internal environments. Plant-specific note 301 states, "Sodium pentaborate solution is a subset of treated water that results in similar aging effects for steel components. Steel piping exposed to sodium pentaborate when system is tested, drained, or are tank overflow lines. Lines are typically drained." Based on its review of the components associated with item 3.3.1-21, which cites generic note E in Table 3.3.2-56, the staff finds the applicant's proposal of using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting program acceptable because the associated periodic visual inspections will be able to detect loss of material for these components.

Item 2. LRA Table 3.3.1, AMR item 3.3.1-89 addresses loss of material due to general, pitting, and crevice corrosion for steel and copper alloy piping, piping components, and piping elements exposed to moist air or condensation. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the External Surfaces Monitoring of Mechanical Components Program to manage the aging effect for steel strainer bodies exposed to air-outdoor in the floor and equipment drains system. The AMR item cites plant-specific note 322, which states "[r]oof drains are gray cast iron body in outdoor air and is treated as steel and managed by external surfaces program…[m]oist air or condensation (Internal) is considered equivalent to Outdoor air." Based on its review of components associated with AMR item 3.3.1-89 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components Program acceptable because:

(1) Moist air, condensation, and outdoor air are similar environments.

(2) The visual inspections conducted by the program, at an interval not to exceed one operating cycle, are capable of detecting loss of material prior to loss of the intended function.

3.3.2.1.6 Cracking Due to Stress Corrosion Cracking

LRA Table 3.3.1, AMR item 3.3.1-83 addresses cracking due to stress corrosion cracking for stainless-steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the Structures Monitoring program to manage the aging effect for stainless-steel diesel exhaust hallway insulation bolting.

Based on its review of the component associated with AMR item 3.3.1-83 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Structures Monitoring program acceptable because, as noted in SRP-LR Table 3.0-1, this program consists of periodic inspection and condition monitoring to ensure that aging degradation leading to loss of intended function will be detected and that the extent of degradation can be determined. Also, the Structures Monitoring AMP is more appropriate for bolting because bolting does not have internal surfaces that can be inspected per the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP.

3.3.2.1.7 Loss of Material Due to General (Steel Only), Pitting, and Crevice Corrosion

LRA Table 3.3.1, AMR item 3.3.1-88 addresses loss of material due to general (steel only), pitting, and crevice corrosion for steel and stainless-steel diesel engine exhaust piping, piping components, and piping elements exposed to raw water (potable) and diesel exhaust. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the Structures Monitoring program to manage the aging effect for stainless-steel diesel exhaust hallway insulation bolting.

Based on its review of the component associated with AMR item 3.3.1-88 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Structures Monitoring program acceptable, because as noted in SRP-LR Table 3.0-1, this program consists of periodic inspection and condition monitoring to ensure that aging degradation leading to loss of intended function will be detected and that the extent of degradation can be determined. Also, the Structures Monitoring AMP is more appropriate for bolting since bolting does not have internal surfaces which can be inspected per the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP.

3.3.2.1.8 No Aging Effects

LRA Table 3.3.1, AMR item 3.3.1-113 addresses no aging effects for aluminum piping, piping components and piping elements exposed to air–dry (internal/external), air–indoor uncontrolled (internal/external), air–indoor controlled (external), and gas. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Compressed Air Monitoring program to ensure the air remains dry and free of contaminants, and thus no aging effects, for aluminum nuclear boiler valve bodies, for aluminum standby diesel generator starting air and controlling air components, and for aluminum service air and instrument air valve bodies.

Based on its review of components associated with AMR item 3.3.1-113 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Compressed Air Monitoring program acceptable because this program can adequately manage for corrosion by monitoring for moisture content and presence of contaminants, and by opportunistically inspecting components for indications of loss of material. This provides additional assurance of no aging effects beyond what would be provided if no AMP was specified consistent with the SRP-LR Report for item 3.3.1-113.

3.3.2.1.9 Loss of Material due to Selective Leaching

As amended by letter dated September 5, 2024 (ML24249A123), LRA Table 3.3.1, AMR item 3.3.1-72 addresses loss of material due to selective leaching for gray cast iron and copper alloy (greater than 15 percent zinc or 8 percent aluminum) piping, piping components, piping elements, and heat exchanger components exposed to treated water, closed-cycle cooling water, soil, and raw water. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Plant-Specific Periodic Inspections for Selective Leaching Program to manage the aging effect for (1) gray cast iron components exposed to soil, (2) gray cast iron components to raw water, and (3) ductile iron components exposed to soil. The staff's evaluation with respect to managing loss of material due to selective leaching for these components using the Plant-Specific Periodic Inspections for Selective Leaching Program is documented in SE Section 3.0.3.3.1.

3.3.2.1.10 Piping, Piping Components and Piping Exposed to Air-Dry (Internal)

LRA Table 3.3-1, AMR items 3.3.1-113, 3.3.1-114, 3.3.1-120, and 3.3.1-121, identify no aging effects/mechanisms and no aging management programs for aluminum, copper alloy, stainless-steel, and steel piping, piping components, and piping elements exposed internally to dry air, for which the GALL-LR Report cites no aging effects or aging management programs. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Compressed Air Monitoring program to monitor and ensure the quality of the air environment is maintained during the PEO for aluminum, copper alloy, stainless steel, and steel piping, tanks, valve bodies, orifices, flexible hoses, accumulators, filter housings, strainer bodies, and motor housings. The LRA also cites item 3.3.1-120 to credit the Compressed Air Monitoring program in the same way for a nickel-alloy flexible hose in the Nuclear Boiler System. Nickel alloys exposed internally to dry air are not included in the GALL-LR Report, and the LRA states that nickel alloy aging effects are treated the same as stainless-steel aging effects in a dried air environment based on Table 4-1 of Electric Power Research Institute (EPRI) Report 1010639, "Non-Class 1 Mechanical Implementation Guideline and Mechanical Tool," Revision 4, Appendix D.

Based on its review of components associated with AMR items 3.3.1-113, 3.3.1-114, 3.3.1-120, and 3.3.1-121 for which the applicant cited generic note E, the staff finds the applicant's proposal to ensure the air quality using the Compressed Air Monitoring program acceptable because the periodic sampling and testing of the air performed by this program are capable of ensuring the moisture and contaminants in the air are maintained below specific limits, and because the program will be enhanced to include opportunistic inspections capable of detecting loss of material if it is occurring (see *Enhancement* 1 in SE Section 3.0.3.2.8). The staff finds it acceptable to manage the nickel-alloy flexible hose in the same way as the stainless-steel components because the current NRC guidance for components exposed internally to dry air cites the Compressed Air Monitoring program and applies to all metallic materials (GALL-LR item VII.D.A-764).

3.3.2.1.11 Loss of Material Due to General Corrosion

LRA Table 3.3.1, AMR item 3.3.1-78, addresses loss of material due to general corrosion of steel piping and components, ducting and components, and ducting closure bolting exposed externally to indoor uncontrolled air, outdoor air, and condensation.

For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Fire Protection Program in lieu of the External Surfaces Monitoring of Mechanical Components Program to manage loss of material for steel carbon dioxide (CO_2) fire suppression system piping and valve bodies exposed externally to outdoor air.

Based on its review of components associated with AMR items 3.3.1-78 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 program are capable of detecting loss of material and cracking before a loss of intended function.

3.3.2.1.12 Loss of Material Due to General, Pitting and Crevice Corrosion; Cracking due to Stress Corrosion Cracking

LRA Table 3.3.1, AMR item 3.3.1-132, addresses loss of material due to general (steel and copper alloy only), pitting, and crevice corrosion, and cracking due to stress corrosion cracking (aluminum, stainless-steel and copper alloy (with greater than 15 percent zinc) only) of insulated steel, stainless steel, copper alloy, aluminum, or copper alloy (with greater than 15 percent zinc) piping, piping components, and tanks exposed to condensation and outdoor air.

For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Fire Protection program to manage loss of material and cracking for aluminum "damper and louver housings and fixed louvers 1," exposed externally to outdoor air. The staff notes that the External Surfaces Monitoring of Mechanical Components Program is also credited for managing cracking, and the Structures Monitoring program is also credited for managing loss of material of aluminum "damper and louver housings and fixed louvers 1," exposed externally to outdoor air.

Based on its review of components associated with AMR items 3.3.1-132 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, External Surfaces Monitoring of Mechanical Components, and Structures Monitoring programs acceptable because periodic visual inspections required by the programs are capable of detecting loss of material and cracking before a loss of intended function.

3.3.2.1.13 Reduction of Heat Transfer Due to Fouling

LRA Table 3.3.1, AMR items 3.3.1-42 and 3.3.1-50, as modified by letter dated June 27, 2024 (ML24180A010), with clarifications in letter dated November 19, 2024 (ML24324A185), address reduction of heat transfer due to fouling of copper alloy heat exchanger tubes exposed to raw water and closed-cycle cooling water, respectively. For the LRA Table 2 AMR items that cite generic note E, the LRA credits the Fire Water System program to manage reduction of heat transfer for the copper alloy less than 15-percent zinc heat exchanger (diesel fire pump heat exchanger tubes) exposed internally to raw water and closed-cycle cooling water in lieu of the Open-Cycle Cooling Water System and Closed Treater Water Systems programs.

The staff notes that the applicant's response to RAI-10332-R1, Question 1 (ML24324A185), provided information demonstrating that the diesel driven fire pump engine monitoring and maintenance activities performed by the Fire Water System program are equivalent to those that would be performed by the Closed Treated Water System program. Based on its review of components associated with AMR items 3.3.1-42 and 3.3.1-50 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the reduction of heat transfer due to fouling using the Fire Water System program acceptable because (1) the program's periodic maintenance requirements include annual replacement of the diesel engine coolant and corrosion inhibitors that are comparable to the water chemistry controls prescribed in the Closed Treated Water Systems Program for managing loss of material and reduction of heat transfer, and (2) based on recent operating experience, the program will be enhanced (as provided in letter dated March 20, 2025 (ML25079A062)) to perform internal visual inspections for heat exchanger tube fouling every 6 years. See the discussion of *Enhancement* 5 in SER Section 3.0.3.2.10 for additional information.

3.3.2.1.14 Loss of Material due to General, Pitting, and Crevice Corrosion; Loss of Material Due to General, Pitting, Crevice, and Galvanic Corrosion; Loss of Material Due to General Corrosion

As supplemented by letter dated June 27, 2024 (ML24180A010), with clarifications in letter dated November 19, 2024 (ML24324A185), LRA Table 3.3.1, AMR items 3.3.1-45, 3.3.1-46, and 3.3.1-78 address loss of material of steel piping, piping components, and piping elements exposed to closed-cycle cooling water; steel and copper alloy heat exchanger components exposed to closed-cycle cooling water, and steel piping and components exposed to indoor uncontrolled air; respectively. 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 steel diesel fire pump heat exchanger shell exposed internally to closed-cycle cooling water, copper alloy less than 15-percent zinc diesel fire pump heat exchanger tubes exposed externally to closed-cycle cooling water, and steel diesel fire pump heat exchanger channel and shell exposed externally to indoor uncontrolled air in lieu of the Closed Treated Water Systems and External Surfaces Monitoring of Mechanical Components programs.

The staff notes that the applicant's response to RAI-10332-R1, Question 1 (ML24324A185), provided information demonstrating that the diesel driven fire pump engine monitoring and maintenance activities performed by the Fire Water System program are equivalent to those that would be performed by the Closed Treated Water System program. Based on its review of components associated with AMR items 3.3.1-45, 3.3.1-46, and 3.3.1-78 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 (1) the program's periodic maintenance requirements include annual replacement of the diesel engine coolant and corrosion inhibitors that are comparable to the water chemistry controls prescribed in the Closed Treated Water Systems Program for managing loss of material and reduction of heat transfer, (2) the diesel driven fire pump heat exchanger channel and shell will be internally inspected for loss of material in conjunction with the replacement of the coolant heat exchanger tube bundle on the diesel driven fire pump, and (3) inspections required by the Fire Water System program are capable of detecting loss of material before a loss of intended function. Because the coolant heat exchanger tube bundle on the diesel driven fire pump engine will be periodically replaced during the PEO, it is no longer subject to aging management during the PEO. See the discussion of *Enhancement* 5 in SER Section 3.0.3.2.10 for additional information.

3.3.2.1.15 Loss of Material due to Pitting and Crevice Corrosion

LRA Table 3.3.1, AMR item 3.3.1-81 addresses loss of material due to pitting and crevice corrosion of copper alloy and aluminum piping, piping components, and piping elements exposed to outdoor air. For the LRA Table 2 AMR item that cites generic note E, the LRA credits the Fire Water System program to manage loss of material for the copper alloy greater than 15-percent zinc spray nozzles exposed externally to outdoor air in lieu of the External Surfaces Monitoring of Mechanical Components Program.

Based on its review of components associated with AMR item 3.3.1-81 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 inspections required by the Fire Water System program are capable of detecting loss of material before a loss of intended function.

3.3.2.1.16 Loss of Material Due to Recurring Internal Corrosion

LRA Table 3.3.1, AMR item 3.3.1-127 addresses loss of material due to recurring internal corrosion of metallic piping, piping components, and tanks exposed to raw water. 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 due to recurring internal corrosion of gray cast iron and steel piping exposed internally to raw water.

Based on its review of components associated with AMR item 3.3.1-127 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 program will be enhanced to perform augmented inspections to manage recurring internal corrosion, the augmented inspections are capable of detecting recurring internal corrosion before a loss of intended function, and use of the Fire Water System program to managing recurring internal corrosion is consistent with NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" (ML17188A158). See the discussion of *Enhancement* 7 in SER Section 3.0.3.2.10 for 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 3.3.1-2, 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. 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. In addition, the applicant addressed the plant-specific TLAA on cumulative fatigue damage in the reactor building crane in LRA Section 4.6.1, consistent with SRP-LR Section 3.3.2.2.1. The staff's evaluation of the TLAA for the reactor building crane is documented in SE Section 4.6.1.

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 3.3.1-3, addresses cracking due to stress corrosion cracking and cyclic loading for stainless-steel PWR heat exchanger components exposed to treated borated water greater than 60°C. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.3.2.2.2 and SRP-LR Table 3.3-1 and finds it acceptable because SRP-LR Table 3.3-1, Item 3 applies to PWRs only.

3.3.2.2.3 Cracking Due to Stress Corrosion Cracking

LRA Section 3.3.2.2.3, as supplemented by letter dated June 27, 2024 (ML24180A010), associated with LRA Table 3.3.1, AMR item 3.3.1-4, 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 because there are no stainless-steel piping, piping components or elements, or tanks exposed to outdoor air in the auxiliary systems. The staff reviewed the applicant's claim against the criteria in SRP-LR Section 3.3.2.2.3 and finds it acceptable because based on a review of the UFSAR and LRA there are no stainless-steel components exposed to outdoor air in the auxiliary systems.

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, AMR item 3.3.1-5, addresses loss of material due to cladding breach for steel charging pump casings with stainless-steel cladding exposed to treated borated water. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.3.2.2.4 and Table 3.3-1 and finds it acceptable because the SRP-LR criteria apply only to PWR steel charging pump casings.

3.3.2.2.5 Loss of Material Due to Pitting and Crevice Corrosion

LRA Section 3.3.2.2.5, as supplemented by letter dated June 27, 2024 (ML24180A010), associated with LRA Table 3.3.1, AMR item 3.3.1-6, addresses loss of material due to pitting and crevice corrosion for stainless-steel piping, piping components, piping elements, and tanks, exposed to outdoor air. The applicant stated that this item is not applicable because there are no stainless-steel piping, piping components or elements, or tanks exposed to outdoor air in the auxiliary systems. The staff reviewed the applicant's claim against the criteria in SRP-LR Section 3.3.2.2.5 and finds it acceptable because based on a review of the UFSAR and LRA there are no stainless-steel components exposed to outdoor air in the auxiliary systems.

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 June 27, 2024 (ML24180A010), is associated with LRA Table 3.3.1 item 3.3.1-127 and addresses loss of material due to recurring internal corrosion for metallic piping components exposed to various water environments. The application notes that plant-specific OE identified recurring internal corrosion in the ESW and fire water systems, and that the aging effect will be managed by the Open-Cycle Cooling Water

System and the Fire Water System programs, respectively. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.3.2.2.8.

In its review of components associated with item 3.3.1-127, 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 cited programs is acceptable because (1) the inspections performed by the Open-Cycle Cooling Water System program are augmented by the additional inspections for loss of material due to erosion conducted by the Flow-Accelerated Corrosion Program, and (2) the enhancements being made to the Fire Water System program will periodically inspect a sample of metallic piping to identify localized corrosion, using nonintrusive wall thickness measurements, with findings entered into the corrective action program for remediation and additional corrective actions. Section 3.0.3.2.10 of this safety evaluation documents the staff's evaluation of the associated enhancements to the Fire Water System program.

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 PEO. 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— Summary of Aging Management Evaluation

<u>Carbon Steel Closure Bolting and Stainless-Steel Closure Bolting Exposed to Condensation (External)</u>. LRA Table 3.3.2-2 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 Diesel Generator and Auxiliaries – Starting Air and Control Air Systems – Summary of Aging Management Evaluation

Valve body exposed to dry air and indoor uncontrolled air. LRA Table 3.3.2-15a, AMR item 3.3.1-116, identifies no aging effects/mechanisms and no aging management programs for zinc valve bodies exposed internally to dry air and externally to indoor uncontrolled air. The AMR item cites plant-specific note 334 which states, “Surfaces are not exposed to prolonged wetting other than humidity. Per EPRI Report 1010639, Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, Revision 4, Appendix E, Section 3.5, “Zinc is used (as a coating) because of its corrosion resistance in an external environment and because it provides galvanic protection of the base metal where discontinuities or damage of the coating has occurred.” In this case, the valve body base material is zinc and not steel. In an air–dry and air–indoor, uncontrolled environments, zinc is resistant to corrosion and similar to galvanized steel.” In addition, the AMR item cites plant-specific note 338 which states, “Surfaces are not exposed to prolonged wetting other than humidity. Per EPRI Report 1010639, Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, Revision 4, Appendix E, Section 3.5, “Zinc is used (as a coating) because of its corrosion resistance in an external environment and because it provides galvanic protection of the base metal where discontinuities or damage of the coating has occurred.” In this case, the valve body base material is zinc and not steel. In an air-dry and air-indoor, uncontrolled environments, zinc is resistant to corrosion and similar to galvanized steel in either environment. The Compressed Air Monitoring program provides assurance that the quality of the “air–dry” environment supports the conclusion that no aging effects are expected.”

The staff reviewed the associated items in the LRA and concluded that there are no aging effects requiring management and no recommended aging management program for zinc components exposed to indoor air based on a review of Volume 13B of the ASM Handbook (page 404), which states that the corrosion rate of zinc in an indoor atmosphere is “very low, typically below 0.1 μm/yr (0.004 mil/yr)….” and “pitting is not a common form of corrosion in zinc applications.” In addition, the ASM Handbook states that “stress corrosion cracking is generally not encountered by zinc products that are normally used for nonstructural applications.” Therefore, the staff finds the applicant’s proposal that there are no aging effects for this component, material, and environment combination acceptable.

In addition, the staff finds the applicant’s proposal to ensure the air quality using the Compressed Air Monitoring program acceptable because the periodic sampling and testing of the air performed by this program are capable of ensuring the moisture and contaminants in the air are maintained below specific limits.

3.3.2.3.3 Fire Protection System– Summary of Aging Management Evaluation

As amended by letter dated June 27, 2024 (LRA Supplement 2, ML24180A010), LRA Table 3.3.2-24 states that change in mechanical properties (cracking, loss of strength) and blistering for fiberglass piping exposed to soil will be managed by the Buried and Underground Piping and Tanks Program. The AMR item cites generic note H and SRP-LR item 3.3.1104. The staff finds the applicant’s proposal to manage the effects of aging acceptable because:

(1) This material/environment/aging effect/program is consistent with SRP-LR Report Table 3.3-1, “Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL Report,” item 104, with the exception that change in color due to water absorption is not being managed.

(2) With the issuance of GALL-SLR and SRP-SLR in 2017, change in color was not included as an aging effect for fiberglass components because the staff concluded that it has no impact on the intended function of the component.

3.3.2.3.4 Fire Protection System and Plant Foundation Underdrain and Electrical Manholes Dewatering – Summary of Aging Management Evaluation

As amended by letters dated June 27, 2024 (ML24180A010), July 3, 2024 (ML24185A092), and September 16, 2024 (ML24260A266), LRA Tables 3.3.2-24 and 3.3.2-44 identify no aging effects/mechanisms and no aging management programs for polymer sight glasses, piping, and valve bodies exposed internally to raw water (no AMR item, Standard Note G). In addition, LRA Tables 3.3.2-24 and 3.3.2-44 cited AMR item 3.3.1-119 with Standard Note A that identifies no aging effects/mechanisms and no aging management programs for polymer sight glasses, piping, and valve bodies exposed externally to uncontrolled indoor air. The following plant-specific notes were cited:

- *Note 310 (polymer sight glasses)*: “Based on plant operating experience, there are no aging effects requiring management for the polymeric (Acrylite) Fire Protection water sight glasses. These polymers are not expected to experience aging effects unless exposed to elevated temperatures or radiation levels capable of attacking the specific chemical composition. The sight glass is not PVC, but is a transparent polymer (Acrylite, a thermoplastic treated similar to PVC). These components are exposed to indoor air externally, and to condensation or fire water internally. These environments do not include elevated temperatures or radiation levels. Therefore, there are no applicable aging effects.”
- *Note 343 (polymer piping and valve bodies)*: “These PVC piping and piping components are not expected to experience aging effects per Appendix A, Section 3.6.2 of the EPRI Report 1010639, Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, Revision 4, because they are not exposed to elevated temperatures above 150 degrees F, ozone, nor ultraviolet or ionizing radiation. These components are located within covered

> manholes that collect rainwater after sufficient rain or melting ice and snow from a significant ground accumulation. Rainwater, ice and snow that seeps past the manhole covers does not contain aggressive chemicals capable of attacking the PVC components. Perry is not in a coastal, saltwater area nor is it in an industrial area with heavy air pollution."

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, materials, and environment descriptions. Based on a review of EPRI Report 1010639, polymers may degrade due to exposure to aggressive chemicals, ozone, ultraviolet radiation, ionizing radiation, and high temperatures. These components are either located indoors or are located within covered manholes, therefore, they are not expected to be exposed to aggressive chemicals, ozone, or ultraviolet radiation. In addition, these components are not expected to be exposed to elevated temperatures or ionizing radiation. Therefore, the staff finds that the applicant has identified all applicable aging effects for these component, material, and environment combinations.

The staff finds the applicant's proposal acceptable because the polymer sight glasses, piping, and valve bodies exposed to indoor uncontrolled air and condensation, or raw water are not exposed to aggressive chemicals, ozone, ultraviolet radiation, ionizing radiation, or high temperatures.

3.3.2.3.5 Station Service Water System – Summary of Aging Management Evaluation

LRA Table 3.3.2-12 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

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

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.

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

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.

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, “[c]onsistent 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

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.

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 aging effect requiring management 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

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.

3.3.2.3.11 Control Complex Chilled Water System – Summary of Aging Management Evaluation

LRA Tables 3.3.2-11, 3.3.2-15c, 3.3.2-18, and 3.3.2-20 state that reduction of heat transfer for copper alloy and aluminum heat exchanger tubes and fins exposed to air-indoor uncontrolled and condensation will be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The AMR items cite generic notes F or G.

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 for components exposed to a condensation environment in other AMR items. Based on its review of the GALL-LR and SRP-LR Reports, which state that copper alloy and aluminum are susceptible to loss of material in a condensation environment but not in an air-indoor uncontrolled environment, 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 the opportunistic visual inspections conducted by the program, with a representative sample of components inspected at least once every 10 years, are capable of detecting fouling of the heat exchanger surfaces prior to loss of the intended function.

3.3.2.3.12 Fire Protection System – Summary of Aging Management Evaluation

Fiberglass piping exposed to raw water. As supplemented by letter dated June 27, 2024 (ML24180A010), LRA Table 3.3.2-24 states that change in mechanical properties (cracking, loss of strength), blistering, and flow blockage for fiberglass piping exposed internally to raw water will be managed by the Fire Water System program. The AMR items cite generic note H. For flow blockage, the AMR item cites plant-specific note 341, which states, "Volume 1 of NUREG-2191 includes flow blockage due to fouling for fiberglass piping and piping components exposed to raw water due to potential intrusion of fouling products in raw water systems and managed by the Fire Water System program." In its response to RAI 10505-R1, Question 1 (ML25079A062), the applicant stated that loss of material due to wear is not an applicable aging effect for the fiberglass piping exposed internally to raw water in the Fire Protection system because the piping experiences stagnant flow more than 98 percent of the time and low flow velocities, the raw water source is from Lake Erie where silt is the primary particles, which is less abrasive than sand, and there has been no plant-specific operating experience of loss of material due to wear for fiberglass piping.

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. Volume 1 of NUREG-2191 recommends managing loss of material due to wear, cracking, blistering, and flow blockage for fiberglass piping exposed to raw water. However, the staff notes that NUREG-2221, “Technical Bases for Changes in the Subsequent License Renewal Guidance Documents NUREG-2191 and NUREG-2192” (ML17362A126), states, in Table 2-6 for VII.G.A-645, “Fiberglass components exposed to raw water, raw water (potable), and treated water environments are subject to loss of material due to wear due to the potential presence of abrasive particles or flow velocity changes (for all water environments) where the configuration of the piping system causes perturbations in flow velocity.” Therefore, because the flow is infrequent and low velocity, and there has been no plant-specific operating experience related to loss of material due to wear of fiberglass piping, loss of material due to wear is not expected to occur. The staff finds that the applicant has identified all applicable aging effects for this component, material, and environment combination.

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
3.4.1-1	Consistent with the GALL-LR Report (see SE Section 3.4.2.2.1)
3.4.1-2	Not applicable to Perry (see SE Section 3.4.2.2.2)
3.4.1-3	Consistent with the GALL-LR Report (see SE Section 3.4.2.2.3)
3.4.1-4	Not applicable to BWRs
3.4.1-5	Consistent with the GALL-LR Report
3.4.1-6	Consistent with the GALL-LR Report
3.4.1-7	Not applicable to Perry
3.4.1-8	Consistent with the GALL-LR Report
3.4.1-9	Not applicable to Perry
3.4.1-10	Consistent with the GALL-LR Report
3.4.1-11	Consistent with the GALL-LR Report
3.4.1-12	Consistent with the GALL-LR Report
3.4.1-13	Not applicable to BWRs
3.4.1-14	Consistent with the GALL-LR Report
3.4.1-15	Consistent with the GALL-LR Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.4.1-16	Consistent with the GALL-LR Report
3.4.1-17	Not applicable to BWRs
3.4.1-18	Not applicable to Perry
3.4.1-19	Consistent with the GALL-LR Report
3.4.1-20	Not applicable to Perry
3.4.1-21	Not applicable to BWRs
3.4.1-22	Not applicable to Perry (addressed by item 3.4.1-19)
3.4.1-23	Not applicable to Perry
3.4.1-24	Not applicable to Perry
3.4.1-25	Not applicable to Perry
3.4.1-26	Not applicable to Perry
3.4.1-27	Not applicable to Perry
3.4.1-28	Not applicable to Perry
3.4.1-29	Consistent with the GALL-LR Report
3.4.1-30	Consistent with the GALL-LR Report
3.4.1-31	Not applicable to Perry
3.4.1-32	Not applicable to Perry
3.4.1-33	Consistent with the GALL-LR Report
3.4.1-34	Consistent with the GALL-LR Report
3.4.1-35	Not applicable to Perry
3.4.1-36	Not applicable to BWRs
3.4.1-37	Not applicable to Perry
3.4.1-38	Not applicable to BWRs
3.4.1-39	Not applicable to Perry
3.4.1-40	Not applicable to Perry
3.4.1-41	Not applicable to BWRs
3.4.1-42	Not applicable to BWRs
3.4.1-43	Not applicable to Perry
3.4.1-44	Consistent with the GALL-LR Report
3.4.1-45	Not applicable to BWRs
3.4.1-46	Not applicable to BWRs
3.4.1-47	Consistent with the GALL-LR Report
3.4.1-48	Not applicable to Perry
3.4.1-49	Not applicable to Perry (addressed by item 3.4.1-47)
3.4.1-50	Consistent with the GALL-LR Report
3.4.1-50x	Not applicable to Perry
3.4.1-51	Not applicable to Perry
3.4.1-52	Consistent with the GALL-LR Report
3.4.1-53	Not applicable to BWRs
3.4.1-54	Consistent with the GALL-LR Report
3.4.1-55	Consistent with the GALL-LR Report
3.4.1-56	Not applicable to Perry
3.4.1-57	Consistent with the GALL-LR Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.4.1-58	Consistent with the GALL-LR Report
3.4.1-59	Not applicable to Perry
3.4.1-60	Not applicable to Perry
3.4.1-61	Not applicable to Perry (See SE Section 3.4.2.2.6)
3.4.1-62	Not applicable to Perry
3.4.1-63	Consistent with the GALL-LR Report
3.4.1-64	Not applicable to Perry
3.4.1-65	Not applicable to Perry
3.4.1-66	Consistent with the GALL-LR Report
3.4.1-67	Consistent with the GALL-LR Report
3.4.1-68	Not applicable to Perry

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

(1) SE Section 3.4.2.1 discusses AMR results for components that the applicant stated are either not applicable to Perry 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 3.4.2-12 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.

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

For LRA Table 3.4.1 items 3.4.1-2, 3.4.1-7, 3.4.1-9, 3.4.1-18, 3.4.1-20, 3.4.1-22 through 28, 3.4.1-31, 3.4.1-32, 3.4.1-35, 3.4.1-37, 3.4.1-39, 3.4.1-40, 3.4.1-43, 3.4.1-48, 3.4.1-49, 3.4.1-50x, 3.4.1-51, 3.4.1-56, 3.4.1-59 through 62, 3.4.1-64, 3.4.1-65, and 3.4.1-68, the applicant claims that the corresponding AMR items in the GALL-LR Report are neither used nor applicable at Perry. The NRC staff reviewed the LRA and UFSAR and confirmed that the applicant's LRA does not have any AMR results that are applicable for these items.

For LRA Table 3.4.1- items 3.4.1-4, 3.4.1-13, 3.4.1-17, 3.4.1-21, 3.4.1-36, 3.4.1-38, 3.4.1-41, 3.4.1-42, 3.4.1-45, 3.4.1-46, and 3.4.1-53, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable because the associated items are applicable only to PWRs while Perry is a BWR unit. The NRC staff reviewed the SRP-LR Report, confirmed that these items apply only to PWRs and finds that these items are not applicable to Perry because the nuclear power plant is a BWR.

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 3.4.1-1, 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. 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.

3.4.2.2.2 Cracking Due to Stress Corrosion Cracking

LRA Section 3.4.2.2.2, as supplemented by letter dated June 27, 2024 (ML24180A010), associated with LRA Table 3.4.1, AMR item 3.4.1-2, 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 because stainless-steel components exposed to outdoor air in the steam and power conversion systems are insulated and managed by the External Surfaces Monitoring of Mechanical Components Program using AMR item 3.4.1-63. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.4.2.2.2 and finds it acceptable because:

(1) The stainless-steel components exposed to outdoor air are managed by a different AMR item using the External Surfaces Monitoring of Mechanical Components Program.

(2) The periodic inspections conducted as part of the External Surfaces Monitoring of Mechanical Components Program are capable of detecting cracking if it is occurring.

3.4.2.2.3 Loss of Material Due to Pitting and Crevice Corrosion

LRA Section 3.4.2.2.3, as supplemented by letter dated June 27, 2024 (ML24180A010), associated with LRA Table 3.4.1, AMR item 3.4.1-3, addresses loss of material due to pitting and crevice corrosion for stainless-steel piping, piping components, piping elements, and tanks exposed to outdoor air. The applicant stated that this item is not applicable because stainless-steel components exposed to outdoor air in the steam and power conversion systems are insulated and managed by the External Surfaces Monitoring of Mechanical Components Program using AMR item 3.4.1-63. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.4.2.2.3 and finds it acceptable because:

(1) The stainless-steel components exposed to outdoor air are managed by a different AMR item using the External Surfaces Monitoring of Mechanical Components Program.
(2) The periodic inspections conducted as part of the External Surfaces Monitoring of Mechanical Components Program are capable of detecting loss of material if it is occurring.

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, associated with LRA Table 3.4.1, item 3.4.1-61, addresses loss of material due to recurring internal corrosion for metallic piping components exposed to multiple water environments. The application states that this item is not applicable based on a review of plant-specific OE, which did not identify internal corrosion in any steam and power supply systems at a frequency provided in LR-ISG-2012-02 for recurring internal corrosion. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.4.2.2.6, as modified by LR-ISG-2012-02, and finds it acceptable because its independent reviews of Perry's OE database did not identify issues in the steam and power supply systems that met the threshold for recurring internal corrosion.

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 3.4.2-12 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 PEO. 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 section documents the staff's evaluation.

3.4.2.3.1 Steam and Power Conversion Systems – Service Water and Emergency Service Water Chlorination – Summary of Aging Management Evaluation

Polymeric Piping, Sight Glasses (Body), Strainer Bodies, and Valve Bodies Exposed to Treated Water. As amended by letter dated June 27, 2024 (ML24180A010), LRA Table 3.4.2-11 identified no aging effects/mechanisms and no aging management programs for polymeric piping, sight glasses (body), strainer bodies, and valve bodies exposed internally to treated water. The AMR items cite generic note G and plant-specific note 402 which states, "[b]ased on plant operating experience, there are no aging effects requiring management for the Service Water and Emergency Service Water Chlorination system polymer components in a treated water or air – indoor uncontrolled environment. The materials are polyvinylidene fluoride (PVDF) and polyvinyl chloride (PVC), and the treated water environment is sodium hypochlorite at a concentration of 12 percent to 15 percent. This material is not expected to experience aging effects unless exposed to elevated temperatures or radiation levels capable of attacking the specific chemical composition. The material in these environments is not expected to experience significant aging effects due to elevated temperatures or radiation levels."

For the items in the LRA associated with PVDF and PVC piping, sight glasses (body), strainer bodies, and valve bodies exposed internally to treated water, the staff reviewed the associated items in the LRA and concluded that there are no aging effects requiring management and no recommended aging management program based on ASM Handbook, Volume 13C, "Corrosion: Environments and Industries," which states that PVC has excellent corrosion resistance and Appendix A, Section 2.1.8 of the EPRI Report 1010639, which states that PVDF is highly corrosion resistant and, therefore, the rates of degradation of PVDF and PVC in the chemical and thermal environment of the treated water is expected to be sufficiently low, such that deterioration of PVDF and PVC piping, sight glasses (body), strainer bodies, and valve bodies and loss of component function is not expected through the PEO. In addition, these components are not expected to be exposed to elevated radiation levels and there has been no plant-specific operating experience of aging effects in the Service Water and Emergency Service Water Chlorination system. Therefore, the staff finds the applicant's proposal that there are no aging effects for these component, material, and environment combinations acceptable.

3.5 Aging Management of Containments, Structures, and Component Supports

3.5.1 Summary of Technical Information in the Application

Section 3.5 of the LRA 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. Table 3.4-1 of the LRA, "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

Table 3.5-1 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
3.5.1-1	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.1.1)
3.5.1-2	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.1.1)
3.5.1-3	Not applicable to Perry (see SE Section 3.5.2.2.1.2)
3.5.1-4	Not applicable to Perry (see SE Section 3.5.2.2.1.3, Item 1)
3.5.1-5	Not applicable to Perry (see SE Section 3.5.2.2.1.3, Item 1)
3.5.1-6	Not applicable to Perry (see SE Section 3.5.2.2.1.3, Item 2)
3.5.1-7	Not applicable to Perry (see SE Section 3.5.2.2.1.3, Item 3)
3.5.1-8	Not applicable to Perry (see SE Section 3.5.2.2.1.4)
3.5.1-9	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.1.5)
3.5.1-10	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.1.6)
3.5.1-11	Not applicable to Perry (see SE Section 3.5.2.2.1.7)
3.5.1-12	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.1.8)
3.5.1-13	Not used (addressed by LRA Table 3.5-1, item 3.5.1-14; see SE Section 3.5.2.2.1.9)
3.5.1-14	Not applicable to Perry (see SE Section 3.5.2.2.1.9)
3.5.1-15	Not applicable to Perry
3.5.1-16	Consistent with the GALL-LR Report
3.5.1-17	Not applicable to Perry
3.5.1-18	Not applicable to Perry
3.5.1-19	Consistent with the GALL-LR Report
3.5.1-20	Not applicable to Perry
3.5.1-21	Consistent with the GALL-LR Report
3.5.1-22	Not applicable to Perry
3.5.1-23	Consistent with the GALL-LR Report
3.5.1-24	Consistent with the GALL-LR Report
3.5.1-25	Not applicable to BWRs
3.5.1-26	Consistent with the GALL-LR Report
3.5.1-27	Not applicable to Perry
3.5.1-28	Consistent with the GALL-LR Report
3.5.1-29	Consistent with the GALL-LR Report
3.5.1-30	Consistent with the GALL-LR Report
3.5.1-31	Consistent with the GALL-LR Report
3.5.1-32	Not applicable to Perry
3.5.1-33	Consistent with the GALL-LR Report
3.5.1-34	Consistent with the GALL-LR Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.5.1-35	Consistent with the GALL-LR Report
3.5.1-36	Not applicable to Perry
3.5.1-37	Consistent with the GALL-LR Report
3.5.1-38	Not used (addressed by LRA Table 3.5.1, items 3.5.1-37 and 3.5.1-95)
3.5.1-39	Not applicable to Perry
3.5.1-40	Not applicable to Perry
3.5.1-41	Consistent with the GALL-LR Report
3.5.1-42	Not applicable to Perry (see SE Section 3.5.2.2.2.1, item 1)
3.5.1-43	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.2.1, item 2)
3.5.1-44	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.2.1, item 3)
3.5.1-45	Not used (see SE Section 3.5.2.2.2.1, item 3)
3.5.1-46	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.2.1, item 3)
3.5.1-47	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.2.1, item 4)
3.5.1-48	Not applicable to Perry (see SE Section 3.5.2.2.2.2)
3.5.1-49	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.2.3, item 1)
3.5.1-50	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.2.3, item 2)
3.5.1-51	Consistent with the GALL-LR Report (see SE Section 3.5.2.2.2.3, item 3)
3.5.1-52	Not applicable to Perry (see SE Section 3.5.2.2.2.4)
3.5,1-53	Not applicable to Perry (see SE Section 3.5.2.2.2.5)
3.5,1-54	Consistent with the GALL-LR Report
3.5,1-55	Consistent with the GALL-LR Report
3.5.1-56	Not applicable to Perry
3.5.1-57	Consistent with the GALL-LR Report
3.5.1-58	Consistent with the GALL-LR Report
3.5.1-59	Consistent with the GALL-LR Report
3.5.1-60	Consistent with the GALL-LR Report
3.5.1-61	Consistent with the GALL-LR Report
3.5.1-62	Consistent with the GALL-LR Report
3.5.1-63	Consistent with the GALL-LR Report
3.5.1-64	Consistent with the GALL-LR Report
3.5.1-65	Consistent with the GALL-LR Report
3.5.1-66	Consistent with the GALL-LR Report
3.5.1-67	Consistent with the GALL-LR Report
3.5.1-68	Consistent with the GALL-LR Report
3.5.1-69	Consistent with the GALL-LR Report
3.5.1-70	Not applicable to Perry
3.5.1-71	Consistent with the GALL-LR Report
3.5.1-72	Consistent with the GALL-LR Report
3.5.1-73	Not used
3.5.1-74	Consistent with the GALL-LR Report
3.5.1-75	Not applicable to Perry

Component Group (SRP-LR Item No.)	Staff Evaluation
3.5.1-76	Consistent with the GALL-LR Report
3.5.1-77	Consistent with the GALL-LR Report
3.5.1-78	Consistent with the GALL-LR Report
3.5.1-79	Consistent with the GALL-LR Report
3.5.1-80	Consistent with the GALL-LR Report
3.5.1-81	Consistent with the GALL-LR Report
3.5.1-82	Consistent with the GALL-LR Report
3.5.1-83	Consistent with the GALL-LR Report
3.5.1-84	Consistent with the GALL-LR Report (see SE Section 3.5.2.1.5)
3.5.1-85	Not applicable to Perry
3.5.1-86	Consistent with the GALL-LR Report
3.5.1-87	Consistent with the GALL-LR Report
3.5.1-88	Consistent with the GALL-LR Report
3.5.1-89	Not applicable to BWRs
3.5.1-90	Consistent with the GALL-LR Report
3.5.1-91	Consistent with the GALL-LR Report
3.5.1-92	Consistent with the GALL-LR Report
3.5.1-93	Consistent with the GALL-LR Report
3.5.1-94	Not applicable to Perry
3.5.1-95	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:

- SE Section 3.5.2.1 discusses AMR results for components that the applicant stated are either not applicable to Perry or are consistent with the GALL-LR Report. Section 3.5.2.1.1 summarizes the staff's review of items that are neither applicable nor used and documents any RAIs issued and the staff conclusions. The remaining subsections in SE Section 3.5.2.1 document the review of components that required additional information or otherwise required explanation.
- SE Section 3.5.2.2 discusses AMR results for which the GALL-LR Report and SRP-LR recommend further evaluation.
- SE Section 3.5.2.3 discusses AMR results for components that the applicant stated are neither consistent with nor 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 NRC staff's review of AMR results listed in LRA Tables 3.5.2-1 through 3.5.2-4 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 LRA 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 ARM items. The staff's conclusion of "Consistent with the GALL-LR Report," is documented in SE Table 3.5-1. For AMR items that required additional evaluation (such as responses to RAIs), the staff evaluation is documented below in Section 3.5.2.1.2.

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

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

For LRA Table 3.5-1, items 3.5.1-3 through 3.5.1-8, 3.5.1-11, 3.5.1-13 through 3.5.1-15, 3.5.1-17, 3.5.1-18, 3.5.1-20, 3.5.1-22, 3.5.1-22, 3.5.1-32, 3.5.1-36; 3.5.1-38 through 3.5.1-40, 3.5.1-42, 3.5.1-45, 3.5.1-48, 3.5.1-52, 3.5.1-53, 3.5.1-56; 3.5.1-70, 3.5.1-73, 3.5.1-75; 3.5.1-85; and 3.5.1-94, the applicant claims that the corresponding AMR items in the GALL-LR Report are neither used nor applicable to Perry. The staff reviewed the LRA and UFSAR and confirmed that the applicant's LRA does not have any AMR results that are applicable for these items.

LRA Table 3.5.1, AMR item 3.5.1-36 addresses managing aging effects of fretting or lockup due to mechanical wear for BWR steel elements: drywell head; downcomers exposed to an air – indoor, uncontrolled environment. The applicant stated that this item is not applicable to Perry BWR Mark III steel containment design because it does not have downcomers. The staff reviewed the applicant's claim and confirmed that it is a BWR Mark III steel containment design as stated in UFSAR Sections 1.1, 3.8.2.1 and shown USAR Figure 3.8-1. The staff also confirmed that the AMR line item as referenced by SRP-LR and GALL-LR Report, Revision 2 items: II.B1.1.C-23, II.B1.2.C-23, II.B2.1.C-23, II.B2.2.C-23 BWR is associated with BWR Mark I and Mark II containments only. However, Perry plans to use Table 1 line item 3.5.1-36 associated with LRA AMP B.2.4, "ASME Section XI, Subsection IWE Program," irrespective of its affiliation to BWR Mark I and II containments, to manage fretting or lockup of the carbon steel, steel elements: drywell head exposed to air - indoor uncontrolled in the Primary Containment shown in USAR Figure 6.2-26. Additionally, the staff notes that LRA Table 3.5.1, items 3.5.1-35, and 3.5.1-84 with relevant Table 2 item(s), reviewed and evaluated in Sections 3.5.2.2.1.3 and 3.5.2.1.5 respectively of this SE address aging management of drywell head steel and bolting including that for loss of material due to general, pitting and crevice corrosion in an air – indoor, uncontrolled and water treated environments. Although the staff finds the specifics of LRA Table 3.5.1, AMR item 3.5.1-36 align with the GALL-LR Report, Revision 2 and the SRP-LR, Revision 2 for not applicability, the staff finds applicant's overall approach to manage the effects of aging associate with the drywell head consistent with SRP-LR, Revision 2 and GALL-LR Report, Revision 2 principles.

LRA Table 3.5.1 AMR item 3.5.1-38, as modified by LRA Supplement 3 (ML24206A150), addresses the aging effects of cracking due to stress corrosion cracking for steel elements: suppression chamber shell (interior surface) exposed to air-indoor, uncontrolled. The applicant stated that this item is not used and see item 3.5.1-37 for steel with stainless-steel cladding on the containment vessel (suppression pool) subjected to treated water and item 3.5.1-95 subjected to air-indoor, uncontrolled. The staff evaluated the applicant's claim and finds it acceptable because it is consistent with the GALL-LR Report, Revision 2. In LRA Table 3.5.1, item 3.5.1-56, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable. During its audit (ML24239A778), the staff asked the applicant to justify why it is not applicable. In its response (ML24206A150), the applicant revised LRA Table item 3.5.1-56 as follows:

Not applicable to Perry - loss of material due to abrasion or cavitation is not expected to be an aging effect requiring management for most concrete components exposed to raw water because the flow velocity is much less than the calculation thresholds as per Perry UFSAR and EPRI Structural Tools.

The staff reviewed the applicant's response, the LRA description of the material and environment associated with each AMR item, and the associated AMP and plant-specific documents and found that loss of material due to abrasion or cavitation is not expected to be an aging effect requiring management for most concrete components exposed to raw water because the flow velocity is much less than the cavitation threshold of 40 fps for open channel flow or 25 fps for closed conduit. UFSAR 9.2.1.3 (page 9.2-15) indicates that the intake system is designed for approach velocity of 0.5 fps, and Table 9.2-13 lists the max approach velocity at the traveling screens as 1.0 fps per EPRI Structural Tool Table 5-3, and the staff concluded that the applicant's claim is reasonable.

LRA Table 3.5.1 AMR item 3.5.1-57, as modified by LRA Supplement 3 (ML24206A150), addresses managing aging effects for loss of mechanical function due to corrosion, distortion, dirt, overload, wear of steel constant and variable load spring hangers; guides; stops components to air-indoor, uncontrolled or air-outdoor environment. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and found it questionable, because there are regulatory requirements associated with LRA Table 3.5.1 AMR item 3.5.1-57. To this end, the staff issued ESEB RCI-10395-R1 - Question 2 to resolve the suitability of the proposed Table 1 AMR line item 3.5.1-74 or item 3.5.1-76 to manage the above-noted aging effects for the referenced component(s), material, and environment combination. By letter dated December 4, 2024, in its response to ESEB RCI-10395-R1 - Question 2 (ML24339A066), the applicant confirmed that the designation of the LRA Table 3.5.1 AMR item 3.5.1-57 as "not applicable" was an oversight. Subsequently, by letter dated December 19, 2024, through Supplement 7 (ML24354A265), the applicant amended the LRA indicating that LRA Table 3.5.1 AMR item 3.5.1-57 as consistent with NUREG-1801 and that. "ASME Section XI, Subsection IWF program will manage aging of ASME Class 1, 2 and 3 supports." To this end the applicant included in LRA Supplement 7, an amended LRA Table 3.5.2-4 – Bulk Commodities with AMR line items 59, 64, and 65, with a consistency note A. Accordingly, the staff aggregated the Table 3.5.1 AMR line item 3.5.1-57 with those Table 3.5.1 AMR line items referenced in Table 3.5.2 AMR line items with consistency note A items.

LRA Table 3.5.1, AMR item 3.5.1-70, as modified by response to ESEB RAI-10327-R1 and Supplement 7 (ML24324A185 and ML24354A265), addresses cracking due to restraint shrinkage, creep, and aggressive environment exposed to air-indoor, uncontrolled or outdoor air. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because:

- The masonry walls that are within scope for license renewal at Perry are isolated non-safety-related and non-seismic category I structures not meeting I.E. Bulletin 80-11.
- LRA AMR item 3.5.1-70 noted that the masonry walls do not include integrated restraints.
- Creep is inconsequential since the significant portion of creep has already occurred in the 40 years of initial licensing.
- The Perry area is not subject to aggressive environment such as salt spray. Additionally, for the masonry walls that are in-scope for license renewal, the Structures Monitoring

program will be credited to monitor masonry walls for cracking (AMR item 3.5.1-71); therefore, the aging effect of cracking will still be monitored.

LRA Table 3.5.1, AMR item 3.5.1-85 addresses managing the aging effect for loss of material due to pitting and crevice corrosion in structural bolting exposed to treated water. The applicant stated that this item is not applicable because the Structures Monitoring and the Water Chemistry programs manage the aforementioned aging effect. The staff reviewed LRA Supplement 3 (ML24206A150) summarizing all of Table 2 AMR line items for aging management evaluations referencing Table 3.5.1 AMR line items for stainless-steel bolting associated with IWF supports in a treated water environment but could not find a match except those evaluated and dispositioned in Section 3.5.2.1.Y of this SE for LRA Table 3.5.1, AMR line item 3.5.1-84.

For SLRA Table 3.5.1 items 3.5.1-25 and 3.5.1-89, the applicant states that the corresponding AMR items in the GALL-LR Report are not applicable because the associated items are only applicable to PWRs. The staff reviewed the SRP-LR Report and confirmed that these items only apply to PWRs; therefore, the staff finds that these items are not applicable to Perry because the plant is a BWR plant.

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

LRA Table 3.5.1 item 3.5.1-78 addresses cracking due to stress corrosion cracking and loss of material due to pitting and crevice corrosion for steel components: fuel pool liner. The staff also notes that the applicant states, “Cracking is not an aging effect for stainless steel exposed to treated water in the spent fuel pool, because normal temperature of the water is below the threshold for cracking of stainless steel (140ºF).” For the LRA Table 2 AMR items that cite generic note E, the LRA either credits the Water Chemistry and One-Time Inspection programs or the Structures Monitoring program to manage the aging effects.

In LRA Table 3.5.2-1, as modified by letter dated July 24, 2024 (ML24206A150), item 3.5.1-78 addresses loss of material for stainless steel upper containment pool gate steel exposed to a treated water external environment. Based on its review of the components associated with item 3.5.1-78, which cites generic note E in Table 3.5.2-1, the staff finds the applicant’s proposal of using the Water Chemistry and One-Time Inspection programs acceptable because the Water Chemistry program will be able to monitor and control system water chemistry to minimize the presence of corrosive impurities and the One-Time Inspection Program will be able to verify its effectiveness.

In LRA Table 3.5.2-4, as modified by letter dated July 24, 2024 (Supplement 3, ML24206A150), item 3.5.1-78 addresses loss of material for stainless-steel Cask Pit Pool Waste Storage Rack1 exposed to a treated water external environment. Based on its review of the components associated with item 3.5.1-78, which cites generic note E in Table 3.5.2-4, the staff finds the applicant’s proposal of using the Water Chemistry and One-Time Inspection programs acceptable because the Water Chemistry program will be able to monitor and control system water chemistry in order to minimize the presence of corrosive impurities and the One-Time Inspection Program will be able to verify its effectiveness.

In LRA Table 3.5.2-4, as modified by letter dated July 24, 2024 (Supplement 3, ML24206A150), item 3.5.1-78 addresses loss of material for stainless-steel anchor bolts, anchorage/embedments and Structural Bolting 1 exposed to a treated water external environment. Based on its review of the components associated with item 3.5.1-78, which cites generic note E in Table 3.5.2-4, the staff finds the applicant's proposal of using the Structures Monitoring program acceptable because the associated periodic inspections will be able to detect loss of material for these components.

LRA Table 3.5.1, AMR item 3.5.1-93 addresses loss of material due to pitting and crevice corrosion for galvanized steel dampers, louver housings and fixed louvers in bulk commodities exposed to air - outdoor (Ext) environment. For the AMR Table 2 items that cite generic note E, the LRA credits the Fire Protection Program to manage the aging effect for galvanized steel dampers, louver housings and fixed louvers in bulk commodities. The AMR item does not have a plant-specific note.

Based on its review of components associated AMR item 3.5.1-93 for which the applicant cited generic note E, as modified by LRA Supplement 3 (ML24206A150), the staff finds the applicant's proposal to manage the effects of aging using the Fire Protection Program acceptable because the periodic visual inspections required by the Fire Protection Program are capable of detecting the loss of material of structural commodities with a fire barrier function such as the galvanized steel dampers, louver housings and fixed louvers before a loss of intended functions at a frequency in accordance with an NRC-approved Fire Protection Program, which is consistent with the GALL-LR Report recommendations.

In addition, LRA Table 3.5.1, AMR item 3.5.1-93 addresses loss of material due to pitting and crevice corrosion for galvanized steel component and piping supports 1 exposed to air - outdoor (Ext) environment. For the AMR Table 2 item that cites generic note E, the LRA credits the ASME Section XI, Subsection IWF program to manage the aging effect for galvanized steel component and piping supports 1. The AMR item does not have a plant-specific note.

Based on its review of components associated AMR item 3.5.1-93 for which the applicant cited generic note E, as modified by LRA Supplement 3 (ML24206A150), 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 visual examinations required by the ASME Section XI, Subsection IWF program are capable of detecting the loss of material of galvanized steel component and piping supports before a loss of intended functions; (2) the ASME Section XI, Subsection IWF program will be enhanced to include preventive actions that are comparable to those of the Structures Monitoring program; and (3) the frequency of visual examinations and sampling of supports are consistent with the GALL-LR Report recommendations for the ASME Section XI, Subsection IWF program.

3.5.2.1.3 Hardening and Loss of Strength due to Elastomer Degradation

LRA table 3.3.1, AMR item 3.3.1-76 addresses hardening and loss of strength due to elastomer degradation for elastomers, elastomer: seals and components exposed to air-indoor, uncontrolled (Internal/External). For the LRA Table 2 item that cites generic note E, the LRA credits the Structures Monitoring program to manage the aging effects for this item. LRA Table 3.5.2-4, "Bulk Commodities," item 3.3.1-76 addresses change in material properties and cracking for elastomer Tefzel Ties. While this item is not verbatim with respect to GALL-LR, it meets the intent of the GALL-LR Report. Table 3.5.2-4 plant-specific note 510 states, "at Perry, Tefzel Ties (ETFE) aging effects of change in material/cracking will be managed by the Structures Monitoring program (S6)." Based on its review of the components associated with item 3.3.1-76, which cites generic note E in Table 3.5.2-4, the staff finds the applicant's proposal of using the Structures Monitoring program acceptable because the associated periodic inspections will be able to detect change in material properties and cracking for these components.

3.5.2.1.4 Cracking Due to Restraint Shrinkage, Creep, and Aggressive Environment

LRA Table 3.5.1, AMR item 3.5.1-70 addresses cracking due to restraint shrinkage, creep, and aggressive environment for masonry walls exposed to air-indoor, uncontrolled, or air-outdoor. AMR item 3.5.1-71 addresses loss of material (spalling, scaling) and cracking due to freeze-thaw for masonry walls exposed to air-indoor, uncontrolled, or air-outdoor. For the LRA Table 2 AMR items that cite generic note E for the masonry walls in the turbine buildings and associated structures, process facilities, and yard structures, the LRA credits the Structures Monitoring AMP (B.2.43) to manage the aging effects of cracking, loss of material, and change in material properties.

Based on its review of components associated with AMR items 3.5.1-70 and 3.5.1-71 for which the applicant cited generic note E, as modified by Supplement 3 (ML24206A150), the staff finds the applicant's proposal to manage the effects of aging using the Structures Monitoring program acceptable because:

- There are no safety-related masonry walls that are in close proximity to, or have attachments from, safety-related systems or components at Perry.
- The masonry walls that are within the scope of license renewal at Perry are limited to isolated non-safety-related, non-seismic Category I structures.
- The aging effect of in-scope masonry walls are managed by the Structures Monitoring program.

Furthermore, the implementation procedures for the Structures Monitoring program will be enhanced to monitor in-scope masonry walls for loss of material (spalling, scaling), cracking, and change in material properties.

3.5.2.1.5 Loss of Material Due to Pitting and Crevice Corrosion

LRA Table 3.5.1, AMR item 3.5.1-84 addresses loss of material due to pitting and crevice corrosion exposed to treated water. For the LRA Table 2 AMR items that cite generic note E and GALL-LR, Revision 2, item III.B1.3.TP-232, the LRA credits the Water Chemistry program and the Structures Monitoring program (SMP) to manage the aging effect for loss of material due to pitting and crevice corrosion of stainless-steel drywell head and associated bolting. Similarly, the applicant uses LRA Table 3.5.1, AMR item 3.5.1-84 to manage the same aging effect and environment, as noted above, for drywell head steel cladded with stainless-steel material. The GALL Report, Revision 2, recommends GALL Report AMPs XI.M2, Water Chemistry and XI.S3, ASME Section XI, Subsection IWF programs, to manage this aging effect for stainless-steel bolting.

The staff also notes the LRA states that the Perry configuration management database identifies the drywell head to be associated to a functional location and to a specific system. However, it also states structures associated with the drywell are evaluated as structures and not as systems.

Based on its review of components associated with AMR item 3.5.1-84 for which the applicant cited generic note E and GALL-LR item III.B1.3.TP-232, the staff finds the applicant's proposal to manage the effects of aging for loss of material due to pitting and crevice corrosion using the

Water Chemistry program acceptable because (1) the stainless-steel drywell head and associated stainless-steel bolting and drywell head steel cladded with stainless-steel material exposed to a treated water already implement the Water Chemistry AMP consistent with the GALL-LR guidance and (2) the added support of the One-Time Inspection Program to verify the Water Chemistry AMP effectiveness; therefore, no further justification for the use of this AMP is needed.

For the use of SMP in lieu of the ASME Section XI, Subsection IWF program, the staff finds that the enhanced in Supplement 3 (ML24206A150) SMP assigned as an AMP to manage the aging effect for loss of material due to pitting and crevice corrosion acceptable because the drywell head is:

- A Class MC, which refers specifically to metallic components within a concrete containment structure, support (UFSAR Section 3.8.3.4.2, f) and not an IWF support to be inspected and examined to the requirements of 10 CFR 50.55a, ASME Section XI, Subsection IWF and guidance of GALL-LR AMP XI.S3.
- The program has provisions within its program elements to address aging effects due to loss of material in frequencies not to exceed 5 years instead of the 10-year periodicity recommended by GALL Report AMP XI.S3, ASME Section XI, Subsection IWF program.
- The program procedures are enhanced (Perry LRA Commitment No. 43) to include structures and structural bulk commodities (including plant systems containing the bulk commodities), such as the drywell head, within the scope of license renewal that credit the SMP for aging management.
- Procedure PTI-P53-P0001 “Drywell Head Seal Leak Rate Test” is consistent with 10 CFR 50.65 and RG 1.160 and verifies the integrity of the bolted seals against seals leakage (see OE ML20247K196) following each RFO.

Additionally, the staff notes that LRA Table 3.5.1, item 3.5.1-35, and relevant Table 2 item(s), reviewed and evaluated in Section 3.5.2.2.1.3 of this SE address aging management of drywell head steel for loss of material due to general, pitting and crevice corrosion in an air-indoor, uncontrolled environment (which may align to treated water per plant-specific note 512) based on the criteria and program elements of ASME Section XI, Subsection IWE and 10 CFR 50, Appendix J AMPs.

3.5.2.1.6 Loss of Sealing Due to Wear, Damage, Erosion, Tear, Surface Cracks, or Other Defects

LRA Table 3.5.1, AMR item 3.5.1-26 addresses loss of sealing due to wear, damage, erosion, tear, surface cracks, or other defects for elastomer moisture barrier exposed to air – indoor, uncontrolled. For the LRA Table 2 AMR items that cite generic note E and GALL-LR, Revision 2 item II.B4.CP-40, the LRA credits the SMP to manage the aging effect for elastomer flood curb 3 and elastomer flood, pressure and specialty doors 1. The GALL Report, Revision 2, recommends GALL Report AMP XI.S1, ASME Section XI, Subsection IWE program, to provide reasonable assurance that this aging effect is adequately managed.

Based on its review of components associated with AMR item 3.5.1-26 for which the applicant cited generic note E, the staff finds the applicant’s proposal to manage the effects of aging using the enhanced SMP acceptable because (1) the Structure Monitoring Program will be enhanced to perform visual inspection, supplemented with feel or manipulation, to detect cracking, loss of material and hardening (e.g., change in material properties) for elastomeric components, and

(2) the SMP will be enhanced to require that structures and structural components are monitored on a frequency not to exceed 5 years instead of 10-year periodicity recommended by GALL Report AMP XI.S1, ASME Section XI, Subsection IWE program.

LRA Table 3.5.1, AMR item 3.5.1-33 addresses loss of sealing due to change in material properties and cracking, and cracking for elastomeric seals and gaskets on drywell equipment hatch seals, upper containment pool gates and seals, exterior walls above grade, seals and gaskets (for doors manways and hatches), shielding, and flood pressure and specialty doors (LRA Table 3.5.2-1 Rows 85, 86, 87, 177, 178, and 179; Table 3.5.2-3 Row 32; Table 3.5.2-4 Rows 185, 186, 318, and 327) exposed to air-indoor uncontrolled environment. As discussed in AMR item 3.5.1-33, the change in material properties and cracking is aligned with the aging effect loss of sealing. The program element, Acceptance Criteria, of GALL-LR Report AMP XI.S6, “Structures Monitoring,” further reinforces that loss of sealing is associated with change in material properties (e.g., hardening) and cracking. For the listed LRA Table 2 AMR items that cite generic note E, the LRA credits the Structures Monitoring AMP (B.2.43) to manage the aging effects for elastomer upper containment pool gates and seals, exterior walls above grade, seals and gaskets (for doors manways and hatches), shielding, and flood pressure and specialty doors. The AMR item does not have plant-specific notes.

LRA Table 3.5.1, AMR item 3.5.1-33 also addresses change in material properties and cracking for elastomeric seals and gaskets on exterior walls above grade, expansion joints, flood curbs, insulation, roof membrane, and seals and gaskets for door manways and hatches (LRA Table 3.5.2-3 row 34; Table 3.5.2-4 Rows 132, 169, 207, 297, and 320) exposed to air-outdoor environment. As discussed in AMR item 3.5.1-33, the change in material properties and cracking is aligned with the aging effect loss of sealing. The program element, Acceptance Criteria, of GALL-LR Report AMP XI.S6, “Structures Monitoring,” further reinforces that loss of sealing is associated with change in material properties (e.g., hardening) and cracking. For the listed LRA Table 2 AMR items that cite generic note E, the LRA credits the Structures Monitoring AMP (B.2.43) to manage the aging effect for elastomer exterior walls above grade, expansion joints, flood curbs, insulation, roof membrane, and seals and gaskets for doors manways and hatches. The AMR item does not have plant-specific notes.

Based on its review of components associated with AMR item 3.5.1-33, for which the applicant cited generic note E, as modified by Supplement 3 (ML24206A150), the staff finds the applicant’s proposal to manage the effects of aging using the SMP acceptable for the following reasons: (1) the SMP scope consists of monitoring the aging effects of elastomers; (2) the program conducts periodic inspection, monitoring and trending of structural components to ensure that aging degradation leading to loss of intended functions will be detected; (3) change in material properties for elastomers are included in the monitored aging effects such as hardening, shrinkage and loss of sealing; (4) the SMP will be enhanced to require inspections of elastomeric components for cracking, loss of material and hardening at a frequency of at least 5 years; and (5) the enhancements include updating the plant implementation procedure to indicate that structural sealants will be acceptable if the observed loss of material, cracking, and hardening will not result in loss of sealing. Furthermore, the SMP is suitable for managing the proposed components since they are not part of the containment building's pressure-retaining boundary, which is typically managed by the 10 CFR 50 Appendix J program.

LRA Table 3.5.1, AMR item 3.5.1-33 addresses change in material properties and cracking for elastomer sealant and seismic isolation joints (LRA Table 3.5.2-4 Rows 277 and 321) exposed to air-indoor uncontrolled environment. For the listed LRA Table 2 AMR items that cite generic note E for bulk commodities such as penetration sealant (flood, radiation) and seismic isolation joints, the LRA credits the External Surfaces Monitoring of Mechanical Components AMP (B.2.18) to manage the aging effect of change in material properties and cracking on the elastomer material. The AMR item does not have plant-specific notes.

Based on its review of components associated with AMR item 3.5.1-33 for which the applicant cited generic note E, as modified by Supplement 3 (ML24206A150), the staff finds the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components Program acceptable because the cited program performs periodic visual inspections of elastomers that will detect change in material properties. The visual inspections are augmented with physical manipulation (e.g., touching, pressing, flexing) to confirm the absence of hardening and loss of strength in elastomeric materials.

Shield Building Electrical Penetration Seals and Sealant. LRA Table 3.5.1, AMR item 3.5.1-33, addresses loss of sealing due to wear, damage, erosion, tear, surface cracks, or other defects for seals and gaskets.

As amended by letter dated July 24, 2024 (ML24206A150), for the LRA Table 2 AMR items that cite generic note E for the shield building electrical penetration seals and sealant, the LRA credits the Fire Protection Program to manage the aging effects of cracking/delamination, loss of material, and loss of sealing on the elastomer material exposed externally to indoor uncontrolled air (rows 160, 161, and 162). The staff notes that the Fire Protection Program is also credited for managing change in material properties/cracking (AMR item 3.3.1-57) of elastomer shield building electrical penetration seals and sealant exposed externally to indoor uncontrolled air.

Based on its review of components associated with AMR item 3.5.1-33, for which the applicant cited generic note E, as modified by letter dated July 24, 2024 (Supplement 3, ML24206A150), 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 program are capable of detecting cracking/delamination, loss of material, and loss of sealing before a loss of intended function.

In addition, as amended by letter dated July 24, 2024 (ML24206A150), LRA Table 3.5.2-1 states that separation for elastomer shield building electrical penetration seals and sealant exposed externally to indoor uncontrolled air will be managed by the Fire Protection Program (row 163). The AMR item cites generic note H, for which the applicant has identified separation as an additional aging effect. The staff finds the applicant's proposal to manage separation acceptable because (1) it is consistent with Section 6, "Fire Barriers," of EPRI 3002013084, "Long-Term Operations: Subsequent License Renewal Aging Affects for Structures and Structural Components (Structural Tools)," issued November 2018, which states that separation may occur in elastomer fire stops; and (2) periodic visual inspections required by the Fire Protection Program are capable of detecting separation before a loss of intended function. See the discussions of Questions 1 and 6 in RAI-10337-R1 and RCI-10338-R1 in SER Section 3.0.3.1.9 for additional information.

Fire Stops, Penetration Sealant (Fire), and Seismic Isolation Joint. LRA Table 3.5.1, AMR item 3.5.1-33, addresses loss of sealing due to wear, damage, erosion, tear, surface cracks, or other defects for seals and gaskets.

As amended by letter dated July 24, 2024 (ML24206A150), for the LRA Table 2 AMR items that cite generic note E for the fire stops, penetration sealant (fire), and seismic isolation joint, the

LRA credits the Fire Protection Program to manage the aging effects of cracking/delamination and loss of material on the elastomer material exposed externally to indoor uncontrolled air (rows 145, 146, 265, 266, 323, and 324). The staff notes that the Fire Protection Program is also credited for managing change in material properties/cracking (AMR item 3.3.1-57) and loss of sealing (AMR item 3.5.1-72, see SER Section 3.5.2.1.4 for more information) of elastomer fire stops, penetration sealant (fire), and seismic isolation joint exposed externally to indoor uncontrolled air.

Based on its review of components associated with AMR item 3.5.1-33, for which the applicant cited generic note E, as modified by letter dated July 24, 2024 (ML24206A150), 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 program are capable of detecting cracking/delamination and loss of material before a loss of intended function.

In addition, as amended by letter dated July 24, 2024 (Supplement 3, ML24206A150), LRA Table 3.5.2-4 states that separation for elastomer fire stops, penetration sealant (fire), and seismic isolation joint exposed externally to indoor uncontrolled air will be managed by the Fire Protection Program (rows 148, 268, and 326). The AMR items cite generic notes H (fire stops and seismic isolation joint) and E (penetration sealant (fire)), for which the applicant has identified separation as an additional aging effect. The staff notes that generic note H should have been cited in lieu of generic note E for the penetration sealant (fire). The staff finds the applicant's proposal to manage separation acceptable because (1) it is consistent with Section 6, "Fire Barriers," of Electric Power Research Institute (EPRI) 3002013084, "Long-Term Operations: Subsequent License Renewal Aging Affects for Structures and Structural Components (Structural Tools)," issued November 2018, which states that separation may occur in elastomer fire stops; and (2) periodic visual inspections required by the Fire Protection Program are capable of detecting separation before a loss of intended function. See the discussions of Question 6 in RAI-10337-R1 and RCI-10338-R1 in SER Section 3.0.3.1.9 for additional information.

3.5.2.1.7 Loss of Material and Cracking Due to Freeze-Thaw

LRA Table 3.5.1, AMR item 3.5.1-26 addresses loss of sealing due to wear, damage, erosion, tear, surface cracks, or other defects for elastomer moisture barrier exposed to air-indoor, uncontrolled. For the LRA Table 2 AMR items that cite generic note E and GALL-LR, Revision 2 item II.B4.CP-40, the LRA credits the SMP to manage the aging effect for elastomer flood curb 3 and elastomer flood, pressure and specialty doors 1. The GALL Report, Revision 2, recommends GALL Report AMP XI.S1, ASME Section XI, Subsection IWE program, to provide reasonable assurance that this aging effect is adequately managed.

Based on its review of components associated with AMR item 3.5.1-26 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the enhanced SMP acceptable because (1) the Structure Monitoring Program will be enhanced to perform visual inspection, supplemented with feel or manipulation, to detect cracking, loss of material and hardening (e.g., change in material properties) for elastomeric components, and (2) the SMP will be enhanced to require that structures and structural components are monitored on a frequency not to exceed 5 years instead of 10-year periodicity recommended by GALL Report AMP XI.S1, ASME Section XI, Subsection IWE program.

3.5.2.1.8 Loss of Sealing Due to Deterioration of Seals, Gaskets, and Moisture Barriers

LRA Table 3.5.1, AMR item 3.5.1-72 addresses loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants) for elastomeric fire stops, penetration sealants (fire) and seismic isolation joints exposed to air - indoor, uncontrolled (Ext) environment. For the AMR Table 2 items that cite generic note E, the LRA credits the Fire Protection Program to manage the aging effect for elastomeric fire stops, penetration sealants (fire) and seismic isolation joints. The AMR items cite plant-specific note 522, which states, "Structures Monitoring program is aligned with Fire Protection program in detecting the loss of sealing aging effect for these material/environment combinations."

Based on its review of components associated with AMR item 3.5.1-72 for which the applicant cited generic note E, as modified by LRA Supplement 3 (ML24206A150), the staff finds the applicant's proposal to manage the effects of aging using the Fire Protection Program acceptable because the visual examinations required by the Fire Protection Program are capable of detecting the loss of sealing of structural commodities with a fire barrier function and seismic isolation joints before a loss of intended functions at a frequency in accordance with the plant's NRC-approved Fire Protection Program, that is consistent with the GALL-LR Report recommendations.

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 criteria contained in SRP-LR Section 3.5.2.2. The following subsections document the staff's review.

3.5.2.2.1 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, as modified by Supplement 3 (ML24206A150), associated with LRA Table 3.5.1 AMR items 3.5.1-1 and 3.5.1-2, addresses cracking and distortion due to increased stress levels from settlement for the concrete dome; wall; basemat; ring girders; buttresses of the reactor containment building 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 water-flowing, which will be managed by the SMP. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.5.2.2.1.1.

LRA Table 3.5.1 AMR item 3.5.1-1, as modified by Supplement 3 (ML24206A150), states 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 Perry does not rely on a dewatering system to control settlement. In its review of the reactor containment building concrete foundation/basemat component associated with AMR item 3.5.1-1 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 SMP for the applicable concrete components is acceptable because:

- The use of periodic visual inspections under the Structures Monitoring AMP to detect cracking and distortion in the reactor containment building structures and components will allow degradation to be detected and corrective action to be taken prior to a loss of intended function.
- Per the current licensing basis, a dewatering system is not relied upon to control settlement so there is no need to verify the continued functionality of a dewatering system.
- The staff reviewed the plant-specific operating experience and did not find any history of significant cracking or distortion that could adversely affect intended function due to increased levels of settlement stress.

LRA Table 3.5.1 AMR item 3.5.1-2, as modified by Supplement 3 (ML24206A150), states that the associated concrete components are managed for reduction of foundation strength and cracking due to differential settlement and erosion of the porous concrete subfoundation by the Structures Monitoring AMP. The applicant also stated that Perry does not rely on a dewatering system to control settlement and the plant substructures were designed with porous concrete and a permanent underdrain system to reduce hydrostatic pressure. The applicant further stated that the measured settlement has been minimal and the Perry below-grade environment is not aggressive. The applicant indicated that Perry operating experience has not identified any aging effects that resulted from aggressive below- grade environment.

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 cited generic note A for five associated components and generic note G for one associated component. The staff further noted that among five components that cited generic note A, two of them should have cited generic note generic G because the environment that these two components are exposed to is soil, instead of a water-flowing environment as specified in the GALL Report. Based on its review of the porous concrete foundation components exposed to water-flowing and soil associated with AMR item 3.5.1-2 for which the applicant cited generic note A and G, respectively, the staff finds that the applicant has met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the SMP is acceptable for the following reasons:

- Although the applicant cited note G in the containment foundation porous concrete component, indicating a different environment from the GALL Report, the staff confirmed that the Structures Monitoring AMP is capable of detecting reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation for structural integrity, and monitoring the groundwater chemistry including accounting for seasonal variations. As described in LRA Section A.1.43, the applicant will enhance, no later than 6 months prior to the PEO, the Structural Monitoring program to monitor the porous concrete subfoundation for: loss of material, change in material properties, settlement, and groundwater chemistry for pH, chlorides, and sulfates and verify that it remains non-aggressive, or evaluate results exceeding criteria to assess impact, if any, on below-grade concrete.

- The staff verified that the Perry 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.
- The staff reviewed the Perry UFSAR discussion on groundwater chemistry and found that the groundwater was in basic pH (quantitative measure of acidity) range values and not aggressive to concrete.
- The staff reviewed the plant-specific operating experience and did not find any history of significant reduction of foundation strength and cracking due to differential settlement and erosion of the porous concrete subfoundation that could adversely affect intended function.

Based on the programs identified and planned enhancements, 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 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 PEO 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 3.5.1-3, 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 AMR item 3.5.1-3, as modified by LRA Supplement 3 (ML24206A150), is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.5.2.2.1.2 and finds it acceptable as follows. Perry containment is a Mark III free-standing steel containment vessel, so the applicable GALL-LR components are the containment basemat and the concrete fill-in annulus, which are in the lower elevations of the containment structure and therefore below the average temperature. According to GALL Chapter IX.F, in concrete, reduction of strength and modulus can be attributed to elevated temperatures (>150°F general; >200°F local). The containment basemat and the concrete fill-in annulus are not exposed to the temperatures required for this aging effect to occur, therefore, reduction of strength and modulus of elasticity due to elevated temperature in concrete components of the Perry containment structure is not an applicable aging effect that needs to be managed.

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

<u>Item 1</u>. LRA Section 3.5.2.2.1.3, associated with LRA Table 3.5.1 AMR item 3.5.1-4, addresses loss of material due to general, pitting, and crevice corrosion in inaccessible areas of the steel elements in drywell shell, drywell head, and drywell shell of BWR exposed to air-indoor, uncontrolled, or concrete. The applicant stated that AMR item 3.5.1-4, as modified by Supplement 3 (ML24206A150), 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 for the following reasons:

- The steel elements of the Perry Mark III containment drywell including the inside face of the drywell formed with steel plate and part of the drywell head are accessible.
- The use of the ASME Section XI, Subsection IWE and 10 CFR 50, Appendix J AMPs to manage the loss of material for accessible steel elements of drywell, associated with

LRA Table 3.5.1, item 3.5.1-35, will allow for degradations to be detected and corrective action to be taken prior to a loss of intended function.

LRA Section 3.5.2.2.1.3, associated with LRA Table 3.5.1 AMR item 3.5.1-5, addresses loss of material due to general, pitting, and crevice corrosion in inaccessible areas of the steel elements in liner plate, liner plate anchors and integral attachments exposed to air-indoor uncontrolled; and suppression chamber, drywell, drywell head, embedded shell, and region shielded by diaphragm floor (as applicable) exposed to air-indoor uncontrolled or treated water. The applicant stated that AMR item 3.5.1-5, as modified by Supplement 3 (ML24206A150), 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 for the following reasons:

- For the inaccessible area of the containment steel liner (located in the lower part of the containment at basemat), its interior and exterior surfaces are protected from contact with the atmosphere by complete concrete encasement, thus preventing corrosion.
- Perry is a Mark III with a free-standing steel containment vessel that does not have a drywell shell, embedded shell or region shielded by diaphragm floors.
- The use of the ASME Section XI, Subsection IWE and 10 CFR 50, Appendix J AMPs to manage the loss of material for relevant steel elements in accessible areas, associated with LRA Table 3.5.1, item 3.5.1-35, will allow for degradations to be detected and corrective action to be taken prior to a loss of intended function.

<u>Item 2</u>. LRA Section 3.5.2.2.1.3, associated with LRA Table 3.5.1 AMR item 3.5.1-6, addresses loss of material due to general, pitting, and crevice corrosion for steel elements torus shell of Mark I containments exposed to air-indoor, uncontrolled, or treated water. The applicant stated that AMR item 3.5.1-6 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 only applies to BWRs with Mark I containments and Perry is a Mark III with a free-standing steel containment vessel that does not have the listed steel element.

<u>Item 3</u>. LRA Section 3.5.2.2.1.3, as modified by Supplement 3 (ML24206A150), associated with LRA Table 3.5.1 AMR item 3.5.1-7, 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 interior surface of suppression chamber shell of Mark III containments exposed to air-indoor, uncontrolled, or treated water. The applicant stated that AMR item 3.5.1-7 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 for the following reasons:

- Perry Mark III containment does not have a torus ring girder or downcomers.
- The suppression chamber inner surface is integral to the SCV, clad with stainless steel, which prevents carbon steel for components associated to this item from being exposed to the suppression pool water environment.
- The use of the ASME Section XI, Subsection IWE Program and 10 CFR 50, Appendix J Program to manage the loss of material for the stainless-steel clad containment vessel exposed to the suppression treated water will allow for degradations to be detected and corrective action to be taken prior to a loss of intended function.

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 3.5.1-8, addresses loss of prestress due to relaxation; shrinkage; creep; elevated temperature in prestressing system and tendons exposed to air-indoor, uncontrolled or air-outdoor. Criteria in SRP-LR Section 3.5.2.2.1.4 states that loss of prestress forces due to relaxation, shrinkage, creep, and elevated temperature for PWR prestressed concrete containments is a TLAA as defined in 10 CFR 54.3. The applicant stated that this item is not applicable because Perry is a BWR Mark III with a steel containment vessel enclosed by a reinforced concrete cylindrical structure, which does not incorporate a prestressing system (not prestressed). The staff confirmed in the UFSAR that the Perry containment design is a free-standing steel containment vessel and does not use a concrete prestressing system. Therefore, loss of prestress due to relaxation, shrinkage, creep, and elevated temperature does not apply to Perry and is thereby acceptable to the staff.

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 3.5.1-9, states that TLAAs are evaluated in accordance with 10 CFR 54.21(c) and that the evaluation of this TLAA is limited to cumulative fatigue damage associated with containment vessel, its penetration sleeves, bellows, and associated components addressed in Section 4.5. This is consistent with SRP-LR Section 3.5.2.2.1.5 and therefore is acceptable.

The staff evaluated the applicant’s claim against the criteria in SRP-LR Section 3.5.2.2.1.5 and finds the limited applicability of LRA Table 3.5.1 item 3.5.1-09 related to TLAA Section 4.5 documented in its evaluation of SER Section 4.5, acceptable because:

- Perry has a Mark III containment confirmed by the staff in its review of UFSAR and Technical Specifications
- The torus, suppression pool shell, vent line bellows, and unbraced downcomers are not in-scope of LRA Chapter 2 BWR components because they are related to Mark I and II containments and therefore are not applicable.

3.5.2.2.1.6 Cracking Due to Stress Corrosion Cracking

As supplemented by letter dated July 24, 2024 (Supplement 3, ML24206A150), LRA Section 3.5.2.2.1.6, associated with LRA Table 3.5.1, item 3.5.110, addresses cracking due to SCC of stainless-steel penetration bellows and dissimilar metal welds in all types of PWR and BWR containments. The applicant stated that applicable components potentially susceptible to SCC at Perry are penetrations sleeves and bellow and associated welds. The applicant also stated that a review of plant operating experience did not identify cracking of these components. The applicant further stated that although an aggressive environment does not exist at Perry for these components, the potential for SCC is assumed. The applicant stated that the applicable aging effects is managed by the ASME Section XI, Subsection IWE Program and 10 CFR Part 50, Appendix J Program for the containment penetrations, and by the ASME Section XI, Subsection IWE, Structures Monitoring, and the Fire Protection programs for the drywell mechanical penetrations.

The staff reviewed the applicant’s proposal against the criteria in SRP-LR Section 3.5.2.2.1.6. The staff finds that the applicant has met the further evaluation criteria, and its proposal to manage the potential effects of aging using the ASME Section XI, Subsection IWE and 10 CFR 50, Appendix J programs for containment penetrations; and by using the ASME Section XI, Subsection IWE, Structures Monitoring and Fire Protection programs for drywell mechanical penetrations. The staff finds the applicant's further evaluation to be acceptable because plant-specific operating experience has not revealed any history of cracking due to SCC, and the programs identified are deemed adequate to detect significant degradation due to SCC, if it should occur during the PEO. For additional information, see the staff's evaluation of the applicant's response to Question 1 of RAI-10337-R1 in SER Section 3.0.3.2.Y (Fire Protection AMP).

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, as modified by LRA Supplement 3 (ML24206A150), response to RAI 10308-R1 Question 2 (ML24324A185), and LRA Supplement 7 (ML 24354A265), associated with LRA Table 3.5.1 AMR item 3.5.1-11, 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 air-outdoor or groundwater/soil environment. The applicant stated that AMR item 3.5.1-11, as modified by LRA Supplement 3 (ML24206A150), is not applicable. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.5.2.2.1.7 and finds it acceptable for the following reasons:

- The design and construction of Perry concrete mix following ACI 318-71 required an air-entraining admixture capable of entraining four to 8 percent air, which is in the range of 3–8 percent air content limits specified in SRP-LR Section 3.5.3.2.1.7; thus, the concrete mix design provides for low permeability and adequate air entrainment such that the concrete has good freeze-thaw resistance. The operating experience at Perry confirms the absence of the aging effects loss of material or cracking due to freeze-thaw in the accessible areas of concrete. Therefore, a plant-specific program is not needed.
- Perry containment is a Mark III free-standing steel containment vessel, so the applicable GALL-LR components are the containment basemat and the concrete fill-in annulus. These inaccessible concrete components are located well below the frost line, thus precluding the aging effects due to freeze-thaw.

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 3.5.1-12, 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. 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 3.5.1-12, as modified by LRA Supplement 3 (ML24206A150), 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 is acceptable for the following reasons:

- Perry has no plant-specific operating experience related to cracking due to expansion from reaction of aggregates. Furthermore, Perry containment concrete (basemat and concrete fill-in annulus) was constructed in accordance with ACI 318 specification and used ASTM C 295, Standard Guide for Petrographic Examination of Concrete Aggregate, to identify elements in the aggregate, consistent with the description in SRP-LR Section 3.5.3.2.1.8. Therefore, a plant-specific aging management program is not needed.

- The ASME Section XI, Subsection IWL program will continue to inspect and monitor the concrete containment structures for cracking due to any mechanism.
- The ASME Section XI, Subsection IWL 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.

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 PEO, 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 3.5.1-13, addresses the aging effects of 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 AMR item 3.5.1-13, as modified by LRA Supplement 3 (ML24206A150), is not used. The applicant pointed to LRA AMR item 3.5.1-47 as an alternative to AMR item 3.5.1-13. For AMR item 3.5.1-47, as modified by LRA Supplement 3 (ML24206A150), the applicant stated that the SMP will be used to manage the aging effects of increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation at concrete inaccessible areas. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.5.2.2.1.9.

In its review of the inaccessible concrete components of containment structure associated with AMR items 3.5.1-47, as an alternative to AMR item 3.5.1-13, 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 SMP is acceptable for the following reasons:

- The previously performed evaluation determined that the observed leaching of calcium hydroxide and carbonation for the porous concrete pad (under the plant buildings) localized in the peripheral portions has no impact on the intended function of the concrete structure. Therefore, a plant-specific program is not needed.
- Table 3.5.2-1 items associated with LRA AMR item 3.5.1-47 for containment inaccessible containment foundations exposed to internal raw water and external soil environment are managed by SMP for aging effects of increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation.
- The SMP inspects for evidence of the aging effect in accessible areas for other components (such as the components associated with LRA AMR item 3.5.1-63) 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.

- The enhanced SMP will perform opportunistic inspections of normally inaccessible below-grade concrete when excavated for any other reasons.

LRA Section 3.5.2.2.1.9, associated with LRA Table 3.5.1, item 3.5.1-14, addresses the aging effects of 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. The applicant stated that this AMR item 3.5.1-14, as modified by LRA Supplement 3 (ML24206A150), is not applicable.

The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.5.2.2.1.9 and finds it acceptable because Perry containment is a Mark III free-standing steel containment vessel whose aging effects of increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible concrete components of the containment structure exposed to water-flowing environment are managed by the Structures Monitoring Structures program and addressed under AMR item 3.5.1-47.

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

3.5.2.2.2.1 Aging Management of Inaccessible Areas

Item 1. LRA Section 3.5.2.2.2.1, item 1, as modified by LRA Supplement 3 (ML24206A150), associated with LRA Table 3.5.1, AMR item 3.5.1-42, addresses the aging effects of loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures exposed to air-outdoor or groundwater/soil environment. The applicant stated that this AMR item, as modified by LRA Supplement 3 (ML24206A150), is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.5.2.2.2.1, item 1 and finds it acceptable for the following reasons:

- The Perry concrete mix design follows Table 4.2-5 of ACI 318-71 specification, which requires reinforced concrete to contain an air-entraining admixture capable of entraining 4–8 percent air, complying with the 3–8 percent air content limit specified in SRP-LR Section 3.5.3.2.2.1, item 1, thus the concrete mix design provides adequate air entrainment such that the concrete has good freeze-thaw resistance. In addition, plant operating experience has not identified any aging effects related to freeze-thaw in accessible areas. Therefore, a plant-specific aging management program is not needed.
- Although Perry is located in moderate-to-severe weathering condition as defined in NUREG-1557, the applicant's USAR, and LRA information on foundation elevations of Groups 1–3, 5, and 7–9 structures and associated ground levels, as well as online guidance document from Ohio Environmental Protection Agency on extreme frost penetration depths up to 40 inches in Ohio State, confirmed that the foundation levels of all groups of structures are well below the frost line, which precludes the aging effect. Therefore, loss of material (spalling, scaling) and cracking due to freeze-thaw are not aging effects requiring management for Perry below-grade inaccessible concrete foundations.

Item 2. LRA Section 3.5.2.2.2.1, item 2, associated with LRA Table 3.5.1, AMR item 3.5.1-43, addresses the aging effect of cracking due to expansion from reaction with aggregates in inaccessible concrete areas of Groups 1–3, 5 and 7–9 structures exposed to any environment, which will be managed by the SMP. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.5.2.2.2.1, item 2. In its review of components associated with item 3.5.1-43, as modified by LRA Supplement 3 (ML24206A150), 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 SMP is acceptable for the following reasons:

- Perry performed a petrographic examination of concrete cores from Unit 2 Auxiliary Building per ASTM C856 demonstrating that those aggregates do not adversely react within reinforced concrete which is consistent with the intent described in SRP-LR Section 3.5.3.2.2.1, Item 2.
- Perry has no plant-specific operating experience related to cracking due to expansion from reaction of aggregates. Furthermore, Perry structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios and air entrainment percentages were within the limits provided in ACI 318, which consistent with the description in SRP-LR Section 3.5.3.2.2.1, item 2. Therefore, a plant-specific aging management program is not needed.
- The enhanced SMP 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.
- The enhanced SMP 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 PEO, as required by 10 CFR 54.21(a)(3).

<u>Item 3</u>. LRA Section 3.5.2.2.2.1, item 3, as modified by LRA Supplement 3 (ML24206A150), associated with (1) LRA Table 3.5.1, AMR item 3.5.1-44, 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 soil environment, which will be managed by the SMP and (2) LRA Table 3.5.1 AMR item 3.5.1-46, 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 Groups 1-3, 5-9 structures exposed to a water-flowing environment, which will be managed by the SMP. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.5.2.2.2.1, item 3.

In its review of components associated with AMR items 3.5.1-44, as modified by LRA Supplement 3 (ML24206A150), 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 SMP is acceptable for the following reasons:

- Perry does not rely on a dewatering for settlement control, so the continued functionality of the dewatering system is not required during the operation.
- The enhanced SMP will monitor the aging effects in accessible concrete components, the condition in accessible concrete is used as an indicator of the condition of the inaccessible concrete components and provides reasonable assurance that degradation of inaccessible

structural components will be detected before a loss of an intended function of degradation in inaccessible areas.

- The SMP will continue to evaluate settlement and rebound measurement results to access 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 soil environment.

In its review of components associated with AMR items 3.5.1-46, as modified by response to RAI 10327-R1 Question 2 (ML24324A185), and LRA Supplement 7 (ML 24354A265), 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 SMP is acceptable for the following reasons:

- Perry does not rely on a dewatering system for settlement control, so the continued functionality of the dewatering system is not required during the operation.
- The SMP will continue to evaluate settlement and rebound measurement results to access 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 Groups 1–3 and 5–9 structures exposed to a water-flowing environment.

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 PEO, as required by 10 CFR 54.21(a)(3).

Item 4. LRA Section 3.5.2.2.2.1, item 4, as modified by LRA Supplement 3 (ML24206A150), associated with LRA Table 3.5.1, item 3.5.1-047, addresses the aging effects of increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of concrete components for Groups 1-5 and 7-9 structures exposed to water-flowing environment, which will be managed by the SMP. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.5.2.2.2.1, item 4.

In its review of components associated with item 3.5.1-47, as modified by LRA Supplement 3 (ML24206A150), 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 SMP is acceptable for the following reasons:

- The Perry below-grade environment is not aggressive, and Perry used a dense low-permeable concrete which provide protection against chemical attack.
- The enhanced SMP 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.
- The enhanced SMP 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 PEO, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.2 Reduction of Strength and Modulus of Concrete Structures Due to Elevated Temperature

LRA Section 3.5.2.2.2.2, associated with LRA Table 3.5.1, item 3.5.1-48, addresses the aging effect of reduction of strength and modulus of elasticity due to elevated temperature in Groups 1-5 concrete structures exposed to air-indoor uncontrolled environment. The applicant stated that this item, as modified by LRA Supplement 3 (ML24206A150), 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 Perry's concrete temperatures for Group 1–5 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 operating experience 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, as modified by LRA Supplement 3 (ML24206A150), response to RAI 10308-R1 Question 2 (ML24324A185), and LRA Supplement 7 (ML24354A265), respectively, associated with LRA Table 3.5.1, AMR item 3.5.1-49, 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). Items in LRA Table 3.5.2-3 associated with AMR item 3.5.1-49, as modified by response to RAI 10308-R1 Question 2 (ML24324A185) and LRA Supplement 7 (ML24354A265), states that loss of material (spalling, scaling) and cracking due to freeze-thaw for inaccessible concrete area of exterior walls below-grade exposed to soil (external), exterior walls above grade exposed to air-outdoor (external), and floor slab exposed to raw water (internal) will be managed by the SMP and cite generic note G. The AMR items in LRA Table 3.5.2-3 also cite plant-specific Note 541, which states "The environment is not listed in GALL for this component and material. AMR Table 1, 3.5.1, Item 3.5.1-49 was chosen to address this aging effect in the inaccessible areas of concrete for Group 6 Structures. A plant-specific aging management program is not required because Perry meets the conditions specified in the further evaluation section. Structures Monitoring is the aging management program to manage this aging effect."

The staff reviewed the associated items in the LRA against the criteria in SRP-LR Section 3.5.2.2.2.3, item 1, 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 finds that the applicant has met further evaluation criteria, and the applicant's proposal to manage the effects of aging using the SMP is acceptable for the following reasons:

- The concrete mix designs contain an air-entraining admixture capable of entraining 4-8 percent air, which is in the range of 3–8 percent air content limits specified in SRP-LR Section 3.5.3.2.2.3, item 1. Furthermore, plant operating experience has not identified any aging effects related to freeze-thaw in accessible areas. Therefore, a plant-specific aging management program is not needed.
- The NRC's interim staff guidance of Updated Aging Management Criteria for Structures Portions, SLR-ISG-2021-03-STRUCTURES (ML20181A381), lists "Air-outdoor,

groundwater/soil" as applicable environment for the component and material associate with SRR Item 3.5.1-49, and plant-specific aging management program or AMP XI.S6, "Structures Monitoring," enhanced as necessary, as aging management program for SPR Item 3.5.1-49. Therefore, the use of the enhanced SMP to manage the aging effects for the component and material expose to air-outdoor, groundwater, or soil environments is consistent with the NRC's interim staff guidance.

- Perry's enhanced SMP 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.
- Perry's enhanced SMP 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 PEO, 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 3.5.1-50, 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 SMP. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.5.2.2.2.3, item 2.

Based on its review of components associated with item 3.5.1-50 for which the applicant cited generic note E, as modified by LRA Supplement 3 (ML 24206A150), 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 SMP is acceptable for the following reasons:

- Perry has no plant-specific operating experience related to cracking due to expansion from reaction of aggregates. Furthermore, Perry structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios, and air entrainment percentages are within the limits provided in ACI 318, consistent with the description in SRP-LR Section 3.5.3.2.2.3, item 2. Therefore, a plant-specific aging management program is not needed.
- NRC's interim staff guidance of Updated Aging Management Criteria for Structures Portions, SLR-ISG-2021-03-STRUCTURES (ML20181A381), lists plant-specific aging management program or AMP XI.S6, "Structures Monitoring," enhanced as necessary, as aging management program for SPR Item 3.5-1,050. Therefore, the use of the enhanced SMP to manage the aging effects is consistent with the NRC's interim staff guidance.
- Perry's enhanced SMP 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.
- Perry's enhanced SMP 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 PEO, as required by 10 CFR 54.21(a)(3).

Item 3. LRA Section 3.5.2.2.2.3, item 3, as modified by LRA Supplement 3 (ML24206A150), associated with LRA Table 3.5.1, item 3.5.1-51, addresses increased porosity and permeability, 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 water-flowing environment, which will be managed by the SMP. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.5.2.2.2.3, item 3.

In its review of components associated with item 3.5.1-51 that cites generic note E, as modified by LRA Supplement 3 (ML24206A150), 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 SMP is acceptable for the following reasons:

- The use of the enhanced SMP to manage the aging effects is consistent with the NRC's interim staff guidance of Updated Aging Management Criteria for Structures Portions, SLR-ISG-2021-03-STRUCTURES (ML20181A381).
- Plant operating experience has not revealed that below-grade exterior reinforced concrete at Perry has been exposed to an aggressive environment (pH less than 5.5), or to chloride or sulfate solutions beyond defined limits (greater than 500 ppm chloride, or greater than 1500 ppm sulfate), and the SMP will be enhanced to include acceptance criteria for indication of leaching of calcium hydroxide if these chemicals exceed the limits.
- The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants program inspects for evidence of the aging effect in the accessible concrete areas of Group 6 structures 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.
- The enhanced SMP 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 the applicant has demonstrated that the effects of aging will be adequately managed so the intended function(s) will be maintained consistent with the CLB during the PEO, 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, associated with LRA Table 3.5.1 AMR item 3.5.1-52, addresses cracking due to SCC and loss of material due to pitting and crevice corrosion for Groups 7 and 8 stainless-steel tank liners exposed to water-standing. The applicant stated that AMR item 3.5.1-52 is not applicable. The applicant also stated that no tanks with stainless-steel liners are included in the scope of the license review at Perry. The applicant further stated that loss of material for sump stainless-steel liners will be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.25) AMP as addressed in item 3.3.1-95; loss of material for stainless-steel liners in treated water pools are managed by the Water Chemistry (B.2.44) AMP as addressed in items 3.3.1-25 and 3.5.1-78; and the One-Time Inspection (B.2.36) AMP will confirm the effectiveness of the Water Chemistry AMP for pools in containment as addressed in item 3.3.1-25. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.5.2.2.2.4 and finds it acceptable for the following reasons:

- A search of applicant's LRA and UFSAR confirmed that there are no Group 7 and 8 stainless-steel tank liners exposed to standing water in the scope of license renewal.
- Component types consisting of concrete and steel with stainless-steel liners are addressed with the applicable mechanical system to which they belong.

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 3.5.1-53, addresses fatigue of component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 component supports of steel exposed to air-indoor uncontrolled environment, only if a CLB fatigue analysis exists. This is consistent with SRP-LR Section 3.5.2.2.2.5 which states that evaluation of this TLAA is in Section 4.3, "Metal Fatigue Analysis," of the SRP-LR and therefore is acceptable.

The applicant stated that this item is not applicable because CLB fatigue analyses do not exist for component support members, component support welds, and support anchorages to building structure for Groups B1.1, B1.2, and B1.3 component supports at Perry.

The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.5.2.2.2. The staff finds the applicant's claim acceptable because it confirmed through a review of the LRA and of the UFSAR that the applicant's CLB did not identify fatigue analyses for component support members, component support welds, and support anchorage to building structures for Groups B1.1 and B1.2 that are required to be identified as TLAAs in accordance with 10 CFR 54.21(c).

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 PEO. 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 types, 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 Bulk Commodities – Summary of Aging Management Evaluation

Sanitary Fixtures Exposed to Indoor Uncontrolled Air and Raw Water. LRA Table 3.5.2-4 identified no aging effects/mechanisms and no aging management programs for porcelain sanitary fixtures inside the control room exposed externally to indoor uncontrolled air and raw water. The AMR items cite generic note H and Plant-specific Note 520 which states, "[b]ased on Industry OE, porcelain in wastewater and air has no aging effect in wastewater or air. Perry internal OE supports this conclusion." As discussed during the audit, Perry cited a raw water environment because the porcelain sanitary fixtures are filled with raw water rather than wastewater.

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, materials, and environment descriptions. Porcelain is essentially a hardened, opaque glass, and based on a review of EPRI Report 1010639, no aging effects of glass have been observed in the industry. Therefore, the staff finds that the applicant has identified all applicable aging effects for these component, material, and environment combinations. The staff finds the applicant's proposal acceptable because no aging effects of glass have been reported in the industry, including at Perry.

Pyrocrete Fireproofing. As amended by letters dated July 24, 2024 (ML24206A150) and December 19, 2024 (ML24354A265), LRA Table 3.5.2-4 states that cracking/delamination, loss of material, and separation for Pyrocrete fireproofing exposed externally to indoor uncontrolled air will be managed by the Fire Protection Program.

The AMR items cite generic note H. 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 component, material, and environment descriptions. The staff notes that SLR-ISG-2021-02 MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance" (ML20181A434), states the Fire Protection Program manages loss of material, cracking/delamination, change in material properties, and separation for cementitious coating fireproofing/fire barriers. The staff notes that Section 6, "Fire Barriers," of EPRI 3002013084, "Long-Term Operations: Subsequent License Renewal Aging Affects for Structures and Structural Components (Structural Tools)," issued November 2018, states that Pyrocrete is a fire wrap and that change in material properties is not expected for fire wraps when the gamma irradiation exposure does not exceed 10^6 rads. The applicant's response to Question 2 in RAI-10337-R1 states, "[o]f these applications, only Pyrocrete applied to fire damper housings would be located in areas where integrated radiation dose over 60 years of operation may exceed 1E 6 rads." Therefore, change in material properties would not be an applicable aging effect for Pyrocrete fireproofing not associated with fire damper housings. See the discussion for Pyrocrete fireproofing, fire damper housing in Section 3.5.2.3.2 of this SER.

The staff finds the applicant's proposal to manage cracking/delamination, loss of material, and separation acceptable because (1) it is consistent with Section 6 of EPRI 3002013084, which states that cracking/delamination, loss of material, and separation may occur in fire wraps; and (2) periodic visual inspections required by the Fire Protection Program are capable of detecting cracking/delamination, loss of material, and separation before a loss of intended function. See the discussions of Question 2 in RAI-10337-R1 and RCI-10338-R1 in SER Section 3.0.3.1.9 for additional information.

3M Interam Fire Wrap and Radiant Energy Shield. LRA Table 3.5.2-4 states that change in material properties, cracking/delamination, and loss of material for 3M Interam fire wrap and radiant energy shield exposed externally to indoor uncontrolled air will be managed by the Fire Protection.

The AMR items cite generic note F and plant-specific note 502 that states, "[t]he Fire Protection Program will manage aging effects for 3M Interam, which is a flexible mat that releases chemically bound water to slow heat transfer at high temperature." 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 component, material, and environment descriptions. The staff notes that SLR-ISG-2021-02 MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance" (ML20181A434), states the Fire Protection Program manages loss of material, cracking/delamination, change in material properties, and separation for subliming compound fireproofing/fire barriers. In addition, the staff notes that Section 6, "Fire Barriers," of EPRI 3002013084, "Long-Term Operations: Subsequent License Renewal Aging Affects for Structures and Structural Components (Structural Tools)," issued November 2018, states separation is not applicable to fire wrap. Therefore, separation would not be an applicable aging effect for 3M Interam fire wrap and radiant energy shield.

The staff finds the applicant's proposal to manage change in material properties, cracking/delamination, and loss of material acceptable because (1) it is consistent with Section 6 of EPRI 3002013084, which states that change in material properties, cracking/delamination, and loss of material may occur in fire wraps; and (2) periodic visual inspections required by the Fire Protection Program are capable of detecting change in material properties, cracking/delamination, and loss of material before a loss of intended function. See the discussion of RCI-10338-R1 in SER Section 3.0.3.1.9 for additional information.

Fiberglass/Alumina Silicate/Calcium Silicate/Mineral Fiber Fire Wrap. As amended by letters dated July 24, 2024 (Supplement 3, ML24206A150), and December 19, 2024 (Supplement 7, ML24354A265), LRA Table 3.5.2-4 states that change in material properties, cracking/delamination, and loss of material for fiberglass/alumina silicate/calcium silicate/mineral fiber fire wrap exposed externally to indoor uncontrolled air will be managed by the Fire Protection Program.

The AMR items cite generic note H. 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 component, material, and environment descriptions. The staff notes that SLR-ISG-2021-02 MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance" (ML20181A434), states the Fire Protection

Program manages loss of material, cracking/delamination, change in material properties, and separation for silicate fireproofing/fire barriers. In addition, the staff notes that Section 6, “Fire Barriers,” of EPRI 3002013084, “Long-Term Operations: Subsequent License Renewal Aging Affects for Structures and Structural Components (Structural Tools),” issued November 2018, states separation is not applicable to fire wrap. Therefore, separation would not be an applicable aging effect for fiberglass/alumina silicate/calcium silicate/mineral fiber fire wrap.

The staff finds the applicant’s proposal to manage change in material properties, cracking/delamination, and loss of material acceptable because (1) it is consistent with Section 6 of EPRI 3002013084, which states that change in material properties, cracking/delamination, and loss of material may occur in fire wraps; and (2) periodic visual inspections required by the Fire Protection Program are capable of detecting change in material properties, cracking/delamination, and loss of material before a loss of intended function. See the discussions of Question 3 in RAI-10337-R1 and RCI-10338-R1 in SER Section 3.0.3.1.9 for additional information.

Gypsum Board Drywall. As amended by letter dated July 24, 2024 (Supplement 3, ML24206A150), LRA Table 3.5.2-4 identifies no aging effects/mechanisms and no aging management programs for gypsum board drywall exposed externally to indoor uncontrolled air. The AMR item cites generic note H and plant-specific note 532 that states, “No mechanism for degradation of drywall was identified due to aging.” The applicant stated in the response to Question 5 in RAI-10337-R1 that they consider gypsum board drywall as large, rigid fire stops.

Section 6, “Fire Barriers,” of EPRI 3002013084, “Long-Term Operations: Subsequent License Renewal Aging Affects for Structures and Structural Components (Structural Tools),” issued November 2018, states that loss of material due to abrasion is an applicable aging effect when fire stops are in contact with vibrating equipment. In response to Question 5 in RAI-10337-R1, the applicant stated, “PNPP considers this condition as being due to a design problem or human interaction and would have been discovered and corrected because of the current licensing basis Fire Protection Program requirements.” In addition, the applicant stated, “[t]he current license basis requires there be a Fire Protection Program that inspects gypsum board assemblies that are used as fire barriers, and these inspections address the damage from event-based mechanisms, as well as damage due to vibration, and make corrections when the damage exceeds acceptance criteria. These inspections will continue through the PEO, as inherently required by Condition 2(c)6 of the facility operating license. The Fire Protection Program establishes a robust set of criteria that would identify the degradation of fire-rated gypsum board assemblies resulting from non-age-related mechanisms and is enhanced, if necessary, to incorporate detection of aging effects.”

Section 6 of EPRI 3002013084 states cracking/delamination and separation due to vibration and movement (differential movement between adjacent structures) are applicable aging effects for fire stops. As noted above, the applicant stated that vibration would be due to design issues or human interaction and would have been identified and corrected. In response to Question 5 in RAI-10337-R1, the applicant stated that gypsum board drywall is not used to separate structures and is not installed as an adhesive; therefore, cracking/delamination and separation due to movement is not applicable.

Section 6 of EPRI 3002013084 states change in material properties due to irradiation damage is an applicable aging effect for fire stops if the gamma irradiation exposure exceeds 10^6 rads. In response to Question 5 in RAI-10337-R1, the applicant stated that gypsum board drywall is in areas where the gamma irradiation exposure is not expected to exceed 10^6 rads. The applicant confirmed in response to RCI-10460-R1 that there has been no plant-specific operating experience related to gypsum board drywall due to age-related degradation.

The staff reviewed the associated item in the LRA and concluded, for Perry, that there are no aging effects requiring management and no recommended aging management program for gypsum board drywall because (1) the applicant provided a plant-specific evaluation of the aging effects for fire stops identified in Section 6 of EPRI 3002013084, as summarized above; (2) there has been no plant-specific operating experience due to age-related degradation for gypsum board drywall; and (3) the applicant's current licensing basis requires gypsum board assemblies be inspected by the Fire Protection Program, which will continue during PEO, and the inspections performed by the Fire Protection Program are capable of identifying age-related degradation before a loss of intended function. Therefore, the staff finds the applicant's proposal that there are no aging effects for this component, material, and environment combination acceptable. See the discussions of Question 5 in RAI-10337-R1 and RCI-10460-R1 in SER Section 3.0.3.1.9 for additional information.

<u>High Strength Steel Structural Bolting 2 Exposed to Treated Water (Ext) Environment</u>. LRA Table 3.5.2-4 states that cracking due to SCC and loss of material due to general corrosion and pitting corrosion for high strength steel structural bolting 2 exposed to treated water (Ext) environment will be managed by the SMP. The AMR item cites generic note G. The AMR items cite plant-specific notes 512 and 519, which state, "[t]reated water environment is considered similar to air for the cracking aging effect," and "Structural Monitoring program will detect this aging effect. Structural Tools Table 4-3 provides the basis for cracking in steel bolting and Table 3-3 provides the basis for loss of material," respectively.

As confirmed by RCI-10395-R1 (ML24339A066), the staff noted that the aging mechanisms associated with the aging effects of cracking and loss of material for high strength steel structural bolting 2 are SCC and general/pitting corrosion, respectively.

The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by the applicant constitute all of the credible aging effects for this component, material and environment description. The staff noted that the applicant addressed other aging effects for this component, material and environment combination in other AMR items (i.e., AMR 3.5.1-88). Based on its review of the LRA and the GALL-LR Report AMR items (III.A3.TP-300, II.A3.TP-248, and III.A3.TP-274), which state that the aging effects of cracking due to SCC and loss of material due to general, pitting and crevice corrosion for structural bolting exposed to air - indoor, uncontrolled or air - outdoor environment are managed by the Structures Monitoring, as well as the applicant's consideration of treated water environment similar to air environment, the staff finds that the applicant has identified all credible aging effects for this component, material, and environment combination.

The staff finds that the applicant's proposal to manage the effects of aging acceptable because the visual examinations required by the enhanced SMP are capable of detecting the cracking due to SCC and loss of material due to general and pitting corrosion for high strength steel structural bolting 2 before a loss of intended functions in a manner that is consistent with the GALL-LR Report recommendations.

<u>High Strength Steel Structural Bolting Exposed to Raw Water (Ext) Environment</u>. LRA Table 3.5.2-4, as modified by LRA Supplement 3 (ML24206A150), states that cracking due to SCC and loss of material due to MIC, general corrosion, and galvanic corrosion for high strength steel structural bolting exposed to raw water (Ext) environment will be managed by the

SMP. The AMR items cite generic note G. The AMR items cite plant-specific notes 535 and 536, which state, “[t]he high strength field bolting connection is in structural steel located in the intake structure of ESW Pumphouse. SMP will manage the aging effect of cracking for these bolts. The raw water environment is considered equivalently to air with water leakage in determining the cracking aging effect. Mechanical Tools Appendix F Table 4-1 states that High strength bolts subjected to prolonged or frequent wetting will result in cracking and High strength, low-alloy steel in raw water may be treated as steel for aging effects/mechanisms other than cracking. See Section 4.3.5, Table 4-2 in EPRI 3002013084, “Long-Term Operations: Subsequent License Renewal Aging Effects for Structures and Structural Components (Structural Tools), 2018,” respectively.

As confirmed by RCI-10395-R1 (ML24339A066), the staff noted that the aging mechanisms associated with the aging effects of cracking and loss of material for high strength steel structural bolting are SCC and MIC, general corrosion, and galvanic corrosion, respectively.

The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by the applicant constitute all of the credible aging effects for this component, material and environment description. The staff noted that the applicant addressed other aging effects for this component, material and environment combination in other AMR items (i.e., AMR 3.5.1-88). Based on its review of the LRA and the GALL-LR Report AMR items (III.B1.1.TP-41, V.E.E-03, and V.A.EP-90), which states that the aging effect of cracking due to SCC for high strength structural bolt exposed to air - indoor, uncontrolled, or air with steam or water leakage environment will be managed by the ASME Section XI, Subsection IWF program or the Bolting Integrity program, and that the aging effect of loss of material due to general, pitting, crevice, and MIC; fouling that leads to corrosion exposed to raw water will be managed by the Open-Cycle Cooling Water System program, as well as the applicant’s considerations in the plant-specific notes, the staff finds that the applicant has identified all credible aging effects for these component, material, and environment combinations.

The staff finds that the applicant’s proposal to manage the effects of aging acceptable because the visual examinations required by the enhanced SMP are capable of detecting the cracking due to SCC and loss of material due to MIC, general corrosion, and galvanic corrosion for high strength steel structural bolting before a loss of intended functions in a manner that is consistent with the GALL-LR Report recommendations.

Polymeric Conduit Caps Exposed to Air - Indoor, Uncontrolled (Ext), and Polymeric Conduit Caps 1 Raw Water (Ext) Environment. LRA Table 3.5.2-4 states that loss of strength due to high temperature, UV, ozone or ionizing radiation exposure for polymeric conduit caps exposed to air - indoor, uncontrolled (Ext) environment will be managed by the SMP. In addition, LRA Table 3.5.2-4, as modified by response to RAI-10327-R1 (ML25036A154), states that loss of sealing due to deterioration of seals, gasket, and moisture barriers for polymeric conduit caps 1 exposed to raw water (Ext) environment will be managed by the SMP. The AMR items cite generic note H, for which the applicant has identified loss of strength due to high temperature, UV, ozone or ionizing radiation exposure and loss of sealing due to deterioration of seals, gasket, and moisture barriers as additional aging effects. The AMR items cite plant-specific note 518, which states, “[t]he function of the conduit cap is to protect conduits from internal flooding. Evaluation has concluded that the aging effect “loss of sealing” is applicable for this component type as the conduit caps have an intended function of flood barrier (FLB). Structures monitoring will monitor for evidence of any leakage to ensure the intended function of providing an adequate seal for flooding. These PVC conduit caps are not expected to experience aging effects because they are not exposed to elevated temperatures above 150 degrees F, ozone, nor ultraviolet or ionizing radiation. These components are located within structures."

As confirmed by RCI-10395-R1 (ML24339A066), the staff noted that the aging mechanisms associated with the aging effect of loss of strength for polymeric conduit caps are high temperature, UV, ozone or ionizing radiation exposure.

As part of its response to RAI-10328-R1 (ML24324A185), the applicant clarified that conduit caps at Perry consisted of a rigid polymer (PVC). For rigid polymers such as PVC, the staff noted that the GALL-LR Report did not identify any applicable aging effects and AMPs (i.e., PVC piping and piping components exposed to air - indoor, uncontrolled, in VIII.I.SP-152). As such, the applicant stated in its response to RAI-10328-R1 (ML24324A185) that there were no aging effects applicable to PVC conduits. However, the applicant further stated in its response to RAI-10328-R1 (ML24324A185) that the aging effect of loss of strength was conservatively assigned regardless in order to monitor conduit caps under the SMP. In addition, in its response to RAI-10327-R1 (ML25036A154), the applicant identified loss of sealing as an additional aging effect to be consistent with the component's current licensing basis intended function of FLB as identified in LRA Table 3.5.2-4. The staff noted that this is consistent with the GALL-LR Report as it addressed the same aging effects for a similar material and environment combination in NUREG-1801 Item III.A6.TP-7, which states that the aging effects of loss of sealing due to deterioration for elastomeric moisture barriers exposed to various environments are managed by the SMP.

The staff finds that the applicant's proposal to manage the effects of aging acceptable because the visual examinations required by the enhanced SMP are capable of detecting the loss of strength for polymeric conduit caps and the loss of sealing for polymeric conduit caps 1 before a loss of intended functions in a manner that is consistent with the GALL-LR Report recommendations.

Steel Structural Bolting and Anchorage/Embedments Exposed to Raw Water (Ext) Environment. LRA Table 3.5.2-4 states that cracking due to SCC for steel structural bolting and anchorage/embedments exposed to raw water (Ext) environment will be managed by the SMP. The AMR item cites generic note H, for which the applicant has identified cracking due to SCC as an additional aging effect. The AMR item cites plant-specific note 519, which states, "Structural Monitoring program will detect this aging effect. Structural Tools Table 4-3 provides the basis for cracking in steel bolting and Table 3-3 provides the basis for loss of material."

As confirmed by RCI-10395-R1 (ML24339A066), the staff noted that the aging mechanism associated with the aging effect of cracking for steel structural bolting and anchorage/embedments is SCC.

The staff noted in the GALL-LR Report that cracking due to SCC for high strength structural bolt exposed to air - indoor, uncontrolled or air - outdoor environment will be managed by the SMP (III.A3.TP-300). The staff finds that the applicant's proposal to manage the effects of aging acceptable because the visual examinations required by the enhanced SMP are capable of detecting the cracking due to SCC for steel structural bolting and anchorage/embedments before a loss of intended functions in a manner that is consistent with the GALL-LR Report recommendations.

<u>Elastomeric Penetration Sealants (Flood), Roof Membrane1, and Waterproofing Membranes1 Exposed to Raw Water (Ext) Environment and Elastomeric Waterproofing Membranes Exposed to Soil (Ext) and Concrete (Int) Environment</u>. LRA Table 3.5.2-4, as modified by LRA Supplement 3 (ML24206A150), states that cracking due to delamination and shrinkage for elastomeric penetration sealants (flood), roof membranes1, and waterproofing membranes1 exposed to raw water (Ext) environment and for elastomeric waterproofing membranes exposed to soil (Ext) and concrete (Int) environment will be managed by the SMP. The AMR item cites generic note H, for which the applicant has identified cracking due to delamination and shrinkage as an additional aging effect. The AMR items cite plant-specific notes 524 and 527, which state, “Raw water environment is conservatively applied to bound the outdoor environment conditions on a roof,” and “[a]ging effect identified per Structural Tools Table 7-5. Structural monitoring program will detect this aging effect,” respectively.

As confirmed by RCI-10395-R1 (ML24339A066), the staff noted that the aging mechanisms associated with the aging effect of cracking for elastomeric penetration sealants (flood), roof membranes1, and waterproofing membranes1 exposed to raw water (Ext) environment and for elastomeric waterproofing membranes exposed to soil (Ext) and concrete (Int) environment are delamination and shrinkage.

The staff noted that the aging effect of cracking due to delamination and shrinkage is directly aligned with the aging effects of increased hardness (loss of flexibility), shrinkage and loss of strength (loss of ability to withstand tensile or compressive stress) due to elastomer degradation or weathering in the GALL-LR Report. The staff further noted that these aging effects (i.e., cracking due to increased hardness and shrinkage and change in material properties such as loss of strength) are precursors to the resulting functional aging effect of loss of sealing and the applicant addressed this aging effect for the same component, material and environment combination in the LRA AMR item 3.5.1-72/NUREG-1801 Item III.A6.TP-7. As the GALL-LR Report addresses the aging effects of loss of sealing due to wear, damage, erosion, tear, surface cracks, and other defects for moistures barriers exposed to any environment (III.A6.TP-7), the staff noted that the cracking due to delamination and shrinkage was associated with other defects. The staff further notes that GALL-SLR Report addresses cracking or blistering due to exposure to ultraviolet light, ozone, radiation, or chemical attack for elastomeric penetration sealants (flood), roof membranes, and waterproofing membranes exposed to raw water and soil, among other environments (NUREG-2191 Item V.A.E-477b). The staff noted that the aging effect of cracking due to delamination and shrinkage could be managed by the SMP in the same way as other aging effects of elastomeric waterproofing membranes.

The staff finds that the applicant’s proposal to manage the effects of aging acceptable because the visual examinations required by the enhanced SMP are capable of detecting the cracking due to delamination and shrinkage for elastomeric penetration sealants (flood), roof membranes1, and waterproofing membranes1 exposed to raw water (Ext) environment and for elastomeric waterproofing membranes exposed to soil (Ext) and concrete (Int) environment before a loss of intended functions in a manner that is consistent with the GALL-LR Report recommendations.

Lubrite®/Fluorogold® Sliding Supports Exposed to Air - Indoor, Uncontrolled (Ext) Environment. LRA Table 3.5.2-4 states that change in material properties due to irradiation for Lubrite®/Fluorogold® sliding supports exposed to air - indoor, uncontrolled (Ext) environment will be managed by the SMP. The AMR item cites generic note H, for which the applicant has identified change in material properties due to irradiation as an additional aging effect. The AMR item cites plant-specific note 525, which states, "[a]ging effect identified per Structural Tools, Table 9-2."

The staff's review identified an area in which the LRA information needed to be confirmed to complete the review of applicability of change in material properties due to irradiation for Lubrite®/Fluorogold®, which resulted in issuance of RCI-10395-R1 associated with LRA Table 3.5.2-4 of Supplement 3 (ML24206A150). The RCI and the applicant's response are documented in ML24339A066.

In its response to RCI-10395-R1, the applicant clarified that the aging mechanism associated with the change in material properties for Lubrite®/Fluorogold® is irradiation. The applicant further clarified that irradiation is not an applicable aging mechanism for Lubrite® for the following reasons:

- Lubrite® lubricants used in nuclear applications are designed for the environments to which they are exposed.
- They are designed with the ability to carry extremely heavy dynamic and static loads with a low coefficient of friction, to operate dry, or wet in high or low temperature conditions, withstand high intensities of radiation, and are not susceptible to corrosion.
- An industry experience search did not find any Lubrite® degradation that could lead to the loss of intended function.

The staff finds the applicant's response to RCI-10395-R1 acceptable for the following reasons: (1) Lubrite® is designed to withstand high intensities of radiation as evidenced by a lack of any operating experience of adverse effects of irradiation on Lubrite®; (2) the staff evaluated the lubricant's capability to perform its intended functions in prior (S)LRAs including that for Surry Power Station, as documented in the staff's safety evaluation report (ML20052F523), and concluded that there would be no significant aging effects for loss of mechanical function of Lubrite® in RV support sliding feet surfaces due to temperature and/or radiation exposure; and (3) LRA Supplement 3 includes a Table 2 AMR line item to manage the effects of aging for loss of mechanical function on sliding surfaces containing Lubrite® lubricant by the SMP.

However, during its audit (ML24239A778), the staff noted that a change in material properties of Fluorogold® due to irradiation in components where (integrated) gamma radiation could exceed 1.0E4 rads is an applicable aging effect requiring aging management through the PEO.

The staff noted in the GALL-LR Report that loss of intended function in mechanical components using Lubrite® or other similar materials including Fluorogold® exposed to air - indoor, uncontrolled environment that the staff could include radiation with GALL-LR item will be managed by the SMP (III.A4.TP-35). The staff finds that the applicant's proposal to manage the effects of aging acceptable because the visual examinations required by the enhanced SMP are capable of detecting the change in material properties due to irradiation for Lubrite®/Fluorogold® sliding supports before a loss of intended functions in a manner that is consistent with the GALL-LR Report recommendations.

Polymeric Storm Drain1 Exposed to Raw Water (Int) and Soil (Ext) Environment. LRA Table 3.5.2-4, as modified by LRA Supplement 3 (ML24206A150), states that flow blockage due to debris accumulation for polymeric storm drain1 exposed to raw water (Int) environment will be managed by the SMP. The AMR items cite generic note H, for which the applicant has identified flow blockage due to debris accumulation as an additional aging effect. The AMR items cite plant-specific note 530, which states, "[c]leaning/inspection of storm drain piping will be performed every five years via a Maintenance Plan, including inspection of inside surfaces of storm drain piping via camera." As confirmed by RCI-10395-R1 (ML24339A066), the staff noted that the aging mechanism associated with the aging effect of flow blockage for polymeric storm drain1 is debris accumulation.

In addition, LRA Table 3.5.2-4 states that loss of material due to peeling, delamination and wear for polymeric storm drains1 exposed to soil (Ext) environment will be managed by the SMP. The AMR item cites generic note H, for which the applicant has identified loss of material due to peeling, delamination and wear as an additional aging effect. The staff noted that the LRA inadvertently assigned plant-specific note 530 to this AMR item, which is associated with flow blockage. The staff further noted that a more appropriate one is plant-specific note 531, which states, "[l]oss of material will be detected based on periodic excavations for storm drain piping and visual inspections performed as part of Structures Monitoring program."

The staff noted that NUREG-2191 addresses the aging effects of flow blockage due to fouling and loss of material due to peeling, delamination and wear for polymeric piping exposed to raw water with other combinations of GALL-LR AMR items and AMPs (e.g., V.A.E-477b and AMP XI.M38). The staff also noted that the aging effects of flow blockage due to debris accumulation and loss of material due to peeling, delamination and wear could be managed by the SMP in the same way as other aging effects of polymeric storm drain1. The staff finds that the applicant's proposal to manage the effects of aging acceptable because the visual examinations required by the enhanced SMP are capable of detecting the flow blockage due to debris accumulation and loss of material due to peeling, delamination and wear for polymeric storm drain1 exposed to raw water (Int) and Soil (Ext) environment before a loss of intended functions in a manner that is consistent with the GALL-LR Report recommendations.

Steel Storm Drain Exposed to Raw Water (Int) Environment. LRA Table 3.5.2-4 states that flow blockage due to debris accumulation for steel storm drain exposed to raw water (Int) environment will be managed by the SMP. The AMR items cite generic note H, for which the applicant has identified flow blockage due to debris accumulation as an additional aging effect. The AMR items cite plant-specific note 530, which states, "[c]leaning/inspection of storm drain piping will be performed every five years via a Maintenance Plan, including inspection of inside surfaces of storm drain piping via camera." As confirmed by RCI-10395-R1 (ML24339A066), the staff noted that the aging mechanism associated with the aging effect of flow blockage for steel storm drain is debris accumulation.

The staff noted that the GALL-LR Report addresses the aging effect of fouling for steel piping and components exposed to raw water in other combinations of GALL-LR AMR items and AMPs (e.g., VIII.G.SP-136 and AMP XI.M38), which is a precursor to flow blockage. The staff also noted that the aging effect of flow blockage due to debris accumulation could be managed by the SMP in the same way as other aging effects of steel storm drain. The staff finds that the applicant's proposal to manage the effects of aging acceptable because the visual examinations required by the enhanced SMP are capable of detecting the flow blockage due to debris accumulation for steel storm drain exposed to raw water (Int) environment before a loss of intended functions in a manner that is consistent with the GALL-LR Report recommendations.

Concrete Storm Drain3 Exposed to Raw Water (Int) and Soil (Ext) Environment. LRA Table 3.5.2-4 states that flow blockage due to debris accumulation and loss of material due to corrosion of embedded steel reinforcing and reaction with aggregates for concrete storm drain exposed to raw water (Int) and soil (Ext) environment will be managed by the SMP. The AMR items cite generic note H, for which the applicant has identified flow blockage due to debris accumulation and loss of material due to corrosion of embedded steel reinforcing and reaction with aggregates as additional aging effects. The AMR items cite plant-specific notes 530 and 531, which state, "[c]leaning/inspection of storm drain piping will be performed every five years via a Maintenance Plan, including inspection of inside surfaces of storm drain piping via camera," and "Loss of material will be detected based on periodic excavations for storm drain piping and visual inspections performed as part of Structures Monitoring program," respectively. As confirmed by RCI-10395-R1 (ML24339A066), the staff noted that the aging mechanisms associated with the aging effects of flow blockage and loss of material for concrete storm drain3 are debris accumulation and corrosion of embedded steel reinforcing and reaction with aggregates, respectively

The staff noted that NUREG-2191 addresses the aging effects of flow blockage due to fouling, among other aging effects, for concrete piping exposed to raw water with other combinations of GALL-LR AMR items and AMPs (e.g., VII.C1.AP-250 and AMP XI.M20). The staff further noted in the GALL-LR Report that the SMP is capable of managing loss of material due to corrosion of embedded steel reinforcing and reaction with aggregates for concrete components (i.e., III.A3.TP-212 and III.A3.TP-204). The staff also noted that the aging effects of flow blockage due to debris accumulation and loss of material due to corrosion of embedded steel reinforcing and reaction with aggregates could be managed by the SMP in the same way as other aging effects of concrete storm drain3. The staff finds that the applicant's proposal to manage the effects of aging acceptable because the visual examinations required by the enhanced SMP are capable of detecting the flow blockage due to debris accumulation and loss of material due to corrosion of embedded steel reinforcing and reaction with aggregates for concrete storm drain3 exposed to raw water (Int) and soil (Ext) environment before a loss of intended functions in a manner that is consistent with the GALL-LR Report recommendations.

Aluminum Roof Scuppers Exposed to Air - Outdoor (Ext) Environment. LRA Table 3.5.2-4, as modified by LRA Supplement 3(ML24206A150), states that cracking due to SCC for aluminum roof scuppers exposed to air - outdoor (Ext) environment will be managed by the SMP. The AMR item cites generic note H, for which the applicant has identified cracking due to SCC as an additional aging effect. The AMR item cites plant-specific note 534, which states, "Structures Tools Table 2-5 identifies this aging effect for aluminum and aluminum alloy exposed to weather. SMP will manage this aging effect." As confirmed by RCI-10395-R1 (ML24339A066), the staff noted that the aging mechanism associated with the aging effect of cracking for aluminum roof scuppers is SCC.

The staff noted in NUREG-2191 that the aging effect of cracking due to SCC for aluminum components exposed to air and condensation environment will be managed by the SMP (III.B2.T-37b). The staff finds that the applicant's proposal to manage the effects of aging acceptable because the visual examinations required by the enhanced SMP are capable of detecting the cracking due to SCC for aluminum roof scuppers before a loss of intended functions in a manner that is consistent with the GALL-LR Report recommendations.

Unimpregnated Fiberglass Fabric and Fiberglass Fabric Impregnated with Elastomer Shielding Exposed to Air - Indoor, Uncontrolled (Ext) Environment. LRA Table 3.5.2-4, as modified by response to RAI-10327-R1 (ML25036A154), states that change in material properties, cracking and loss of material due to ionizing radiation for unimpregnated fiberglass fabric; fiberglass fabric impregnated with elastomer shielding exposed to air - indoor, uncontrolled (Ext) environment will be managed by the SMP. The AMR items cite generic note J. The AMR items cite plant-specific notes 523 and 542, which state, "[a]ging effect identified per Structural Tools, Revision 2, Table 7-5. Structural monitoring program will detect this aging effect," and "Structural Monitoring program will detect this aging effect," respectively. As confirmed by RCI-10395-R1 (ML24339A066), the staff noted that the aging mechanism associated with the aging effects of change in material properties, cracking and loss of material for unimpregnated fiberglass fabric; fiberglass fabric impregnated with elastomer shielding is ionizing radiation.

The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by the applicant constitute all of the credible aging effects for this component, material and environment description. The staff notes that GALL-LR Report addresses the same aging effects for a similar material and environment combination (NUREG-2191 Item V.E.E-477a), which states that the aging effects of hardening or loss of strength due to polymeric degradation (i.e., change in material properties); loss of material due to peeling, delamination, wear; cracking or blistering due to exposure to ultraviolet light, ozone, radiation, or chemical attack for polymetric piping and ducting components and seals exposed to air and condensation environment, among other applicable environments, are managed by the SMP. The staff further notes that NUREG-219 addresses the same aging effects for fiberglass piping and ducting components exposed to air (VII.I.A-720). Based on its review of the LRA and the NUREG-2191 guidance, the staff finds that the applicant has identified all credible aging effects for this component, material, and environment combination.

The staff finds that the applicant's proposal to manage the effects of aging acceptable because the visual examinations required by the enhanced SMP are capable of detecting the change in material properties, cracking and loss of material due to ionizing radiation for unimpregnated fiberglass fabric; fiberglass fabric impregnated with elastomer shielding before a loss of intended functions in a manner that is consistent with the GALL-LR Report recommendations.

3.5.2.3.2 Containment Structure, Unit 1 (includes the Reactor Building and Containment Vessel) and Bulk Commodities – Summary of Aging Management Evaluation

<u>Fire barriers exposed to indoor uncontrolled air</u>. As amended by letters dated July 24, 2024 (ML24206A150), and December 19, 2024 (ML24354A265), LRA Tables 3.5.2-1 and 3.5.2-4 state that change in material properties, cracking/delamination, loss of material, and separation for the following materials/components exposed to indoor uncontrolled air will be managed by the Fire Protection Program:

- Unimpregnated fiberglass fabric; Fiberglass fabric impregnated with elastomer drywell mechanical penetration (fiberglass fabric)
- Fiberglass/Alumina silicate/Calcium silicate/Mineral fiber drywell mechanical penetration (fiberglass)
- Pyrocrete fireproofing, fire damper housing
- Fiberglass/Alumina silicate/Calcium silicate/Mineral fiber penetration sealant (fire)
- Unimpregnated fiberglass fabric; Fiberglass fabric impregnated with elastomer penetration sealant (fire)

- Unimpregnated fiberglass fabric; Fiberglass fabric impregnated with elastomer SRV tailpipe penetration boot seals

The AMR items cite generic note H. In addition, the AMR item for change in material properties/cracking for Pyrocrete “fireproofing, fire damper housing” cites plant-specific note 540, which states, “[t]he fire protection program manages this aging effect. This aging effect only applies to Pyrocrete located where integrated dose will exceed 1 E 6 rads, in the following environmental zones: AB-7; AB-8; AB-10; FB-6; TB-1.” The staff notes that Section 6, “Fire Barriers,” of EPRI 3002013084, “Long-Term Operations: Subsequent License Renewal Aging Affects for Structures and Structural Components (Structural Tools),” issued November 2018, states that change in material properties is not expected for fire stops when the gamma irradiation exposure does not exceed 10^6 rads.

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 component, material, and environment descriptions. The staff notes that SLR-ISG-2021-02-MECHANICAL, “Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance” (ML20181A434), 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.

The staff finds the applicant’s proposal to manage change in material properties, cracking/delamination, loss of material, and separation acceptable because (1) it is consistent with Section 6 of EPRI 3002013084, which states that change in material properties, cracking/delamination, loss of material, and separation may occur in fireproofing and fire stops; and (2) periodic visual inspections required by the Fire Protection Program are capable of detecting change in material properties, cracking/delamination, loss of material, and separation before a loss of intended function. See the discussions of Questions 2 through 5 in RAI-10337-R1 and RCI-10338-R1 in SE Section 3.0.3.1.9 for additional information.

<u>Elastomeric Upper Containment Pool Gates Seals Exposed to Treated Water (Ext) Environment</u>. LRA Table 3.5.2-1, as modified by LRA Supplement 3 (ML24206A150), states that cracking due to delamination and shrinkage for elastomeric upper containment pool gates seals exposed to treated water (Ext) environment will be managed by the SMP. The AMR items cite generic note H, for which the applicant has identified cracking due to delamination and shrinkage as an additional aging effect. The AMR item cites plant-specific note 537, which states, “Structural Tool Table 7-5 provides change in material properties and cracking for elevated temperatures greater than 95 degrees F or ionizing radiation exceeding 1E6 Rads total integrated dose over the PEO. Structural Tools Table 6-3 provides cracking due to delamination/shrinkage for silicone foam penetration seals. Change in material properties include hardening and loss of strength in elastomers. These aging effects will be managed using the SMP.”

As confirmed by RCI-10395-R1 (ML24339A066), the staff noted that the aging mechanisms associated with the aging effect of cracking for elastomeric upper containment pool gates seals are delamination and shrinkage.

The staff notes in the GALL-LR Report that the aging effect of cracking due to delamination and shrinkage is directly aligned with that for increased hardness (loss of flexibility), shrinkage and loss of strength (loss of ability to withstand tensile or compressive stress) due to elastomer degradation or weathering. The staff also noted that these aging effects (i.e., cracking due to increased hardness and shrinkage and change in material properties such as loss of strength) are precursors to the resulting functional aging effect of loss of sealing. As such, the GALL-LR Report XI.S6 AMP recommends that moisture barriers such as elastomeric seals exposed to any environment are monitored for loss of sealing due to several mechanisms such as wear, damage, erosion, tear, surface cracks, and other defects, among other aging effects, that could result in loss of function (III.A6.TP-7). The staff noted that the aging effect of cracking due to delamination and shrinkage could be managed by the SMP in the same way as other aging effects of upper containment pool gates seals.

The staff finds that the applicant's proposal to manage the effects of aging acceptable because the visual examinations required by the enhanced SMP are capable of detecting the cracking due to delamination and shrinkage for elastomeric upper containment pool gates seals before a loss of intended functions in a manner that is consistent with the GALL-LR Report recommendations.

3.5.2.3.3 Water Control Structures – Summary of Aging Management Evaluation

<u>Galvanized Steel Culvert (Major Stream) Exposed to Raw Water (Int) and Soil (Ext) Environment</u>. LRA Table 3.5.2-3, as modified by LRA Supplement 3 (ML24206A150), states that loss of material due to microbiologically influenced corrosion (MIC), general corrosion, and galvanic corrosion for galvanized steel culvert (major stream) exposed to raw water (Int) and soil (Ext) environment will be managed by the SMP. The AMR items cite generic note G. The AMR items cite plant-specific note 539, which states, "Material, environment, and aging effect combination not in GALL. Loss of material will be detected based on visual inspections performed under Structures Monitoring Program." In addition, LRA Table 3.5.2-3 states that flow blockage due to debris accumulation for galvanized steel culvert (major stream) exposed to raw water (Int) environment will be managed by the SMP. The AMR item cites generic note H. The AMR item cite plant-specific note 530, which states, "[c]leaning/inspection of storm drain piping will be performed every five years via a Maintenance Plan, including inspection of inside surfaces of storm drain piping via camera."

As confirmed by RCI-10395-R1 (ML24339A066), the staff noted that the aging mechanisms associated with the aging effects of loss of material and flow blockage for galvanized steel culvert (major stream) are MIC/general corrosion/galvanic corrosion and debris accumulation, respectively.

The staff reviewed the associated items in the LRA and considered whether the aging effects proposed by the applicant constitute all of the credible aging effects for this component, material and environment description. The staff considers that flow blockage due to debris accumulation is an applicable aging effect due to the function of the galvanized steel culvert (major stream). The staff noted that the applicant addressed other aging effects for this component, material and environment combination in other AMR items (e.g., AMR 3.5.1-58). Based on its review of the LRA and GALL-LR Report AMR items (V.C.E-22 and V.B.EP-111), which state that aging effect of loss of material due to general, pitting, crevice, and MIC for steel components exposed to raw water and soil environment is managed by the Open-Cycle Cooling Water System program or the Buried and Underground Piping and Tanks Program, the staff finds that the applicant has identified all credible aging effects for these component and material combinations.

The staff finds that the applicant's proposal to manage the effects of aging acceptable because the visual examinations required by the enhanced SMP are capable of detecting the loss of material due to MIC, general corrosion, and galvanic corrosion and flow blockage due to debris accumulation for the galvanized steel culvert (major stream) before a loss of intended functions in a manner that is consistent with the GALL-LR Report recommendations.

3.5.2.3.4 Turbine Buildings and Associated Structures, Process Facilities, and Yard Structures – Summary of Aging Management Evaluation

Stainless-Steel Scuppers and Associated Cover Exposed to Air - Outdoor (Ext) Environment. LRA Table 3.5.2-2 states that cracking due to SCC for stainless-steel scuppers and associated cover exposed to air - outdoor (Ext) environment will be managed by the SMP. The AMR items cite generic note H, for which the applicant has identified cracking due to SCC as an additional aging effect. The AMR item cites plant-specific note 501, which states, "[t]he Structures Monitoring Program will manage aging of stainless-steel roof scuppers and associated cover exposed to outdoor air."

As confirmed by RCI-10395-R1 (ML24339A066), the staff noted that the aging mechanism associated with the aging effect of cracking for stainless-steel scuppers and associated cover is SCC.

The staff noted in NUREG-2191 that the aging effect of cracking due to SCC for stainless-steel components exposed to air, condensation environment will be managed by the SMP (III.B5.T-37b). The staff finds that the applicant's proposal to manage the effects of aging acceptable because the visual examinations required by the enhanced SMP are capable of detecting the cracking due to SCC for stainless-steel scuppers and associated cover before a loss of intended functions in a manner that is consistent with the GALL-LR Report recommendations.

Concrete Block Masonry Walls Exposed to Air - Outdoor (Ext) Environment. LRA Table 3.5.2-2 states that change in material properties due to aggressive chemical attack for concrete block masonry walls exposed to air - outdoor (Ext) environment will be managed by the SMP. The AMR items cite generic note H, for which the applicant has identified change in material properties due to aggressive chemical attack as an additional aging effect. The AMR item cites plant-specific note 538, which states, "[t]he aging effect of change in material properties will be managed under the Structures Monitoring Program."

The staff noted from LRA AMR item 3.5.1-61 that increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide and carbonation are inclusive of change in material properties as masonry block walls are generally constructed from concrete blocks and grout and are susceptible to the same aging effects identified for concrete. The staff further noted in the GALL-LR Report that the aging effects of increase in porosity and permeability, among other aging effects, due to aggressive chemical attack for concrete components will be managed by the SMP (III.A4.TP-28). The staff finds that the applicant's proposal to manage the effects of aging acceptable because the visual examinations required by the enhanced SMP are capable of detecting the change in material properties due to aggressive chemical attack for concrete block masonry walls before a loss of intended functions in a manner that is consistent with the GALL-LR Report recommendations.

3.6 <u>Aging Management of Electrical Commodities</u>

3.6.1 Summary of Technical Information in the Application

LRA Section 3.6 provides AMR results for those components the applicant identified in LRA Section 2.5, “Scoping and Screening Results: Electrical and Instrumentation and Control Systems,” as being subject to an AMR. LRA Table 3.6.1, “Summary of Aging Management Evaluations for the Electrical Components Evaluated in Chapter VI of NUREG-1801,” is a summary comparison of the applicant’s AMR results with those provided in the GALL-LR Report for electrical components.

3.6.2 Staff Evaluation

SE Table 3.6-1 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 Components in the GALL-LR Report

Component Group (SRP-LR Item No.)	Staff Evaluation
3.6.1-1	Consistent with the GALL-LR Report (see SE Section 3.6.2.2.1)
3.6.1-2	Not applicable to Perry (see SE Sections 3.6.2.1.1, 3.6.2.2.2, and 3.6.2.3.1)
3.6.1-3	Not applicable to Perry (see SE Sections 3.6.2.1.1, 3.6.2.2.2, and 3.6.2.3.1)
3.6.1-4	Not applicable to Perry (see SE Sections 3.6.2.1.1, 3.6.2.2.3, and 3.6.2.3.2)
3.6.1-5	Not applicable to Perry (see SE Sections 3.6.2.1.1, 3.6.2.2.3, and 3.6.2.3.2)
3.6.1-6	Not applicable to Perry (see SE Sections 3.6.2.1.1, 3.6.2.2.3, and 3.6.2.3.2)
3.6.1-7	Not applicable to Perry (see SE Sections 3.6.2.1.1, 3.6.2.2.3, and 3.6.2.3.2)
3.6.1-8	Consistent with the GALL-LR Report
3.6.1-9	Consistent with the GALL-LR Report
3.6.1-10	Consistent with the GALL-LR Report
3.6.1-11	Not applicable to Perry (see SE Section 3.6.2.1.1)
3.6.1-12	Not applicable to Perry (see SE Section 3.6.2.1.1)
3.6.1-13	Not applicable to Perry (see SE Section 3.6.2.1.1)
3.6.1-14	Not applicable to Perry (see SE Section 3.6.2.1.1)
3.6.1-15	Not applicable to Perry (see SE Section 3.6.2.1.1)
3.6.1-16	Consistent with the GALL-LR Report
3.6.1-17	Not applicable to Perry (see SE Sections 3.6.2.1.1 and 3.6.2.3.3)
3.6.1-18	Consistent with the GALL-LR Report
3.6.1-19	Not applicable to Perry (see SE Section 3.6.2.1.1)
3.6.1-20	Not applicable to Perry (see SE Section 3.6.2.1.1)
3.6.1-21	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 and 3.6.2.1.1 discuss AMR results for components that the applicant states are either not applicable to Perry or are consistent with the GALL-LR Report.

(2) SE Section 3.6.2.2 discusses AMR results for which the GALL-LR Report and SRP-LR recommend further evaluation.

(3) SE Section 3.6.2.3 discusses AMR results for components that the applicant states 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 Tables 3.6.1 and 3.6.2.1, "Electrical Commodities – Summary of Aging Management Evaluation," 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. The staff verified that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL-LR Report AMRs. For those AMR items the staff found to be consistent with the GALL-LR Report and for which no additional evaluation or request for additional information 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 item. 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. The staff did not identify any AMR items that required additional review with an associated writeup.

SE Section 3.6.2.1.1 documents the staff's review of AMR items that the applicant determined to be not applicable or not used.

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

For LRA Table 3.6.1, AMR items 3.6.1-2, 3.6.1-3, 3.6.1-4, 3.6.1-5, 3.6.1-6, 3.6.1-7, 3.6.1-11, 3.6.1-12, 3.6.1-13, 3.6.1-14, 3.6.1-15, 3.6.1-17, and 3.6.1-20, the applicant claims that the corresponding AMR items in the GALL-LR Report are not applicable to Perry. The staff reviewed the LRA and UFSAR and confirmed that the applicant's LRA does not have any AMR results that are applicable for these AMR items.

For LRA Table 3.6.1, item 3.6.1-19, the applicant claimed that the corresponding AMR item in the GALL-LR Report is not applicable because the associated item is only applicable to PWRs. The staff reviewed SRP-LR, confirmed that this item only applies to BWRs, and finds that this item is not applicable to Perry because it is a BWR.

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 states that TLAAs are evaluated in accordance with 10 CFR 54.21(c). The applicant's evaluation of this TLAA, environmental qualification of electrical equipment, is addressed in Section 4.4, "Environmental Qualification for Electrical Equipment." This is consistent with SRP-LR Section 3.6.2.2.1 and is, therefore, acceptable. The staff's evaluation regarding the TLAA for environmental qualification of electrical equipment is documented in SE Section 4.4.

3.6.2.2.2 Reduced Insulation Resistance Due to 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 3.6.1-2 and 3.6.1-3, 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 presence of salt deposits or surface contamination for high-voltage insulators exposed to air-outdoor. 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 as follows.

<u>High-Voltage Insulators Composed of Porcelain; Galvanized Steel; Cement Exposed to Air – Outdoor</u>. LRA Section 3.6.2.2.2 associated with LRA Table 3.6.1, AMR item 3.6.1-2, addresses loss of material due to mechanical wear caused by wind blowing on transmission conductors for high-voltage insulators composed of porcelain; galvanized steel; cement exposed to air-outdoor. The applicant noted 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 SRP-LR Appendix A.1 and finds it acceptable because the Perry transmission conductors are designed and installed not to swing significantly and cause wear due to wind-induced abrasion and fatigue.

<u>Transmission Conductors Composed of Aluminum; Steel Exposed to Air – Outdoor</u>. LRA Section 3.6.2.2.2 associated with LRA Table 3.6.1, AMR item 3.6.1-3, addresses reduced insulation resistance due to presence of salt deposits or surface contamination for high-voltage insulators composed of porcelain; galvanized steel; cement exposed to air – outdoor. The applicant noted that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.6.2.2.2 and SRP-LR Appendix A.1 and finds it acceptable because the glazed insulator surface of high-voltage insulators is designed to minimize adherence of pollution and salt spray, periodic rainfall should be sufficient to remove contaminants from the high-voltage insulators, and Perry has experienced no instances of flashover due to pollution or salt contamination.

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 Pre-load

LRA Section 3.6.2.2.3, associated with LRA Table 3.6.1, items 3.6.1-4, 3.6.1-5, 3.6.1-6, and 3.6.1-7, addresses loss of conductor strength due to corrosion, increased resistance of connection due to oxidation or loss of pre-load, and loss of material due to wind-induced abrasion in transmission conductors, 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. A discussion of each of these AMR items is provided as follows.

<u>Transmission Conductors Composed of Aluminum; Steel Exposed to Air - Outdoor</u>. LRA Section 3.6.2.2.3, associated with LRA Table 3.6.1, AMR item 3.6.1-4, addressed loss of

conductor strength due to corrosion for transmission conductors composed of Aluminum; steel exposed to air – outdoor. The applicant noted that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.6.2.2.3 and SRP-LR Appendix A.1 and finds it acceptable because the Perry outdoor environment is not subject to industry air pollution or saline environment and aluminum conductors, bus material, stainless steel support hardware and aluminum connection material do not experience any appreciable aging effects in this environment.

Transmission Connectors Composed of Aluminum; Steel Exposed to Air - Outdoor. LRA Section 3.6.2.2.3, associated with LRA Table 3.6.1, AMR item 3.6.1-5, addresses increased resistance of connection due to oxidation or loss of pre-load for transmission connectors composed of aluminum; steel exposed to air – outdoor. The applicant noted that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.6.2.2.3 and SRP-LR Appendix A.1 and finds it acceptable because the Perry outdoor environment is not subject to industry air pollution or saline environment and aluminum switchyard bus material, stainless steel support hardware and aluminum connection material do not experience any appreciable aging effects in this environment.

Switchyard Bus and Connections Composed of Aluminum; Stainless Steel; Galvanized Steel Exposed to Air - Outdoor. LRA Section 3.6.2.2.3, associated with LRA Table 3.6.1, AMR item 3.6.1-6, addresses loss of material due to wind-induced abrasion; increased resistance of connection due to oxidation or loss of pre-load for switchyard bus and connections composed of aluminum; stainless steel; galvanized steel exposed to air – outdoor. The applicant noted that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.6.2.2.3 and SRP-LR Appendix A.1 and finds it acceptable because the Perry switchyard bus is rigid aluminum with aluminum clamps securely fastened with stainless-steel nuts and bolts to a rigid support structure.

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 3.6.1-7, addresses loss of material due to wind-induced abrasion for transmission conductors composed of aluminum; steel exposed to air – outdoor. The applicant noted that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-LR Section 3.6.2.2.3 and SRP-LR Appendix A.1 and finds it acceptable because the Perry transmission conductors are designed and installed not to swing significantly and cause wear due to wind-induced abrasion and fatigue.

Based on its audit and application review, the staff concludes that Perry 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 Perry 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 AMR results listed in LRA Tables 3.6.1 and 3.6.2 that are either not consistent with or not addressed in the GALL-LR Report and are usually denoted with generic notes F through J. To efficiently capture and identify multiple applicable AMR items in each subsection, and because these AMR items often are not associated with a Table 1 item, the subsections are organized by applicable AMR section and then by material and environment combinations.

For component type, material, and environment combinations not evaluated in the GALL-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 function(s) 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

LRA Table 3.6.2, Row 5 (associated with LRA Table 3.6.1, AMR item 3.6.1-2) of the 10 CFR 54.21(b) annual update to the Perry LRA (ML24185A092), notes that loss of material due to mechanical wear caused by wind blowing on transmission conductors for high-voltage insulators composed of porcelain, galvanized steel, cement, silicone exposed to air – outdoor is not applicable and no AMP is proposed. The AMR item cites generic note I. The AMR item cites plant specific note 602, which states: "High-voltage insulator loss of material due to mechanical wear caused by wind is not an aging effect requiring management, see 3.6.2.2.2."

The staff reviewed the associated items in the LRA to confirm that this aging effect is not applicable for this component, material and environment combination. The staff finds the applicant's proposal acceptable because Perry transmission conductors are designed and installed not to swing significantly and cause wear due to wind-induced abrasion and fatigue. Therefore, loss of material due to wind-induced abrasion and fatigue on high-voltage insulators supporting transmission conductors is not an applicable aging effect requiring management.

LRA Table 3.6.2, Row 7 (associated with LRA Table 3.6.1, AMR item 3.6.1-3) of the 10 CFR 54.21(b) annual update to the Perry LRA (ML24185A092), notes that reduced insulation resistance due to presence of salt deposits or surface contamination for high-voltage insulators composed of porcelain, galvanized steel, cement exposed to air - outdoor is not applicable and no AMP is proposed. The AMR item cites generic note I. The AMR item cites plant specific note 603, which states: "High-voltage insulator reduced insulation resistance due to presence of salt deposits or surface contamination are not aging effects requiring management, see 3.6.2.2.2."

The staff reviewed the associated items in the LRA to confirm that this aging effect is not applicable for this component, material and environment combination. The staff finds the applicant's proposal acceptable because the glazed insulator surface of high-voltage insulators is designed to minimize adherence of pollution and salt spray, periodic rainfall should be sufficient to remove contaminants from the high-voltage insulators, and Perry has experienced no instances of flashover due to pollution or salt contamination.

3.6.2.3.2 Transmission Conductors and Conductors Composed of Aluminum; Steel Exposed to Air-Outdoor; and Switchyard Bus and Connections Composed of Aluminum, Stainless Steel, Copper, Bronze, and Galvanized Steel Exposed to Air-Outdoor

Switchyard Bus and Connections Composed of Aluminum; Stainless Steel; Galvanized Steel Exposed to Air – Outdoor. LRA Table 3.6.2, Row 10 (associated with LRA Table 3.6.1, AMR item 3.6.1-6) of the 10 CFR 54.21(b) annual update to the Perry LRA (ML24185A092), notes that loss of material due to wind-induced abrasion; increased resistance of connections due to oxidation or loss of pre-load for switchyard bus and connections composed of aluminum; stainless steel; galvanized steel exposed to air – outdoor is not applicable and no AMP is proposed. The AMR item cites generic note I. The AMR item cites plant specific note 604, which states: “Switchyard bus and connection loss of material due to wind-induced abrasion or increased resistance of connection due to oxidation are not aging effects requiring management, see 3.6.2.2.3.”

The staff reviewed the associated items in the LRA to confirm that this aging effect is not applicable for this component, material and environment combination. The staff finds the applicant’s proposal acceptable because the Perry switchyard bus is rigid aluminum with aluminum clamps securely fastened with stainless-steel nuts and bolts to a rigid support structure.

Transmission Conductors Composed of Aluminum; Steel Exposed to Air – Outdoor. LRA Table 3.6.2, Row 11 (associated with LRA Table 3.6.1, AMR item 3.6.1-4) of the 10 CFR 54.21(b) annual update to the Perry LRA (ML24185A092), notes that loss of conductor strength due to corrosion for transmission conductors composed of aluminum; steel exposed to air - outdoor is not applicable and no AMP is proposed. The AMR item cites generic note I. The AMR item cites plant specific note 605, which states: “Transmission conductor loss of strength due to corrosion is not an aging effect requiring management, see 3.6.2.2.3.”

The staff reviewed the associated items in the LRA to confirm that this aging effect is not applicable for this component, material and environment combination. The staff finds the applicant’s proposal acceptable because the Perry outdoor environment is not subject to industry air pollution or saline environment and aluminum conductors, bus material, stainless steel support hardware and aluminum connection material do not experience any appreciable aging effects in this environment.

Transmission Connectors Composed of Aluminum; Steel Exposed to Air – Outdoor. LRA Table 3.6.2, Row 12 (associated with LRA Table 3.6.1, AMR item 3.6.1-5) of the 10 CFR 54.21(b) annual update to the Perry LRA (ML24185A092), notes that increased resistance of connection due to oxidation of loss of pre-load for transmission connectors composed of aluminum; steel exposed to air – outdoor is not applicable and no AMP is proposed. The AMR item cites generic note I. The AMR item cites plant specific note 606, which states, “Transmission connector increased resistance of connection due to oxidation or loss of pre-load are not aging effects requiring management, see 3.6.2.2.3.”

The staff reviewed the associated items in the LRA to confirm that this aging effect is not applicable for this component, material and environment combination. The staff finds the applicant’s proposal acceptable because the Perry outdoor environment is not subject to industry air pollution or saline environment and aluminum switchyard bus material, stainless steel support hardware and aluminum connection material do not experience any appreciable aging effects in this environment.

Transmission Conductors Composed of Aluminum, Steel Exposed to Air – Outdoor. LRA Table 3.6.2, Row 13 (associated with LRA Table 3.6.1, AMR item 3.6.1-7) of the 10 CFR 54.21(b) annual update to the Perry LRA (ML24185A092), notes that loss of material due to wind-induced abrasion for transmission conductors composed of aluminum; steel exposed to air – outdoor is not applicable and no AMP is proposed. The AMR item cites generic note I. The AMR item cites plant specific note 607, which states: “Transmission conductor loss of material due to wind-induced abrasion is not an aging effect requiring management at Perry, see 3.6.2.2.3.”

The staff reviewed the associated items in the LRA to confirm that this aging effect is not applicable for this component, material and environment combination. The staff finds the applicant’s proposal acceptable because the Perry transmission conductors are designed and installed not to swing significantly and cause wear due to wind-induced abrasion and fatigue.

3.6.2.3.3 Fuse Holders (Not Part of Active Equipment): Metallic Clamps Composed of Various Metals Used for Electrical Connections Exposed to Air-Indoor Controlled or Uncontrolled

LRA Table 3.6.2, Row 4 (associated with LRA Table 3.6.1, AMR item 3.6.1-17) of the 10 CFR 54.21(b) annual update to the Perry LRA (ML24185A092) states that increased resistance of connection due to fatigue caused by frequent manipulation or vibration for various metals used for electrical connections of fuse holders (not part of active equipment): metallic clamps exposed to air - indoor controlled or uncontrolled is not applicable, and no AMP is proposed. The AMR item cites generic note I. The AMR item cites plant specific note 601, which states: “Fuse holder metallic clamps are not subject to frequent manipulation or vibration, no aging management program is required.”

The staff reviewed the associated items in the LRA to confirm that this aging effect is not applicable for this component, material and environment combination. The staff finds the applicant’s proposal acceptable based on its review of Table 3.6-1 of SRP-LR which states that no AMP is required for those applicants who can demonstrate these fuse holders are located in an environment that does not subject them to environmental aging mechanisms or fatigue caused by frequent manipulation or vibration.

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 Perry.

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 Perry Unit 1, 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 NRC regulations.

SECTION 4 TIME-LIMITED AGING ANALYSES

4.1 Identification of Time-Limited Aging Analyses

This section of the safety evaluation (SE) provides the Nuclear Regulatory Commission (NRC) staff's evaluation of the applicant's basis for identifying those time-limited aging analyses (TLAAs) and plant-specific exemptions, granted pursuant to 10 CFR 50.12, "Specific Exemptions," that are based on TLAAs.

The regulation in 10 CFR 54.3, "Definitions," defines TLAAs as those licensee calculations and analyses (henceforth referred to as "analysis" or "analyses") that:

(1) involve systems, structures, and components (SSCs) within the scope of license renewal, as delineated in [10 CFR] 54.4(a)

(2) consider the effects of aging

(3) involve time-limited assumptions defined by the current operating term; for example, 40 years (for initial license renewal)

(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)

(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 that:

(1) The analyses will remain valid for the period of extended operation (PEO);

(2) The analyses have been projected to the end of the PEO; or

(3) The effects of aging on the intended function(s) will be adequately managed for the PEO.

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 PEO.

4.1.1 Summary of Technical Information in the Application

Section 4.1 of the license renewal application (LRA) 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 was reviewed and searched to identify potential TLAAs. The document search was performed consistent with the guidance provided in NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," (SRP), and with 10 CFR 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." Additionally, a list of potential generic TLAAs was assembled from the SRP, industry guidance, and experience with other renewal applicants, including NUREG-1800, Revision 2; NUREG-1801, Revision 2; NEI 95-10, Revision 6; the statement of considerations related to the final rule for 10 CFR 54 (60 FR 22461), and prior LRAs (including NRC requests for additional information and NRC safety evaluation reports (SERs) for those applications).

The applicant stated that the exemptions for Perry were identified through a search of the CLB and design-basis documentation. The applicant reviewed the exemptions currently in effect for Perry pursuant to 10 CFR 50.12 and determined that none were associated with or supported by 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-Limited Aging Analyses," which includes staff review procedures, acceptance criteria, and a list of potential TLAAs.

The LRA states that the applicant searched the CLB and design-basis documentation to identify potential TLAAs. The documentation that was searched included the Updated Final Safety Analysis Report (UFSAR), Facility Operating License, EPRI Boiling Water Reactor Vessels and Internals Program (BWRVIP) documents (incorporated by reference in the CLB), NRC SERs, and 10 CFR 50.12 Exemption Requests.

During the audit (ML24239A778), the staff confirmed that the applicant performed a search of its CLB and design-basis documentation to identify potential TLAAs. The staff noted that a list of specific key words was used by the applicant during this search to identify potential TLAAs. The staff noted that this list of key words was appropriate in identifying potential TLAAs because the key words searched were reasonable and tailored to focus on age-related degradation targeted toward time dependent assessment. During its audit, the staff confirmed that the applicant performed further reviews of the design calculations if an analysis was deemed a potential candidate for a TLAA during this search with specific key words. The staff also confirmed that each potential TLAA identified during this search was reviewed by the applicant against the six criteria for time-limited aging analysis in 10 CFR 54.3(a) and that those potential TLAAs that met all six criteria were identified as TLAAs that require evaluation for the PEO. During its review, the staff noted that the applicant conservatively identified LRA Section 4.6.12, "Reactor Pressure Vessel (RPV) Annealing," as a TLAA. The staff's evaluation of the TLAA for the RPV annealing is documented in SER Section 4.6.12.

During its audit, the staff also confirmed that the applicant performed a search of docketed licensing correspondence, the operating license, and the UFSAR to identify exemptions granted pursuant to 10 CFR 50.12 that are currently in effect. The staff also confirmed that 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.

For completeness, the staff is including the following discussion associated with an exemption granted pursuant to 10 CFR 50.12 that is no longer in effect or applicable and is related to the use of an ASME Code case for the development of Pressure-Temperature Limits. During its review, the staff noted that the applicant was granted an exemption in accordance with 10 CFR 50.12 by letter dated April 29, 2003 (ML030700189) related to the use of Code Case N-640, which permits the use of the plane strain fracture toughness (K_{Ic}) curve instead of the crack arrest fracture toughness (K_{Ia}) curve for RPV materials, in determining the pressure-temperature

(P-T) limits. The staff noted following its approval of this exemption request, NRC Regulatory Issue Summary (RIS) 2004-04: Use of Code Cases N-588, N-640, and N-641 in Developing Pressure-Temperature Operating Limits was issued on April 5, 2004 (ML040920323), and states that:

- Licensees may use the provisions of any edition and addenda of ASME Code Section XI, Appendix G incorporated into 10 CFR 50.55a for RPV P-T limit curve development, up to and including the most recently incorporated edition and addenda, without the need for an exemption.
- Use of NRC-approved ASME Code Cases (e.g., N-588, N-640, and N-641) in conjunction with earlier versions of the ASME Code endorsed in 10 CFR 50.55a also may be used for the development of P-T limit curves without the need for an exemption.
- However, changing the P-T limit curve methodology specified in the licensee's Technical Specifications or modifying a facility's P-T limit reporting methodology requires NRC staff approval because this is a license amendment.

The staff noted that the provisions of ASME Code Cases N-588, N 640, and N-641 that are applicable to P-T limit curve development were incorporated into ASME Code Section XI. In accordance with 10 CFR 50.55a(g)(4)(ii), the following is required:

> In-service examination of components and system pressure tests conducted during successive code of record intervals must comply with the requirements of the latest edition and addenda of the ASME BPV Code incorporated by reference in paragraph (a) of this section no more than 18 months before the start of the code of record interval (or the optional ASME Code Cases listed in NRC Regulatory Guide 1.147, when using ASME BPV Code, Section XI, or NRC Regulatory Guide 1.192, when using the ASME OM Code, as incorporated by reference in paragraphs (a)(3)(ii) and (iii) of this section), subject to the conditions listed in paragraph (b) of this section. However, a licensee whose in-service inspection interval commences during the 12 through 18-month period after September 30, 2024, may delay the update of their Appendix VIII program by up to 18 months after September 30, 2024. Alternatively, licensees may, at any time in their code of record interval, elect to use the Appendix VIII in the latest edition and addenda of the ASME BPV Code incorporated by reference in paragraph (a) of this section, subject to any applicable conditions listed in paragraph (b) of this section. Licensees using this option must also use the same edition and addenda of Appendix I, Subarticle I–3200, as Appendix VIII, including any applicable conditions listed in paragraph (b) of this section.

The staff noted that the latest edition and addenda of Section XI of the ASME BPV Code incorporated by reference in 10 CFR 50.55a(a) is the 2021 edition. Appendix G in the 1998 edition through 2000 addenda, which has been codified in 10 CFR 50.55a, took effect on October 28, 2002 (67 FR 60520). As such, the staff concludes that an exemption in accordance with 10 CFR 50.12 to use Code Case N-640 is no longer necessary because this Code Case has been codified into ASME Section XI via 10 CFR 50.55a and the applicable In-service Inspection (ISI) Code for successive code of record intervals for the applicant during the PEO in accordance with 10 CFR 50.55a(g)(4)(ii) will be later than the 1998 edition through 2000 addenda of Section XI of the ASME BPV Code. Regardless, the applicant did address its TLAA for P-T Limits in the LRA and the staff's evaluation is documented in SER Section 4.2.4.

During its review, the staff performed an independent search of the UFSAR and a sample of docketed licensing correspondence and NRC SERs to identify potential TLAAs. Based on this independent search, the staff did not identify TLAAs that were not already identified in the 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, that were not already identified in the LRA.

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

Section 4.1.1 of the LRA has identified TLAAs for Perry, employing methods consistent with those outlined in NUREG-1800, Revision 2, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP), as well as with 10 CFR 54, which covers requirements for renewing operating licenses for nuclear power plants. A compilation of potential generic TLAAs was created by the applicant based on the SRP and industry guidance.

LRA Section 4.2.1 details the applicant's TLAA concerning neutron fluence projections for the reactor vessel and its internals. These projections quantify the number of neutrons that impact these surfaces, serving as inputs for neutron embrittlement analyses that assess the degradation of fracture toughness caused by aging effects from neutron fluence.

Neutron fluence refers to the total number of neutrons per square centimeter that interact with the reactor vessel shell and its internal components over a specified duration. The fluence projections, which quantify the number of neutrons contacting these surfaces, have been utilized in the neutron embrittlement analyses evaluating the aging effects on fracture toughness resulting from neutron fluence.

In Section 4.2.1 of the LRA, the applicant indicated the present projections were conducted to estimate the neutron fluence anticipated during 32 effective full-power years (EFPY) of plant operation. The calculations for 32 EFPY were submitted in a letter dated June 4, 2002 (ML021650244) and were approved by the NRC in a letter dated April 29, 2003 (ML030700189). At the time of preparation, 32 EFPY was the expected power output over 40 years of plant operation, assuming an average capacity factor of 80 percent. These fluence projections represent TLAAs that require evaluation for the extended operation period.

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 PEO. As part of the review, NRC staff considered whether the applicant (1) identified the neutron fluence for each beltline material at the end of PEO, (2) used a staff-approved methodology to calculate the neutron fluence, and (3) 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 BWRVIP-114-A, “BWR Vessel and Internals Project RAMA [Radiation Analysis Modeling Application] Fluence Methodology Theory Manual,” (ML092650376). The staff’s review results are summarized below.

4.2.1.2.1 RPV Fluence

The fluence values provided in this section were calculated by the applicant using the RAMA computer code, which was used to perform a series of transport calculations based on reactor, core, and vessel geometry; nuclear data from the cross-section library; and reactor operating history. Output from these calculations include fluxes, fluence, wire activation and uncertainties. The RAMA neutron transport calculations are deterministic in three dimensions using an integration scheme.

The application of this methodology for fluence evaluations at Perry was conducted in accordance with the guidelines outlined in Regulatory Guide (RG) 1.190. Following these guidelines, comparisons were made by the applicant with surveillance capsule flux wire and dosimetry measurements to assess the accuracy of the RPV fluence model. Additionally, an uncertainty analysis was performed by the applicant to check for any statistical bias in the model. The NRC staff has concluded that the Perry model does not exhibit statistical bias and that the best estimate fluence is appropriate for evaluating the impacts of embrittlement on RPV material, as specified in Appendix G to 10 CFR 50 and RG 1.99, Revision 2.

In response to the NRC Request for Additional Information (RAI) dated August 14, 2024 (ML24227A956), regarding the LRA referencing the SE for BWRVIP-145 (ML080390160) for the RPV, the applicant stated (ML24260A266) that the fluence values provided as part of the RAI response “were calculated using the RAMA Fluence Methodology.” Additionally, the applicant stated that, “RAMA was developed for the Electric Power Research Institute and the Boiling Water Reactor Vessel and Internals Project. The NRC has reviewed and approved RAMA for BWR RPV fluence predictions by letters dated May 13, 2005, and February 7, 2008 [References 4.7-13 and 4.74].” The NRC staff reviewed the applicant’s response to the RAI and found it acceptable because it references the appropriate fluence methodology documents.

Fast neutron fluence evaluation was performed by the applicant for the RPV based on operating data through cycle fourteen. Fluence was calculated at the end of cycle (EOC) 14 (20.0 EFPY) and projected to 54 EFPY. In LRA Section 4.2.1, the applicant stated the following:

> “In LRA Table 4.2-1, *[Perry] RPV Beltline Fluence Data for 54 EFPY*, fast neutron fluence for energy >1.0 MeV is reported for the RPV plates, welds and nozzles throughout the RPV beltline region at the interface of the base metal and cladding, hereafter denoted as the 0t location of the RPV wall. Fluence attenuations are performed through the RPV wall to the ¼t locations using the displacement per atom (DPA) attenuation method prescribed in NRC Regulatory Guide 1.99, Revision 2. Fluence

values that exceed the threshold value of 1.0E+17 n/cm^2 [neutrons per square centimeter] for 54 EFPY define the RPV beltline for the period of extended operation."

The applicant further stated that the maximum fluence value for the lower intermediate shell plate at the 0t location is 4.79E+18 n/cm^2, which is higher than the NRC-approved limit of 1 E+17 n/cm^2. Regulatory Issue Summary 2014-11 (ML14149A165) clarifies that the RPV beltline definition in Appendix G to 10 CFR Part 50 is applicable to all RPV ferritic materials with projected neutron fluence values greater than 1.0E+17 n/cm^2 (E > 1 MeV), and that this fluence threshold remains applicable for the design life as well as throughout the licensed operating period of the reactor. The NRC staff's SE on BWRVIP-76 (ML092940318) provides additional guidance which allows the fluence values to exceed 1.0E+17 n/cm^2. Therefore, the calculated maximum fluence value for the lower intermediate shell plate at the 0t location of 4.79E+18 n/cm^2 is acceptable.

The applicant also prepared neutron fluence analyses valid for 54 EFPY for the reactor vessel beltline materials and bound the projected EFPY value for 60-years of operation. Based on its review of the information above, the NRC staff concludes that the applicant's neutron fluence analysis is acceptable because it is projected to the end of the PEO.

4.2.1.2.2 Reactor Vessel Surveillance Program

The applicant in the LRA stated that:

> "The Reactor Vessel Surveillance Program is an existing condition monitoring program that manages the loss of fracture toughness due to neutron irradiation embrittlement for reactor vessel beltline materials using material data and dosimetry. The program meets the requirements of 10 CFR 50, Appendix H.
>
> The Reactor Vessel Surveillance Program is part of the BWRVIP Integrated Surveillance Program (ISP) described in BWRVIP-86, Revision 1-A and approved by the NRC. The schedule for removing surveillance capsules is in accordance with the timetable specified in BWRVIP-86, Revision 1-A. The Perry 183° surveillance capsule, designated as an In-Service Inspection Program ISP(E) capsule, is scheduled for withdraw and testing in the period of extended operation at approximately 40 EFPY.
>
> Surveillance capsule testing and reporting, to the extent practicable, is performed in accordance with the requirements of American Society for Testing and Materials (ASTM) E 185 Standard. Any changes to the capsule withdrawal schedule, including spare capsules, must be approved by the NRC prior to implementation. Untested capsules placed in storage must be maintained for future insertion.
>
> The program is a condition monitoring program that measures the increase in Charpy Vnotch 30 foot-pound (ft-lb) transition temperature and the drop in the upper shelf energy as a function of neutron fluence and irradiation temperature. The data from this surveillance program are used to monitor neutron irradiation embrittlement and are used to support upper shelf energy and pressure-temperature limit calculations.
>
> The program will be continued for the period of extended operation."

Based on its review of the information presented above, the NRC staff concludes that the applicant's Reactor Vessel Surveillance Program is acceptable because it is consistent with the ten elements of an effective AMP as described in NUREG-1801, Section XI.M31, Reactor Vessel Surveillance.

Reactor Vessel Internal

In response to staff's RAI (ML24260A266) the applicant explained what methods were used to perform the transport calculations required to estimate the fluence for the reactor vessel and internals (RVI) for Perry.

In its response, the applicant discussed that:

(1) Perry has performed a site-specific evaluation of the applicability of the RAMA methodology, which includes benchmarking needed for the application of the RAMA fluence methodology for the RPV. The Perry benchmarking is documented in the submittal of BWRVIP-281NP, Revision 1, "BWR Vessel and Internals Project, Testing and Evaluation of the Perry 177° Capsule," by letter from Andrew McGehee to Joseph Holonich, dated January 3, 2017 (ML17012A341).

(2) BWRVIP-189, "BWR Vessel and Internals Project Evaluation of RAMA Fluence Methodology Calculational Uncertainty," July 2008, includes an evaluation of Clinton Power Station, which is a BWR/6 of similar design to Perry.

(3) To clarify the use of the RAMA fluence methodology, Supplement 1 (ML24151A637) to the Perry LRA was submitted, which added the supplemental information to Perry LRA Section 4.2.1, TLAA Evaluation.

Based on its review of the information above, the NRC staff concludes that the site-specific evaluation of the applicability of the RAMA methodology provides the benchmarking information that demonstrate the application of the RAMA methodology for Perry meets the limitation in the NRC SER for BWRVIP-145, and may be used by the applicant for core shroud and top guide in the LRA, and, therefore, may also be used by the applicant for other reactor internal locations as provided in the NRC SER for BWRVIP-114, -115,-117, and -121.

The NRC staff reviewed and finds acceptable the applicant's TLAA for the RPV and the Internals 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.

Pressure-Temperature Limits

To minimize the risk of brittle fracture during the operation of the RPV, variations in material toughness due to neutron radiation exposure (fluence) are incorporated using operating P-T limits specified in the Perry Technical Specifications. These P-T limits consider the reduction in toughness of the RPV beltline materials that corresponds to a specific fluence. The beltline region consists of the reactor vessel materials expected to experience a cumulative high-energy neutron exposure exceeding 1.0E+17 n/cm^2 throughout the plant's licensed lifespan. As the cumulative neutron fluence is projected to increase during the extended operation period, a review is necessary to ascertain whether any additional components will surpass the threshold value and require assessment for neutron embrittlement.

The toughness of beltline materials is anticipated to decline as a result of exposure to the expected fluence values. Consequently, upper shelf energy (USE) calculations are conducted to evaluate whether the components will retain sufficient fracture toughness at the end of the license term to meet the required minimum standards. P-T limit curves are created to establish the minimum temperature thresholds that must be reached during operations before applying the specified RPV pressures. These curves are derived from the RT_{NDT} and ΔRT_{NDT}.

The ΔRT_{NDT} and USE values for the RPV material, calculated based on neutron fluence, are integral to the licensing basis and assist in safety evaluations. Increases in RT_{NDT} (ΔRT_{NDT}) also influence the criteria for exemptions from circumferential weld inspections and the associated calculations for the limiting axial weld conditional failure probability. Therefore, these calculations are classified as TLAAs. The following TLAAs concerning neutron embrittlement are assessed in the Perry LRA subsections listed below:

- Neutron Fluence (Section 4.2.1)
- USE (Section 4.2.2)
- Adjusted Reference Temperature Analyses (Section 4.2.3)
- Pressure – Temperature Limits (Section 4.2.4)
- RPV Shell Welds Failure Probability Assessment Analyses (Section 4.2.5)
- RPV Reflood Thermal Shock (Section 4.2.6)

The NRC staff reviewed the applicant's proposed P-T limits and concludes that P-T limits are acceptable because they are consistent with 10 CFR 54.21(c)(1)(ii), and the acceptance criteria in the SRP-LR Section 4.2.2.1.1.2.

4.2.1.3 UFSAR Supplement

LRA Appendix A provides the UFSAR supplement for the Neutron Fluence Monitoring program. The staff reviewed the UFSAR supplement description of the program and noted that monitoring is performed in accordance with the methods that are defined for the licensing basis in NRC-approved reports and are consistent with the recommended description in the GALL-LR Report. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program. 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 Exceptions, Enhancement and Operating Experience

The applicant did not propose any exceptions or enhancements in the LRA. The NRC staff evaluation of the LRA did not identify any exceptions or need for any enhancements to be implemented by the applicant for Perry Unit 1. Based on its review of the operating experience at the plant, the NRC staff did not identify any deficiencies in the applicant's proposed Neutron Fluence Monitoring program and finds it to be acceptable.

4.2.1.5 Conclusion

Based on its review, the staff concludes that the applicant has demonstrated that the analyses of the neutron fluence for the RPV, vessel internals, and the extended beltline materials are correctly projected to the end of the PEO pursuant to 10 CFR 54.21(c)(1)(ii).

The staff concluded that the analyses and the evaluations performed by the applicant meet the acceptance criteria in SRP-LR Section 4.2.2.1.1 because the method used to calculate the neutron fluence is consistent with the NRC-approved methodology (BWRVIP-114) and adheres to the guidance of RG 1.190.

4.2.2 Upper Shelf Energy

4.2.2.1 Summary of Technical Information in the Application

LRA Section 4.2.2, as modified by letters dated August 7, 2024 (ML24220A270), and November 7, 2024 (ML24312A368), describes the applicant's TLAA evaluation for calculating the USE values for base metal and weld components that are made from ferritic steel materials and are in the beltline region of the RPV. The applicant stated that USE values were calculated using methods that are consistent with NRC's methods of analysis in RG 1.99, Revision 2. The LRA states that these calculations are based on peak neutron fluence values for the ¼T (T = the wall thickness of the RPV beltline region) locations of the components in the RPV through 54 EFPY, which bounds the maximum possible EFPY at the end of the PEO.

10 CFR 50, Appendix G, states that RPV beltline materials must have Charpy USE of no less than 75 ft-lb initially and must maintain Charpy USE throughout the life of the vessel of no less than 50 ft-lb, unless it is demonstrated in a manner approved by the Director, Office of Nuclear Reactor Regulation, that lower values of the Charpy USE will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code.

The applicant dispositioned the TLAA for USE in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analyses have been projected to the end of the PEO.

4.2.2.2 Staff Evaluation

During its audit (ML24239A778) and review, the staff assessed the material property values (e.g., initial USE and weight percent copper) for the RPV materials in LRA Table 4.2-2, as amended by letters dated August 7, 2024, and November 7, 2024, to confirm (1) these values were consistent with the CLB, (2) revisions to the CLB values are justified and appropriate, or (3) determine if these values are justified and appropriate if the RPV materials were not previously addressed in the CLB.

The staff noted that the revisions to LRA Table 4.2-2, associated with reactor vessel materials with Heat No. 5P6214B that were made by letter dated August 7, 2024, are the result of rounding and consistency with the remainder of the LRA; thus, the staff finds these revisions appropriate. Additionally, LRA Table 4.2-2, as modified by RAI-10231-R1, is the result of resolving inconsistencies identified during the staff's review related to weight percent copper content value for Lower Shell Plate (i.e., Heat Nos C2448-1, C2448-2 and A1068-1) in LRA Tables 4.2-2 and 4.2-3 and the "check" values (i.e., measurements taken from the product form) documented in the certified material test reports. The staff finds the applicant's use of the "check" values of weight percent copper and nickel content documented on the certified material test reports for the Lower Shell Plate (i.e., Heat Nos C2448-1, C2448-2 and A1068-1) to be appropriate and acceptable because the measurements were taken from the product form are the most representative for the reactor vessel material.

Based on its review and audit, the staff verified that the material information (e.g., initial USE, weight percent copper) for the RPV materials contained in LRA Table 4.2-3, as supplemented by letter dated August 7, 2024 (ML24220A270) and November 7, 2024 (ML24312A368), were based on information from certified material test reports and fabrication records, or consistent with the applicant's CLB or NRC-approved topical reports (i.e., BWRVIP-86, Rev. 1-A). Thus, the staff finds the material property values for the RPV materials in LRA Table 4.2-3 are acceptable and appropriate for use in determining USE values at the 1/4 T location through the end of the PEO.

The staff reviewed the applicant's credibility assessment of surveillance data from the Perry 3° and 177° surveillance capsules and confirmed that it was performed in accordance with RG 1.99, Rev. 2, for the following RPV materials:

- Heat No. C2557-1
  - Lower- Intermediate Shell Plate – 22-1-1
- Heat No. 5P6214B
  - Upper- Intermediate Shell Axial Weld – BG, BJ, BK
  - Lower Intermediate Shell Axial Weld – BD, BF
  - Lower Intermediate Shell Axial Weld – BE
  - Lower Shell Axial Weld – BA, BB, BC

The staff noted during its audit that BWRVIP-135, Revision 4, "Integrated Surveillance Program (ISP) Data Source Book and Plant Evaluations," provides an assessment of surveillance data from the Perry 3° and 177° surveillance capsules (ML20134M751and ML14308A077, respectively). During its audit, the staff noted that in lieu of Position 2.2 of RG 1.99, Revision 2, the applicant used Position 1.2 of RG 1.99, Revision 2, when assessing USE values for the reactor vessel materials with Heat Nos. C2557-1 and 5P6214B. The staff reviewed and determined that the applicant's use of Position 1.2 of RG 1.99, Rev 2, is conservative (i.e., larger decrease in USE) when compared to the use of Position 2.2 of RG 1.99, Revision 2 for the evaluation of USE values through the PEO for these RPV materials, and therefore, is acceptable.

Based on its review, the staff also verified that the projected Charpy USE values for the RPV materials in LRA Table 4.2-2 were calculated in accordance with RG 1.99, Revision 2, and as such, the staff finds the projected Charpy USE values at 54 EFPY are appropriate and greater than the screening criterion of 50 ft-lb per Appendix G of 10 CFR Part 50 through the PEO.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for RPV materials with initial USE values have been projected to the end of the PEO. Additionally, this TLAA meets the acceptance criteria in SRP-LR Section 4.2.2.1.1.2 because the USE analyses were evaluated consistent with RG 1.99, Revision 2, when considering the neutron fluence values for 60 years (i.e., 54 EFPY). The staff further finds that the applicant has demonstrated that for RPV materials having initial USE values, the requirement for USE greater than 50 ft-lb per Appendix G of 10 CFR Part 50 was met.

4.2.2.3 UFSAR Supplement

LRA Section A.2.2.2 provides the UFSAR supplement summarizing the TLAA for USE reduction in RPV materials due to neutron embrittlement. The staff reviewed LRA Section A.2.2.2 consistent with review procedures in SRP-LR Section 4.2.3.1.1.2.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-LR Section 4.2.2.1.1.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address USE reduction in RPV materials due to neutron embrittlement, 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 the USE reduction in RPV materials due to neutron embrittlement has been projected to the end of the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.3 Adjusted Reference Temperature Analyses

4.2.3.1 Summary of Technical Information in the Application

LRA Section 4.2.3, as modified by letters dated August 7, 2024 (ML24220A270) and November 7, 2024 (ML24312A368), describes the applicant's TLAA for its adjusted reference temperature (ART) analyses related to its RPV materials. The ART of the limiting beltline material is used to adjust the beltline P-T limit curves to account for neutron irradiation effects. The applicant dispositioned the TLAA for the change in ART related to its RPV materials in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the PEO.

4.2.3.2 Staff Evaluation

The staff reviewed the applicant's TLAA, as modified by letters dated August 7, 2024 (ML24220A270) and November 7, 2024 (ML24312A368), for ART analyses related to its RPV 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 (ML24239A778) and review, the staff assessed the material property values (e.g., initial RT_{NDT}, weight percent copper, weight percent nickel) for the RPV materials in LRA Tables 4.2-3, as amended by letters dated August 7, 2024 and November 7, 2024, to confirm whether (1) these values were consistent with the CLB; (2) revisions to the CLB values are justified and appropriate; or (3) determine if these values are justified and appropriate if the RPV materials were not previously addressed in the CLB.

The staff noted that the revisions to LRA Table 4.2-3 associated with reactor vessel materials with Heat No. 5P6214B that were made by letter dated August 7, 2024, are the result of rounding and consistency with the remainder of the LRA; thus, the staff finds these revisions appropriate. Additionally, LRA Table 4.2-3, as modified by RAI-10231-R1, is the result of resolving inconsistencies identified during the staff's review related to weight percent copper and nickel content values for Lower Shell Plate (i.e., Heat Nos C2448-1, C2448-2 and A1068-1) in LRA Tables 4.2-2 and 4.2-3 and the "check" values (i.e., measurements taken from the product form) documented in the certified material test reports. The staff finds the applicant's use of the "check" values weight percent copper and nickel content documented on the certified material test reports for the Lower Shell Plate (i.e., Heat Nos C2448-1, C2448-2 and A1068-1) to be appropriate and acceptable because the measurements were taken from the product form are the most representative for the reactor vessel material.

Based on its review and audit, the staff verified that the material information (e.g., initial RT_{NDT}, weight percent copper, weight percent nickel) for the RPV materials contained in LRA Table 4.2-3, as supplemented by letter dated August 7, 2024 (ML24220A270) and November 7, 2024 (ML24312A368), were based on information from certified material test reports and fabrication records, or consistent with the applicant's CLB or NRC-approved topical reports (i.e., BWRVIP -86, Rev. 1-A). Thus, the staff finds the material property values for the RPV materials in LRA Table 4.2-3 are acceptable and appropriate for use in determining ART values at the ¼T (T = the wall thickness of the RPV beltline region) location through the end of the PEO. 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 RPV material for the purposes of addressing ART.

The staff reviewed the applicant's credibility assessment of surveillance data from the Perry 3° and 177° surveillance capsules was performed in accordance with RG 1.99, Rev. 2, for the following RPV materials:

- Heat No. C2557-1
  - Lower- Intermediate Shell Plate – 22-1-1
- Heat No. 5P6214B
  - Upper- Intermediate Shell Axial Weld – BG, BJ, BK
  - Lower Intermediate Shell Axial Weld – BD, BF
  - Lower Intermediate Shell Axial Weld – BE
  - Lower Shell Axial Weld – BA, BB, BC

The staff noted during its audit that BWRVIP-135, Revision 4, "Integrated Surveillance Program (ISP) Data Source Book and Plant Evaluations," provides an assessment of surveillance data from the Perry 3° and 177° surveillance capsules (ML20134M751and ML14308A077, respectively). The staff verified that the applicant's use of applicable surveillance data is credible in accordance with RG 1.99, Rev. 2, for these RPV materials, and the associated chemistry factor and margin values are acceptable, as reflected in LRA Table 4.2-3. Based on its review, the staff also verified that the projected ART values, as amended by letter dated August 7, 2024, and November 7, 2024, were calculated in accordance with RG 1.99, Revision 2, and as such, the staff finds that the ART values at 54 EFPY identified by the applicant at the time of the LRA are 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 materials have been projected to the end of the PEO. Additionally, the TLAA meets the acceptance criteria in SRP-LR Section 4.7.2.1 because the ART analyses were reevaluated consistent with RG 1.99, Revision 2, when considering the neutron fluence values for 60 years (54 EFPY). The staff noted that ART values of the RPV materials are used to adjust the PT limit curves to account for irradiation effects, which are evaluated in SE Section 4.2.4.

4.2.3.3 UFSAR Supplement

LRA Section A.2.2.3 provides the UFSAR supplement summarizing the TLAA associated with the change in ART for RPV materials due to neutron embrittlement. The staff reviewed LRA Section A.2.2.3 consistent with the review procedures in SRP-LR Section 4.7.3.2.

Based on its review, the staff finds that the UFSAR 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 TLAA associated with the change in ART for RPV materials due to neutron embrittlement, 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 analysis for the change in ART for RPV materials due to neutron embrittlement has been projected to the end of the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.4 Pressure-Temperature Limits

4.2.4.1 Summary of Technical Information in the Application

LRA Section 4.2.4 describes the applicant's TLAA for P-T Limits for the reactor vessel. The regulations in 10 CFR Part 50, Appendix G, require that the reactor vessel be maintained within established P-T limits. These limits specify the minimum acceptable reactor coolant temperature as a function of the reactor pressure. As the reactor vessel is exposed to increased neutron irradiation over time, P-T limits must account for the reduction in fracture toughness due to anticipated reactor fluence.

The applicant dispositioned the TLAA for P-T Limits in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of loss of fracture toughness due to neutron irradiation embrittlement on the intended functions of the reactor vessel will be adequately managed in accordance with the requirements of 10 CFR Part 50, Appendix G, for the PEO. Specifically, maintenance of the P-T limits during the PEO will be managed through the licensing process in 10 CFR 50.90, "Application for Amendment of License, Construction Permit, and Early Site Permit."

4.2.4.2 Staff Evaluation

The staff reviewed the applicant's TLAA for P-T Limits 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. The review procedures indicate that (1) updated P-T limits for the PEO must be available before the PEO, and (2) the 10 CFR 50.90 process is adequate to maintain and update the P-T limits located in the limiting conditions of operations of plant technical specifications through the PEO.

During its audit (ML24239A778), the staff reviewed the applicant's CLB to determine whether the applicant controls revisions of its P-T limits through updates of the limiting conditions of operations in the plant technical specifications in accordance with 10 CFR 50.90 license amendment process, or through a P-T limit reporting process that is governed and controlled by the administrative controls section of the plant technical specifications. The staff noted that the current P-T limit curves through 32 EFPY, as approved in the NRC staff SE for License Amendment Request (LAR) No. 168 (ML15141A482), are located in the applicant's technical specifications. Based on its review, the staff noted that the applicant controls revisions of its P-T limits in accordance with the 10 CFR 50.90 license amendment process.

Based on its review, the staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of loss of fracture toughness due to neutron irradiation embrittlement on the intended functions of the reactor vessel components will be adequately managed in accordance with the 10 CFR 50.90 license amendment process before entering into the PEO. Additionally, it meets the acceptance criteria in SRP-LR Section 4.2.2.1.3.3 because the 10 CFR 50.90 license amendment process identified by the applicant to ensure revisions of its P-T limits to account for the PEO provide an adequate basis for accepting this TLAA in accordance with 10 CFR 54.21(c)(1)(iii) and consistent with the SRP-LR.

4.2.4.3 UFSAR Supplement

LRA Section A.2.2.4 provides the UFSAR supplement summarizing the TLAA for P-T Limits. The staff reviewed LRA Section A.2.2.4 consistent with the review procedures in SRP-LR Section 4.2.3.1.3.3.

Based on its review, the staff finds that the UFSAR supplement, as amended by letter dated August 7, 2024 (ML24220A270), meets the acceptance criteria in SRP-LR Section 4.2.2.1.3.3 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address P-T Limits of the RPV, 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)(iii), that the effects of loss of fracture toughness due to neutron irradiation on the P-T limits will be adequately managed for the PEO through the 10 CFR 50.90 license amendment process. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.5 RPV Welds Failure Probability Assessment Analysis

4.2.5.1 Summary of Technical Information in the Application

LRA Section 4.2.5 describes the applicant’s TLAA for both RPV circumferential and axial weld examination relief from the requirements of ASME Code, Section XI. The applicant dispositioned the TLAA for both RPV circumferential and axial welds in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analyses have been projected to the end of the PEO.

4.2.5.2 Staff Evaluation

The staff reviewed the applicant’s TLAA, as supplemented by letter dated August 7, 2024 (ML24220A270), for both RPV circumferential and axial weld failure probabilities 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 4.2.3.1.4 and 4.2.3.1.5, respectively.

During its audit (ML24239A778) and review, the staff assessed the plant-specific RPV dimensions and the plant-specific end-of-interval RT_{max} values to verify the applicant’s RPV is within the envelope of BWRVIP-329-A. The staff noted that the plant-specific end-of-interval RT_{max} values were calculated based on the material properties of the reactor vessel (e.g., initial RT_{NDT}, weight % Cu, weight % Ni, chemistry factor) based on 54 EFPY.

The staff noted that BWRVIP-86, Revision 1-A: BWR Vessel and Internals Project, "Updated BWR Integrated Surveillance Program (ISP) Implementation Plan (ML14308A077)" designated Perry as a host plant for its reactor vessel plate material (i.e., Heat No. C2557-1). BWRVIP-281-NP, Revision 1: BWR Vessels and Internals Project, "Testing and Evaluation of the Perry 177° Capsule" includes the testing results for Perry 177° capsule after it was removed in 2013. This report provides the most recent surveillance data for Heat No. C2557-1 from the Perry 177° capsule. After considering this surveillance data reported in BWRVIP-281-NP, the staff noted that heat number C2557-1 becomes the limiting plate material for the applicant's RPV.

As documented in its Audit Report, the staff noted a discrepancy in the applicant's identification of the limiting plate material (A1155-1 vs. C2557-1). Based on its review of LRA Table 4.2-3 and of BWRVIP-281-NP, as discussed above, the staff noted that the RPV material assessed by the applicant in LRA Section 4.2.5 did not appear to be the limiting plate material. By letter dated August 7, 2024 (ML24220A270), the applicant revised LRA Table 4.2-5 to provide the plant-specific end-of-interval RT_{max} value based on the material properties of the limiting plate material (i.e., C2557-1). Additionally, as documented in the Audit Report, the staff noted a variance in the applicant's determination of end-of-interval RT_{max} values compared to BWRVIP-329-A. By letter dated August 7, 2024 (ML24220A270), the applicant revised the results in determining end-of-interval RT_{max} values, such that they were calculated consistent with BWRVIP-329-A.

During its audit and review, the staff verified the following:

- The plant-specific RPV dimensions are enveloped by the RPV dimensions assessed in the probabilistic fracture mechanics (PFM) analyses in BWRVIP-329-A.
- The plant-specific end-of-interval RTmax for the limiting plate and circumferential and axial welds, as revised by letter dated August 7, 2024 (ML24220A270), were calculated based on plant-specific material properties of the RPV based on 54 EFPY. (The staff's review of plant-specific material properties of the reactor vessel is documented in SER Section 4.2.3).
- The plant-specific end-of-interval RTmax values, as revised by letter dated August 7, 2024 (ML24220A270), were calculated consistent with BWRVIP-329-A.
- The plant-specific end-of-interval RTmax values for the limiting plate and the circumferential and axial welds were less than corresponding limiting RTmax values for the plates and the circumferential and axial welds in BWRVIP-329-A.

Although the applicant's disposition of its analysis for the RPV circumferential welds has been projected to the end of the extended period of operation, in accordance with 10 CFR 54.21(c)(1)(ii), and is acceptable, the staff notes that should the applicant decide to pursue an alternative from the required ASME Code, Section XI Examinations for RPV circumferential welds during the PEO, the applicant must still pursue such a request in accordance with 10 CFR 50.55a(z)(1), as the staff's review here does not constitute an approval for such an alternative under 10 CFR 50.55a(z)(1).

Based on its review and audit activities, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for the RPV welds failure probability assessment analysis have been projected to the end of the PEO. Additionally, it meets the acceptance criteria in SRP-LR Sections 4.2.2.1.4 and 4.2.2.1.5, respectively, because the applicant (1) met the applicability criteria of NRC-approved BWRVIP-329-A, (2) provided plant-specific calculations to evaluate the safety significance of a postulated, low temperature isothermal transient in BWR RPVs, and (3) demonstrated that the NRC regulatory safety goals defined in BWRVIP-329-A are satisfied for the postulated transient through the PEO.

4.2.5.3 UFSAR Supplement

LRA Section A.2.2.5 provides the UFSAR supplement summarizing the TLAA for RPV Shell Welds Failure Probability Assessment Analysis. The staff reviewed LRA Section A.2.2.5 consistent with the review procedures in SRP-LR Sections 4.2.3.1.4 and 4.2.3.1.5.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-LR Sections 4.2.2.1.4 and 4.2.2.1.5 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address plant-specific applicability of BWRVIP-329-A and to project the analyses for the RPV welds failure probability assessment analysis through the PEO, 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)(ii), that the effects of aging on the integrity of the RPV welds have been projected to the end of the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.6 RPV Reflood Thermal Shock

4.2.6.1 Summary of Technical Information in the Application

LRA Section 4.2.6 describes the applicant's TLAA for analysis of adequate margin against non-ductile failure of the RPV following a reflood event. The applicant dispositioned the TLAA for the reactor coolant system and reactor vessel in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the PEO.

4.2.6.2 Staff Evaluation

The staff reviewed the applicant's TLAA, as modified by Supplement 1 dated August 7, 2024 (ML24220A270), for the reactor coolant pressure boundary and RPV and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-LR Section 4.7.3.1.2.

The TLAA for the RPV refined the maximum stress intensity factor during a loss-of-coolant accident (LOCA) and revised the estimated embrittlement of the RPV material to reflect operation to 60 years. The applicant updated their maximum stress intensity factor, $K_{Iapplied}$, for a postulated quarter thickness (¼T) flaw for the RPV shell experiencing a main steam line break to 105 ksi√in, which the staff finds acceptable because it is more conservative than the value used in the CLB analysis. The value for the adjusted reference temperature at the vessel inside surface (0T ART) was also updated based on neutron fluence experienced through 60 years of plant operation to be 83.1°F for the shell. The staff finds the use of the 0T ART value to be conservative because the applicant is considering a more embrittled condition (due to higher neutron fluence) of the reactor vessel material at the inside surface when compared to the condition at the location of the postulated flaw at the ¼T (thickness) location. The staff's evaluation of this ART value is documented in SER Section 4.2.3. The staff noted that the

ASME Code limits the maximum stress intensity factor experienced during a LOCA to be $K_{IC}/\sqrt{2}$. Furthermore, the applicant set the upper shelf value of fracture toughness, K_{IC}, of the reactor vessel shell material is 200 ksi√in. The staff finds this upper shelf value of fracture toughness acceptable because it is based on Section A-4200 of Appendix A to Section XI to the ASME Code. Thus, based on the minimum reactor vessel temperature of 280°F during the transient, and the limiting ART at 0T at 54 EFPY, the applicant demonstrated a margin of a factor of 1.3 when comparing the maximum stress intensity factor of 105 ksi√in from the transient with the ASME allowed value of 141 ksi√in.

The TLAA also includes analysis of crack stability during a recirculation line break. This analysis was performed by the applicant for a postulated surface flaw of depth of 0.052t, rather than a surface flaw depth of ¼T thickness location postulated for the main steam line break. The staff finds this acceptable because the ASME Section XI ISI acceptance criteria for the subject pressure vessel welds (IWB-3500, Examination Category B-A, Item No. B1.12), would not allow a flaw larger than 0.052t to be left in-place without further action, and the subject weld is inspected during every ISI interval in accordance with ASME Code Section XI. Additionally, the staff confirmed during the audit that the subject Examination Category B-A, Item No. B1.12, welds met the flaw acceptance standards of IWB-3500 during the most recent ASME Section XI ISI of the welds. The applicant stated the maximum stress intensity factor, $K_{Iapplied}$, for a postulated 0.052t flaw for the RPV shell experiencing a recirculation line break to be 56 ksi√in at 480 seconds into the transient. The postulated temperature of the vessel at this point in the transient is 160°F. Furthermore, the applicant stated that the value of fracture toughness, K_{IC}, of the reactor vessel shell material as 130 ksi√in at this temperature. The applicant demonstrated a margin of a factor of 1.6 when comparing the maximum stress intensity factor of 56 ksi√in from the transient with the ASME allowed value of 92 ksi√in (130 ksi√in/1.414).

The applicant also included the low pressure coolant injection N6 nozzles and water level instrument N12 nozzles in the evaluation. The applicant stated that the N6 nozzles do not exceed the 1.0×10^{17} n/cm^2 fluence threshold prior to 54 EFPY, but the N12 nozzles do. The applicant stated that the N12 nozzles are not bounding for the current analysis because of thermal transient conditions and lack of significant pressure load during the postulated time of maximum thermal stresses. The staff find this acceptable because the N6 nozzles do not meet material embrittlement fluence threshold of 1.0×10^{17} n/cm^2 identified in Appendix H to 10 CFR Part 50, and the N12 nozzles do not experience enough crack driving force to be more limiting than the other postulated vessel locations. The staff also noted during the audit that the water instrument level nozzles are made of a stainless-steel alloy; as such, the staff determined that the embrittlement neutron fluence threshold of 1.0×10^{17} n/cm^2 for ferritic materials do not apply to these nozzles.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis for the reactor coolant pressure boundary and RPV, as modified by letter dated August 7, 2024 (ML24220A270), has been projected to the end of the PEO. Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1.2 because the applicant has demonstrated that the maximum stress intensity factor, $KI_{applied}$, for the limiting transient based on the largest $KI_{applied}$ value (i.e., the main steam line break transient) on the RPV materials (i.e., the RPV shell) is less than the ASME Code limit when accounting for neutron embrittlement through 54 EFPY.

4.2.6.3 UFSAR Supplement

LRA Section A.2.2.6 provides the UFSAR supplement summarizing the analysis of adequate margin against non-ductile failure of the RPV following a reflood event. The staff reviewed LRA Section A.2.2.6 consistent with the review procedures in SRP-LR Section 4.7.3.2.

Based on its review, the staff finds that the UFSAR 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 analysis of adequate margin against non-ductile failure of the RPV following a reflood event, as required by 10 CFR 54.21(d).

4.2.6.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis of adequate margin against non-ductile failure of the RPV following a reflood event for the reactor coolant pressure boundary and reactor vessel have been projected to the end of the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, 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:

- “Class 1 Fatigue” (LRA Section 4.3.1)
- “Non-Class 1 Fatigue” (LRA Section 4.3.2)
- “Environmental Fatigue” (LRA Section 4.3.3)
- “Reactor Vessel Internals Fatigue” (LRA Section 4.3.4)
- “Intermediate High-Energy Line Break (HELB) Location Determination” (LRA Section 4.3.5)

4.3.1 Class 1 Fatigue

4.3.1.1 Summary of Technical Information in the Application

LRA Section 4.3.1 describes the applicant’s fatigue TLAA for ASME Code Section III, Class 1 piping systems and components. The 60-year transient cycles are estimated by projecting the actual cycles accumulated since the start of the plant operation. The 60-year projected cycles are used as the input to the 60-year cumulative usage factor (CUF) calculations. The fatigue analysis for 60 years of operation indicates that the 60-year projected values for the ASME Code Section III, Class 1 piping systems and components do not exceed the fatigue design limit (i.e., 1.0).

The applicant dispositioned the fatigue TLAA on 60-year cycle projection 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 Class 1 piping systems and components will be adequately managed by the Fatigue Monitoring AMP for the PEO. The Fatigue Monitoring AMP will be used to ensure that the CUFs for the Class 1 piping systems and components do not exceed the design limit of 1.0.

4.3.1.2 Staff Evaluation

The staff reviewed the applicant's fatigue TLAA on transient cycle projections for 60-year operation for ASME Code Section III, Class 1 piping systems and 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.

Based on the transient cycles accrued since the start of plant operation to April 13, 2021, the applicant estimated the 60-year transient cycles as described in LRA Table 4.3-1. The staff finds that the cycle projections are reasonable because the applicant used the actual cycle accumulation data in the projections. The applicant used the 60-projected cycles to calculate the CUF values for the RPV and Class 1 piping systems including the following piping systems:

- nuclear boiler
- reactor recirculation
- standby liquid control
- residual heat removal
- low pressure core spray
- high pressure core spray
- reactor core isolation cooling
- reactor water cleanup
- feedwater

The applicant indicated that the 60-year projected CUF values for the RPV components do not exceed the fatigue design limit of 1.0, as described in LRA Table 4.3-2. The applicant also indicated that the 60-year projected CUF values for Class 1 piping systems do not exceed the fatigue design limit (1.0), as described in LRA Table 4.3-3.

The applicant also proposed to use the Fatigue Monitoring AMP to manage the aging effect of cumulative fatigue damage associated with the fatigue TLAA for the Class 1 piping systems and components. The staff noted that the Fatigue Monitoring AMP monitors the actual transient cycles, which are used as the input to the CUF calculations, to ensure that the CUF values will not exceed the design limit of 1.0 (SER Section 3.0.3.2.9).

The staff finds that the applicant's use of the Fatigue Monitoring AMP is adequate to manage the effects of cumulative fatigue damage because the program monitors the transient cycles to ensure that the CUF values meet the design limit (1.0), consistent with the guidance in the

GALL-LR Report AMP X.M1. “Fatigue Monitoring.” In its review, the staff finds that the fatigue TLAA for the ASME Code Section III, Class 1 piping systems and components is acceptable because (1) the 60-year projected CUF values are less than the design limit of 1.0 and (2) the Fatigue Monitoring AMP will ensure that the CUF values continue to meet the design limit of 1.0 by monitoring the transient cycles and performing corrective action as needed (e.g., repair/replacement of components and refinement of fatigue analysis).

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 Class 1 piping systems and components will be adequately managed for the PEO. Additionally, it meets the acceptance criteria in SRP-LR Section 4.3.2.1.1.3 because the applicant proposed using the Fatigue Monitoring AMP to manage the effects of cumulative fatigue damage, consistent with the guidance in SRP-LR Section 4.3.2.1.1.3. As previously noted, the staff’s evaluation of the Fatigue Monitoring AMP is documented in SER Section 3.0.3.2.9.

4.3.1.3 UFSAR Supplement

LRA Section A.2.3.1 provides the UFSAR supplement summarizing the fatigue analysis of the Class 1 piping systems. The staff reviewed LRA Section A.2.3.1, consistent with the review procedures in SRP-LR Section 4.3.3.2. Based on its review of the UFSAR supplement, the staff finds that it meets the acceptance criteria in SRP-LR Section 4.3.2.2, and is, therefore, acceptable. The staff also finds that the applicant provided an adequate summary description to address the metal fatigue TLAA for the ASME Code Section III, Class 1 piping systems and components, as required by 10 CFR 54.21(d).

4.3.1.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of cumulative fatigue damage on the intended functions of the ASME Code Section III, Class 1 piping systems and components will be adequately managed by the Fatigue Monitoring AMP for the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2 Non-Class 1 Fatigue

4.3.2.1 Summary of Technical Information in the Application

LRA Section 4.3.2, as supplemented by letter dated August 7, 2024 (ML24220A270) describes the fatigue TLAA for the 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 whether a stress range reduction factor less than 1.0 is required. The applicant dispositioned the non-Class 1 fatigue TLAA in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analysis remains valid for the PEO.

4.3.2.2 Staff Evaluation

The staff reviewed the fatigue TLAA for the non-Class 1 piping systems and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-LR Section 4.3.3.1.2.1.

The applicant indicated that Perry Unit 1 has piping systems that were designed in accordance with the ASME Code Section III Class 2 or 3 or 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 the transient cycles is 7,000 or less, a stress range reduction factor of 1.0 is applied to the allowable stress range for expansion stress, 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 transient cycles is greater than 7,000, a stress range reduction factor less than 1.0 is applied to the allowable stress range.

The applicant explained that some of the non-Class 1 piping systems (e.g., residual heat removal and high pressure core spray piping) are attached to ASME Section III, Class 1 piping and are affected by the same thermal and pressure transients as the Class 1 piping systems. The applicant also stated that the 60-year projections for the transient types that affect these piping systems demonstrate that the total number of cycles through the PEO are limited to well below 7,000 cycles.

The staff finds that the applicant’s evaluation for the non-Class 1 piping systems, which are connected to the Class 1 piping systems, is acceptable because (1) the 60-projected cycles for these non-Class 1 piping systems do not exceed 7000 cycles, as shown in LRA Table 4.3-1; (2) there is no need to apply a stress range reduction factor less than 1.0; and (3) therefore, the existing allowable stress TLAA for the non-Class 1 piping systems remains valid for PEO.

For the other non-Class 1 piping systems, the applicant explained that an operational review was performed for each system (1) to determine the number of cycles that have occurred in the past and (2) to project the total number of cycles that will occur through the PEO. The applicant also indicated that the operation review and cycle projections include the cycles during unit pre-operational testing, plant operational cycles, and periodic surveillance test cycles, as applicable. In LRA Table 4.3-3A, the applicant provided the 60-year projected cycles for the following non-Class 1 piping systems, which are not connected to the Class 1 piping:

- control and computer room humidification
- reactor plant sampling
- fire protection
- auxiliary steam and drains
- hydrogen chemistry system
- post-accident sampling
- division 1 and 2 standby diesel generator exhaust, intake, and crankcase
- emergency diesel generator

The staff finds that the applicant’s cycle projection and evaluation for the non-Class 1 piping systems, which are not connected to the Class 1 piping systems, are acceptable because:

(1) The applicant's cycle projections used the relevant information such as plant operation data, test requirements, and specific transient cycles for the piping per unit time period (e.g., monthly or annular cycles).

(2) The estimated 60-year cycles are less than 7,000 cycles such that there is no need to reduce the existing stress range reduction factor (i.e., 1.0).

(3) Accordingly, the existing allowable stress TLAA for the non-Class 1 piping systems remains valid for the PEO.

As discussed above, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the analysis of the effects of cumulative fatigue damage on the intended functions of the non-Class 1 piping systems remains valid for the PEO. Additionally, it meets the acceptance criteria in SRP-LR Section 4.3.2.1.2.1 because the applicant demonstrated that the existing allowable stress analysis remains valid for the PEO.

4.3.2.3 UFSAR Supplement

LRA Section A.2.3.2 provides the UFSAR supplement summarizing the allowable stress analysis of the non-Class 1 piping systems. The staff reviewed LRA Section A.2.3.2, consistent with the review procedures in SRP-LR Section 4.3.3.2. Based on its review, the staff finds that the UFSAR 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).

4.3.2.4 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 analysis of the effects of cumulative fatigue damage on the allowable stresses and the intended functions of the non-Class 1 piping systems remains valid for the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.3 Environmental Fatigue

4.3.3.1 Summary of Technical Information in the Application

LRA Section 4.3.3, as supplemented by letters dated August 7, 2024 (ML24220A270), and September 16, 2024 (ML24260A266), describes the applicant's TLAA on the environmental fatigue (also called environmentally assisted fatigue or EAF) of reactor coolant pressure boundary components and piping. The EAF analysis considers the limiting EAF locations described in NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components," and additional plant-specific locations that could be more limiting than the NUREG/CR-6260 locations. In the analysis, the environmental cumulative usage factor (CUF_{en}) value is calculated in accordance with NUREG/CR-6909, Revision 0, "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 (LRA Section B.2.19).

4.3.3.2 Staff Evaluation

The staff reviewed the applicant's EAF TLAA and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.3.3.1.3.

As addressed in LRA Section 4.3.3, the applicant performed an EAF analysis on the following reactor coolant pressure boundary components and piping that are NUREG/CR-6260 locations:

- reactor vessel shell and lower head
- reactor vessel feedwater nozzle
- recirculation piping including inlet and outlet nozzles
- core spray line reactor vessel nozzle and associated Class 1 piping
- residual heat removal nozzles and associated Class 1 piping
- feedwater line 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, by performing 60-year CUF_{en} calculations for the NUREG/CR-6260 locations. The staff also noted that the CUF_{en} calculations for the NUREG/CR-6260 locations were performed in accordance with the guidance in NUREG/CR-6909, Revision 0, which is consistent with the guidance in SRP-LR Section 4.3.2.1.3.

In addition, the applicant performed an EAF screening evaluation to identify additional plant-specific locations that may be more limiting than the NUREG/CR-6260 locations in terms of CUF_{en}. The screening process evaluated the reactor coolant pressure boundary component and piping locations, and the screening results for the limiting (also called sentinel) locations are described in LRA Table 4.3-5.

The applicant also discussed the use of thermal zones in the screening evaluation that was performed to identify additional limiting locations. The staff concludes the applicant used an adequate approach in the determination of the thermal zone because a thermal zone is defined as a collection of components that undergo essentially the same group of thermal and pressure transients during plant operations such that the comparison of the CUF_{en} values in each thermal zone can result in relevant and comprehensive selections of limiting EAF locations. The staff also noted that the screening evaluation appropriately considered different material types (e.g., carbon steel, low-alloy steel, and stainless steel) in the calculations of F_{en} and CUF_{en} values to determine the limiting locations for each thermal zone.

The staff finds that the screening CUF_{en} values are acceptable because they were calculated in accordance with the guidance of NUREG/CR-6909, Revision 0, consistent with SRP-LR Section 4.3.2.1.3. The staff also finds the screening CUF_{en} values are conservative because the applicant estimated the bounding F_{en} values based on the following conservative parameters in the F_{en} calculation per NUREG/CR-6909, Revision 0: (1) the maximum temperature for each thermal zone, (2) the most conservative strain rate, and (3) the most conservative sulfur content for steel materials.

In addition, the applicant performed the more detailed EAF analysis to refine the CUF_{en} calculations for the limiting EAF locations as needed. The staff finds that the approach to refine the CUF_{en} values is acceptable because:

- The refined Fen values were calculated in accordance with NUREG/CR-6909, Revision 0, consistent with SRP-LR Section 4.3.2.1.3.
- If original analyses conservatively grouped multiple transients into one fatigue load pair, the transients were separated and used to create separate load pairs for each transient in a more detailed manner.
- The specific strain rate of each transient was used in-place of the most conservative strain rate in the CUF_{en} calculation for the components.

With respect to the aging management for EAF, the applicant indicated that the effects of fatigue on the intended functions of reactor coolant pressure boundary components and piping will be managed by the Fatigue Monitoring AMP (LRA Section B.2.19). The staff noted that the Fatigue Monitoring AMP monitors the actual transient cycles to ensure that the actual cycles do not exceed the transient cycles that were used as the inputs to the EAF analysis such that the CUF_{en} values will not exceed the design limit of 1.0 (SER Section 3.0.3.2.9). 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 finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of EAF on the intended functions of the reactor coolant pressure boundary components and piping will be adequately managed for the PEO. Additionally, it meets the acceptance criteria in SRP-LR Section 4.3.2.1.3 because the applicant proposed to use the Fatigue Monitoring AMP to manage the effects of EAF, consistent with the guidance in SRP-LR Section 4.3.2.1.3.

4.3.3.3 UFSAR Supplement

LRA Section A.2.3.3 provides the UFSAR supplement summarizing the EAF analysis of the reactor coolant pressure boundary components and piping. The staff reviewed LRA Section A.2.3.3, consistent with the review procedures in SRP-LR Section 4.3.3.2. Based on its review of the UFSAR supplement, the staff finds that it meets the acceptance criteria in SRP-LR Section 4.3.2.2, and is, therefore, acceptable. The staff also finds that the applicant provided an adequate summary description to address the EAF TLAA for the reactor coolant pressure boundary components and piping, 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 EAF on the intended functions of the reactor coolant pressure boundary components and piping will be adequately managed by the Fatigue Monitoring AMP for the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.4 Reactor Vessel Internals Fatigue

4.3.4.1 Summary of Technical Information in the Application

LRA Section 4.3.4 describes the applicant's fatigue TLAA on reactor vessel internal components. The reactor vessel internal core support structure components are designed in accordance with ASME Code, Section III, Subsection NG. The core support structure components have existing fatigue analyses that calculate CUF values. Therefore, the fatigue analyses for the reactor vessel internals are identified as TLAAs. The 60-year bounding CUF values for the reactor vessel internals are less than the design limit (1.0). The applicant dispositioned the fatigue TLAA in accordance with 10 CFR 54.21(c)(1)(iii) and will manage the aging effects on the reactor vessel internals for the extended period of operation by using the Fatigue Monitoring AMP (LRA Section B.2.19) and BWR Vessel Internals AMP (LRA Section B.2.14).

4.3.4.2 Staff Evaluation

The staff reviewed the applicant's fatigue TLAA for the reactor vessel internals 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.

The applicant also indicated that the core support structure components of the reactor vessel internals are designed in accordance with ASME Code, Section III, Subsection NG, and include the following components:

- shroud
- shroud support cylinder
- core plate and hardware
- top guide grid
- control rod guide tube
- control rod housing
- orificed fuel support
- peripheral fuel support

As a result, these reactor vessel internal components have fatigue analyses in the CLB, and the applicant identified the reactor vessel internal fatigue analyses as TLAAs. The staff finds that the applicant appropriately identified the fatigue analyses as TLAAs for the PEO based on the existing fatigue analyses in the CLB.

The applicant further explained that the reactor vessel internal fatigue analyses are based on the design transients used in the fatigue analyses for the RPV described in LRA Table 4.3-1. The applicant provided the 60-year projected CUF values of the limiting reactor vessel internal components in LRA Table 4.3-6. The staff finds that the 60-year projected CUF values are acceptable because the CUF values meet the fatigue design limit (1.0).

The applicant proposed to use the Fatigue Monitoring AMP and BWR Vessel Internals AMP to manage the aging effect of cumulative fatigue damage associated with the fatigue TLAA for the reactor vessel internal components. The staff noted that the Fatigue Monitoring AMP monitors the actual transient cycles, which are used as the inputs to the CUF analysis, to ensure that the CUF values will not exceed the design limit of 1.0. The staff also noted that the BWR Vessel Internals AMP performs periodic inspections to ensure the structural integrity of the reactor vessel internal components.

The staff finds that the applicant's use of the Fatigue Monitoring AMP is acceptable to manage the effects of cumulative fatigue damage because the program monitors the transient cycles to ensure that the CUF values meet the design limit (1.0), consistent with the guidance in GALL-LR Report AMP X.M1. "Fatigue Monitoring." The staff also finds that the applicant's use of the BWR Vessel Internals AMP is acceptable to manage the effects of fatigue because the BWR Vessel Internals AMP performs periodic inspections of the reactor vessel internal components and corrective actions as needed (e.g., flaw evaluation and repair and replacement activities) to ensure the structural integrity of the reactor vessel internal components, consistent with GALL-LR Report AMP XI.M9, "BWR Vessel Internals."

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 reactor vessel internal components will be adequately managed for the PEO. 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 in SRP-LR Section 4.3.2.1.1.3. The applicant's proposal to use the BWR Vessel Internals AMP for managing the effects of fatigue cracking is also consistent with GALL-LR Report AMP XI.M9. As previously noted, the staff's evaluations of the Fatigue Monitoring AMP and BWR Vessel Internals AMP are documented in SER Sections 3.0.3.2.9 and 3.0.3.2.6, respectively.

4.3.4.3 UFSAR Supplement

LRA Section A.2.3.4 provides the UFSAR supplement summarizing the fatigue TLAA for the RPV internals. The staff reviewed LRA Section A.2.3.4, consistent with the review procedures in SRP-LR Section 4.3.3.2. Based on its review of the UFSAR supplement, the staff finds that it meets the acceptance criteria in SRP-LR Section 4.3.2.2, and is, therefore, acceptable. The staff also finds that the applicant provided an adequate summary description to address the metal fatigue TLAA for the reactor vessel internal components, as required by 10 CFR 54.21(d).

4.3.4.4 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 cumulative fatigue damage and fatigue cracking on the intended functions of the reactor vessel internal components will be adequately managed by the Fatigue Monitoring AMP and BWR Vessel Internals AMP for the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.5 Intermediate High-Energy Line Break (HELB) Location Determination

4.3.5.1 Summary of Technical Information in the Application

LRA Section 4.3.5, as supplemented by letter dated August 7, 2024 (ML24220A270), describes the TLAA on the intermediate HELB location determination for Class 1 piping. As described in UFSAR Section 3.6.2.1.5, the postulation of Class 1 intermediate HELB locations relies on an evaluation of CUF values. The threshold for the break location postulation is a CUF of 0.1. Because the CUF values are based on time dependent transient cycles, the analysis on the HELB break location postulation is identified as a TLAA.

The applicant dispositioned the HELB TLAA for the Class 1 piping 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 Class 1 high-energy piping will be adequately managed by the Fatigue Monitoring AMP for the PEO. The Fatigue Monitoring AMP (LRA Section B.2.19) will monitor transient cycles and severities and will require actions as needed to ensure that the postulation of HELB locations continue to be valid for the PEO.

4.3.5.2 Staff Evaluation

The staff reviewed the applicant's TLAA on the HELB location postulation 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.

As discussed in UFSAR Section 3.6.2.1.5, the 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. UFSAR Section 3.6.2.1.5 also indicates that the HELB postulation follows the guidance in NRC Branch Technical Positions APCSB 3-1 and MEB 3-1 (ML19282E104 and ML19221B014). The applicant also explained that that the time-limited aspect of the HELB analyses includes a CUF screening criterion of 0.1 for the postulation of Class 1 HELB locations.

The applicant indicated that the Fatigue Monitoring AMP will monitor the design transient cycles and the resultant CUF values and will take actions as needed (e.g., refined CUF analyses or repair/replacement of components) to ensure that the existing HELB location postulation for the Class 1 piping continue to be valid for the PEO. 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. The staff also finds that the applicant's use of the Fatigue Monitoring AMP 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 the validity of the HELB location postulation for Class 1 piping for the PEO.

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 HELB location postulation and intended functions of the Class 1 high-energy piping will be adequately managed for the PEO. 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 Program AMP to manage the effects of cumulative fatigue damage, consistent with the guidance in the SRP-LR.

4.3.5.3 UFSAR Supplement

LRA Section A.2.3.5, as supplemented by letter dated July 24, 2024 (ML24206A150), provides the UFSAR supplement summarizing the Class 1 HELB TLAA. The staff reviewed LRA Section A.2.3.5, consistent with the review procedures in SRP-LR Section 4.3.3.2. Based on its review of the UFSAR 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 TLAA on Class 1 HELB location postulation, as required by 10 CFR 54.21(d).

4.3.5.4 Conclusion

Based on its review, the staff concludes the following. 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 Class 1 HELB location postulation and the intended functions of the Class 1 piping will be adequately managed by the Fatigue Monitoring AMP for the PEO. In addition, the staff concludes that the UFSAR supplement contains an adequate 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 PEO. 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 by the applicant 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 PEO.

4.4.2 Staff Evaluation

The staff reviewed the applicant’s TLAA for the EQ of electrical 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 in its end-of-life condition, it will meet its performance specifications during and following design-basis accidents. An EQ of electrical 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. Electrical 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 whether 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 PEO. The staff reviewed the applicant's EQ program, including the management of aging effects, to confirm that electrical equipment requiring EQ will continue to operate consistent with the CLB during the PEO.

The staff also conducted an audit of the information provided in LRA Section B.2.17, the program basis document, and other program documents provided to the staff during the audit. Based on the staff review of LRA Section B.2.17 and the results of the audit, the staff concludes that the 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 Electrical Components program is documented in SER Section 3.0.3.1.17.

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 methods, underlying assumptions, acceptance criteria, ongoing qualifications, and corrective actions (if acceptance criteria are not met). The applicant noted that environmentally qualified electrical 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 electrical equipment, will be adequately managed for the PEO. 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), environmentally qualified electrical components are refurbished, replaced, or their qualification is extended prior to reaching the aging limit established in the evaluation.

Additionally, the applicant's EQ program meets the acceptance criteria in SRP-LR Section 4.4.2.1.3 as it is capable of programmatically managing the qualified life of components within the scope of program for license renewal and that the continued implementation of the EQ program provides assurance that the aging effects will be managed and that environmentally qualified electrical components will continue to perform their intended functions for the PEO consistent with the requirements of 10 CFR 54.21(c)(1)(iii).

4.4.3 UFSAR Supplement

LRA Section A.1.17 provides the UFSAR supplement summarizing the EQ of Electrical Components. The staff reviewed LRA Section A.1.17 consistent with the review procedures in SRP-LR Section 4.4.3.2.

The staff also noted that the applicant committed (Commitment No. 17) to continue the existing EQ of Electrical Components program for managing the effects of aging for applicable components during the PEO.

Based on its review, the staff finds that the UFSAR 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 the TLAA for the EQ of electrical 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 environmentally qualified electrical components will be adequately managed by the EQ of Electrical Components program for the PEO. The staff also concludes that the UFSAR supplement contains an adequate 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 TLAAs for the following containment structure and components:

- steel containment vessel
- containment piping penetrations
- containment piping penetration bellows

4.5.1 Containment Vessel

4.5.1.1 Summary of Technical Information in the Application

LRA Section 4.5.1 describes the applicant's TLAA for the containment vessel. The applicant stated that Perry's GE BWR/6 has a Mark III free-standing steel containment vessel anchored to the foundation mat. The domed pressure-retaining cylindrical structure is designed, fabricated, and erected in accordance with the requirements of ASME Code Section III for Class MC components. The applicant dispositioned the TLAA for the steel containment vessel in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of fatigue on the intended functions of the containment vessel will be adequately managed by the Fatigue Monitoring Program, which will continue to monitor CUFs at critical structure and component locations during the PEO.

4.5.1.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the steel containment vessel fatigue analysis and the corresponding disposition of 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.6.3.1.1.3. In its review, the staff considered Perry UFSAR Section 3.8.2, "Steel Containment," Revision 23 to confirm that the steel containment vessel cyclic loading design was based on detailed fatigue analysis requirements of ASME Code, Section III, Subsection NE for specified stress cycles and service loadings.

During the Perry LRA regulatory audit (ML24239A778), the staff reviewed the applicant's Audit Portal information to help identify critical containment vessel structure and component locations of highest fatigue usage for cycle-based fatigue monitoring. In its review, the staff noted that the applicant considered the highest fatigue usage components for each analyzed portion of the steel containment vessel structure for the selection of its "limiting location" to be included in the Fatigue Monitoring Program. Based on the audit and reviewed documents, the staff confirmed that the 32-inch diameter, P-101 lower containment vessel penetration location, selected in LRA Table 4.5-1, is the limiting and bounding location and included in the Fatigue Monitoring

Program for the containment CUF evaluation. The staff also confirmed that the projected CUF at that location remains less than the design limit of 1.0 during the PEO.

During its evaluation of the TLAA, the staff also reviewed the Perry Fatigue Monitoring AMP and noted that it tracks and evaluates transient cycles. Based on specified parameters, the program calculates CUFs to ensure that limiting locations and components remain below design limits and when these are approached it prompts corrective actions to be taken. The staff also noted that LRA Table 4.3-1 describes the transients considered by the program in the fatigue evaluation, their associated design cycles, those accrued as of April 13, 2021, and those projected to the end of the PEO. The staff further noted that LRA Table 4.5-1 aligns with LRA Table 4.3-3, which includes CUFs for all Class 1 piping including those associated with the selected P-101 containment vessel penetration limiting and bounding location. The staff's evaluation of the Fatigue Monitoring AMP is documented in SER Section 3.0.3.2.9.

Accordingly, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21 (c)(iii), that the effects of fatigue due to cyclic loading on the intended functions of the containment vessel will be adequately managed for the PEO. Additionally, LRA Section 4.5.1 meets the acceptance criteria in SRP-LR Section 4.6.2.1.1.3 because the applicant's proposed Fatigue Monitoring AMP ensures that the effects of fatigue due to cyclic loading of the steel containment vessel will be adequately managed for the PEO.

4.5.1.3 UFSAR Supplement

LRA Section A.2.5.1 provides the UFSAR supplement summarizing the containment vessel design and construction, including the fatigue analysis performed in accordance with the ASME Code requirements. It also describes actions taken to monitor the CUF and manage the effects of fatigue on the containment vessel by the Fatigue Monitoring Program at its most critical and bounding component location(s) and states that the evaluation remains valid to the end of the PEO. The staff reviewed LRA Section A.2.5.1 consistent with the review procedures in SRP-LR Section 4.6.3.1.1.3. Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-LR Section 4.6.2.1.1.3 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address monitoring of the containment vessel CUF at its most limiting location, bounding all other locations, as required by 10 CFR 54.21(d).

4.5.1.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of cumulative fatigue damage, due to cyclic loading, on the intended function(s) of the steel containment vessel will be adequately age managed by the Fatigue Monitoring AMP (B.2.19) for the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation as required by 10 CFR 54.21(d).

4.5.2 Containment Piping Penetrations

4.5.2.1 Summary of Technical Information in the Application

LRA Section 4.5.2 describes the applicant's TLAA for the containment piping penetrations. The applicant indicated that the containment penetrations are designed in accordance with the requirements of Section III of the ASME Boiler and Pressure Vessel Code. The applicant dispositioned the TLAAs for the containment piping penetrations in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of fatigue on their intended functions will be adequately managed by the Fatigue Monitoring Program, which will continue to monitor CUFs at bounding piping containment penetration locations during the PEO.

4.5.2.2 Staff Evaluation

The staff reviewed the applicant's TLAA for containment piping penetrations fatigue analysis and the corresponding disposition of 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-LR Section 4.6.3.1.1.3. In its review of LRA Section 4.5.2, the staff confirmed that the fatigue analysis requirements for the steel containment vessel, as noted in UFSAR Section 3.8.2, were evaluated in accordance with the requirements of the ASME Code, Section III.

During the Perry LRA regulatory audit (ML24239A778), the staff reviewed the applicant's Audit Portal information for fatigue monitoring that helped identify critical containment piping penetration locations of highest fatigue usage. Based on the audit and reviewed documents, the staff confirmed that the applicant considered the number and severity of cycles and other parameters when selecting the "limiting locations" for the Fatigue Monitoring Program to monitor and calculate the highest CUF of the containment penetrations attached to Class 2 or 3 piping system and the CUF for penetrations attached to Class 1 piping system. The staff's evaluation of the Fatigue Monitoring AMP is documented in SER Section 3.0.3.2.9.

In its evaluation, the staff also reviewed LRA Section 4.3, "Metal Fatigue," and noted that the Perry Fatigue Monitoring Program, as described in LRA Section B.2.19, tracks and evaluates transient cycles for Class 1 and non-Class 1 piping so that they do not exceed the design cycles and calculates CUFs at the limiting locations and bounding components to ensure that these remain below design limits of 1.0, and that corrective actions are taken when these limits are approached. The staff also reviewed LRA Table 4.3-3 which provides a summary of fatigue usage for Class 1 piping and confirmed that all locations for the projected 60 year (end of the PEO) had CUFs below the allowable design limit. In its review of the audited documents the staff confirmed that LRA Table 4.5-2 identifies the most limiting penetration location for Class 1 piping to be the P-121 penetration, and for non-Class 1 piping the P-402, P-421, and P-424 with projected CUFs less than 1.0 at the end of the PEO.

Accordingly, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21 (c) (iii), that the effects of fatigue due to cyclic loading on the intended functions of the containment piping penetrations will be adequately managed for the PEO. Additionally, LRA Section 4.5.2 meets the acceptance criteria in SRP-LR Section 4.6.2.1.1.3 because the applicant's proposed Fatigue Monitoring AMP ensures that the effects of fatigue due to cyclic loading of containment piping penetrations will be adequately managed during the PEO.

4.5.2.3 UFSAR Supplement

LRA Section A.2.5.2 provides the UFSAR supplement summarizing the fatigue analysis, actions taken by the Fatigue Monitoring AMP to monitor CUFs at the most critical and bounding containment penetration location(s) and associated components. It also states that the evaluation remains valid and in accordance with the ASME fatigue requirements during the PEO. The staff reviewed LRA Section A.2.5.2 consistent with the review procedures in SRP-LR Section 4.6.3.1.1.3. Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-LR Section 4.6.2.1.1.3 and is, therefore, acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address monitoring the containment piping penetrations CUFs at the most limiting locations and associated components as required by 10 CFR 54.21(d).

4.5.2.4 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, due to cyclic loading, on the intended functions of the most critical containment piping penetrations and associated piping components will be adequately age managed by the Fatigue Monitoring AMP (B.2.19) for the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation as required by 10 CFR 54.21(d).

4.5.3 Containment Piping Penetrations Bellows

4.5.3.1 Summary of Technical Information in the Application

LRA Section 4.5.3, as amended by letter dated August 7, 2024, in LRA Supplement 1 (ML24220A270), describes the applicant's TLAA for the containment piping penetrations bellows. The applicant dispositioned the TLAA for the containment piping penetrations bellows in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of fatigue on their intended functions will be adequately managed by the Fatigue Monitoring Program which will continue to monitor CUFs at critical locations during the PEO.

4.5.3.2 Staff Evaluation

The staff reviewed the applicant's TLAA, for the containment piping penetration bellows fatigue analyses 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 4.6.3.1.1.3. The staff reviewed LRA Section 4.5.3 and noted that the design specification required the bellows used in containment penetrations be analyzed for at least 500 cycles of normal operation plus one safe shutdown earthquake cycle for 40 years of operation.

During the Perry LRA regulatory audit (ML24239A778), the staff reviewed the applicant's audit Portal information for penetration bellows fatigue monitoring. The staff noted that the applicant initially dispositioned the containment piping penetration bellows TLAA in the LRA under 10 CFR 54.21(c)(1)(i) rather than under 10 CFR 54.21(c)(1)(iii) as for the penetrations to which the bellows are associated. The staff participated in audit meetings with the applicant and clarified information about TLAA evaluations of aging management programs under 10 CFR 54.21(c)(1). In Supplement 1, the applicant re-dispositioned the containment piping penetration bellows TLAA from 10 CFR 54.21(c)(1)(i) to 10 CFR 54.21(c)(1)(iii) and revised LRA Section 4.5-3 to indicate alignment of the bellows' fatigue monitoring usage with those of associated penetrations. As a result, the effects of fatigue on the containment piping penetrations bellows will be managed for the PEO by the Fatigue Monitoring AMP (B.2.19).

The staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21 (c)(iii), that the effects of fatigue due to cyclic loading on the intended functions of the containment piping penetration bellows will be adequately managed for the PEO., because it will be managed by the Fatigue Monitoring Program which will continue to monitor CUFs at critical locations during the PEO. Additionally, LRA Section 4.5.3 meets the acceptance criteria in SRP-LR

Section 4.6.2.1.1.3 because the applicant's proposed addition to the Fatigue Monitoring Program shall monitor the number of occurrences of the plant transients associated with the containment piping penetrations bellows fatigue analysis to ensure that the effects of aging of containment piping penetrations bellows remain within design acceptance criteria during the PEO.

4.5.3.3 UFSAR Supplement

LRA Section A.2.5.3 provides the UFSAR supplement, as amended by letter dated July 24, 2024, in LRA Supplement 3 (ML24206A150), summarizing the fatigue analysis and monitoring of containment piping penetration bellows critical structure and component location most limiting CUF. The staff reviewed LRA Section A.2.5.3 consistent with the review procedures in SRP-LR Section 4.6.3.1.1.3. The staff also noted that the applicant committed (Commitment No. 19) to enhance the existing Fatigue Monitoring Program to incorporate managing the effects of fatigue on the containment piping penetration bellows. Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-LR Section 4.6.2.1.1.3 and is, therefore, acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address monitoring the containment piping penetrations bellows' CUFs at their most limiting location as required by 10 CFR 54.21(d).

4.5.3.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii) that the effects of cumulative fatigue damage due to cyclic loading, on the intended functions of the containment piping penetrations bellows will be adequately age managed by the Fatigue Monitoring AMP (B.2.19) for the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation as required by 10 CFR 54.21(d).

4.6 Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analyses

4.6.1 Crane Load Cycles

4.6.1.1 Summary of Technical Information in the Application

LRA Section 4.6.1 describes the applicant's TLAA for crane load cycle limits. The applicant dispositioned the TLAAs for the Reactor Building Crane (a.k.a., Containment Polar Crane), Fuel Handling Building Crane and Emergency Service Water Pump House Crane in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analyses remain valid for the PEO.

4.6.1.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the Reactor Building Crane, Fuel Handling Building Crane, and Emergency Service Water Pump House Crane and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-LR Section 4.7.3.1.1.

4.6.1.2.1 Reactor Building Crane (a.k.a., Containment Polar Crane)

The applicant conservatively projected 2,000 cycles in LRA Section 4.6.1, “Crane Load Cycles,” for the 60-year plant operating life including the PEO. The staff reviewed the basis for the estimated number of cycles for refueling outages and the final core off load as well as the pre-operational construction period and finds that the estimates for the expected number of cycles over the plant life to the end of the PEO are reasonable. Therefore, this confirms the applicant’s conservative projected number of 2,000 cycles remains well below the CLB load cycle limit of 20,000 provided for service Class A in Crane Manufactures Association of America (CMAA) Specification No. 70, “Specifications for Electrical Overhead Traveling Cranes,” 1975, and the Reactor Building Crane TLAA remains valid for the PEO.

4.6.1.2.2 Fuel Handling Building Crane

The applicant conservatively projected 11,500 cycles in LRA Section 4.6.1, “Crane Load Cycles,” for the 60-year plant operating life including the PEO. The staff reviewed the basis for the estimated number of cycles for refueling outages and the final core off load as well as the pre-operational construction period and finds that the estimates for the expected number of cycles over the plant life to the end of the PEO are reasonable. Therefore, this confirms the applicant’s conservative projected number of 11,500 cycles remains well below the CLB load cycle limit of 20,000 provided for service Class A in CMAA Specification No. 70, 1975, and the fuel handling building crane TLAA remains valid for the PEO.

4.6.1.2.3 Emergency Service Water Pump House Crane

The applicant conservatively projected 2,000 cycles in LRA Section 4.6-1, “Crane Load Cycles,” for the 60-year plant operating life including the PEO. The staff reviewed the basis for the estimated number of cycles for crane usage throughout the calendar year as well as the pre-operational construction period and finds that the estimates for the expected number of cycles over the plant life to the end of the PEO are reasonable. Therefore, this confirms the applicant’s conservative projected number of 2,000 cycles remains well below the CLB load cycle limit of 20,000 provided for service Class A in CMAA Specification No. 70, 1975, and the Emergency Service Water Pump House Crane TLAA remains valid for the PEO.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for Reactor Building Crane, Fuel Handling Building Crane, and Emergency Service Water Pump House Crane remain valid for the PEO. 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 No.70 allowable load cycles and are, therefore, valid through the PEO.

4.6.1.3 UFSAR Supplement

LRA Appendix A, Section A.2.6.1 provides the UFSAR supplement summarizing the cranes that are subject to this TLAA and lists the cranes’ number of expected cycles for the PEO, as well as the limiting number of cycles. The staff reviewed LRA Section A.2.6.1 consistent with the review procedures in SRP-LR Section 4.7.3.2.

Based on its review, the staff finds that the UFSAR 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 cycle load limits, 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 analyses for the crane load cycle limits remain valid for the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6.2 Main Steam Line Flow Restrictors Erosion Analysis

4.6.2.1 Summary of Technical Information in the Application

LRA Section 4.6.2 describes the applicant's TLAA for the erosion analysis of the main steam line flow restrictors that are designed to limit the critical flow associated with a postulated main steam line break. The applicant dispositioned the TLAA for the main steam line flow restrictors in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the PEO. By conservatively projecting the increased flow rate of the flow restrictors to account for an additional twenty years of erosion, the applicant showed that the resulting mass flow rates would be substantially less than the assumed flow rate in the UFSAR main steam line break accident analysis.

4.6.2.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the main steam line flow restrictors and the corresponding disposition in accordance with the review procedures in SRP-LR Section 4.7.3.1.2. The staff concludes that the applicant has demonstrated that the calculated increase in mass flow rate, due to additional erosion of the main steam flow restrictors, would still be within the assumed mass flow rate in the accident analysis for a postulated main steam line break.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis for erosion of the main steam line flow restrictors has been projected to the end of the PEO. Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 because the applicant demonstrated that the projected increased mass flow rate for a main steam line break is within the assumed mass flow rates in the associated accident analysis.

4.6.2.3 UFSAR Supplement

LRA Section A.2.6.2 provides the UFSAR supplement summarizing the main steam line flow restrictor erosion analysis. The staff reviewed LRA Section A.2.6.2, consistent with the review procedures in SRP-LR Section 4.7.3.2. Based on its review, the staff finds that the UFSAR 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 erosion analysis for the main steam line flow restrictors, 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)(ii), that the analysis for the main steam line flow restrictors has been projected to the end of the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6.3 Reduction in Fracture Toughness for the Reactor Vessel Internals

4.6.3.1 Summary of Technical Information in the Application

LRA Section 4.6.3 describes the applicant's TLAA for neutron irradiation embrittlement of the reactor vessel internals. The applicant dispositioned the TLAA for the reactor vessel internals in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of irradiation embrittlement on the intended functions will be adequately managed by the BWR Vessel Internals AMP for the PEO.

4.6.3.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the reactor vessel internals 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. The BWR Vessel Internals AMP is predicated on a series of BWRVIP topical reports. These topical reports address several engineering aspects of aging management of vessel internals, including but not limited to safety significance of vessel internals components, examination guidance, and flaw evaluation procedures. The BWRVIP topical reports address reduction in fracture toughness, specifically, through examinations to detect flaws that may challenge the structural integrity of safety-significant vessel internals components. The BWRVIP continuously updates the guidance based on operating experience and research results, subject to NRC staff review. The NRC staff independently reviewed and approved the BWRVIP topical reports credited as part of the applicant's BWR Vessel Internals AMP for technical adequacy and ability to manage age-related degradation of the reactor vessel internals as part of the topical report review process. The staff's evaluation of the BWR Vessel Internals Program is documented in SE Section 3.0.3.2.6. Therefore, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of irradiation embrittlement on the intended functions of the reactor vessel internals will be adequately managed for the PEO.

Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 and the disposition of 10 CFR 54.21(c)(1)(iii) because the applicant is crediting previously NRC reviewed and approved aging management guidance contained in BWRVIP topical reports, which are implemented as part of the applicant's BWR Vessel Internals Program, to adequately manage the effects of aging on the intended functions of the reactor vessel internals during the PEO.

4.6.3.3 UFSAR Supplement

LRA Section A.2.6.3 provides the UFSAR supplement summarizing the reactor vessel internals embrittlement TLAA. The staff reviewed LRA Section A.2.6.3 consistent with the review procedures in SRP-LR Section 4.7.2.2.

Based on its review, the staff finds that the UFSAR 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 reactor vessel internals embrittlement TLAA, as required by 10 CFR 54.21(d).

4.6.3.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of neutron irradiation embrittlement on the intended functions of the reactor vessel internals will be adequately managed by the BWR Vessel Internals AMP for the PEO.

4.6.4 Fatigue Analysis – Earthquake Cycle Loading

4.6.4.1 Summary of Technical Information in the Application

LRA Section 4.6.4 describes the applicant’s TLAA for earthquake cycles used as input to the fatigue analyses for different classes of piping and components. The applicant dispositioned the TLAA for the earthquake cyclic loading in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analyses remain valid for the PEO.

4.6.4.2 Staff Evaluation

The staff reviewed the applicant’s TLAA for the earthquake cyclic loading 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 staff reviewed UFSAR Subsection 3.7.3.2 and verified that for fatigue evaluation during the 40-year plant life, one safe shutdown earthquake and five operating basis earthquakes (OBEs) were considered with ten maximum stress cycles per earthquake for the balance of plant, 50 peak OBE cycles were considered for the Nuclear Steam Supply System piping, and 10 peak OBE cycles were considered for other steam supply system equipment and components. LRA Section 4.6.4 describes that Perry did not experience any OBE events since the earthquake that occurred on January 31, 1986.

The staff also reviewed UFSAR Subsection 3.7.4.4.2, and the report titled, “Cleveland Electric Illuminating Company, Perry Power Plant, Confirmatory Program of the January 31, 1986, Ohio Earthquake Effect,” and confirmed the following:

- No damage related to the earthquake was reported from both the survey immediately after the earthquake and the subsequent detailed walkdown of all plant areas.
- Perry’s design has additional safety margins to resist the recorded 1986 Ohio earthquake.

Therefore, the staff concludes that the assumptions related to the number of earthquake cycles used as input to the fatigue analyses remain valid for the PEO because Perry’s design had sufficient safety margin against the 1986 Ohio earthquake, and Perry has not experienced any OBE events since the 1986 earthquake.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i) that the analysis for earthquake cycles used as input to the fatigue analyses for different classes of piping and components remain valid for the PEO. Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 because the UFSAR fatigue analyses based on the number of OBE events considered in the UFSAR remain valid through the PEO.

4.6.4.3 UFSAR Supplement

LRA Appendix A, Section A.2.6.4 provides the UFSAR supplement summarizing the earthquake cyclic loading that are subject to this TLAA and lists the number of OBE events Perry has experienced. The staff reviewed LRA Section A.2.6.4 consistent with the review procedures in SRP-LR Section 4.7.3.2. Based on its review, the staff finds that the UFSAR 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 earthquake cyclic loading TLAA, as required by 10 CFR 54.21(d).

4.6.4.4 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 earthquake cyclic loading limits remain valid for the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6.5 Fatigue due to Partial Feedwater Heating

4.6.5.1 Summary of Technical Information in the Application

LRA Section 4.6.5 describes the applicant’s TLAA for fatigue due to partial feedwater heating of the feedwater nozzles. The applicant dispositioned the TLAA for the reactor vessel internals in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of fatigue on the intended functions will be adequately managed by the BWR Feedwater Nozzle AMP for the PEO.

4.6.5.2 Staff Evaluation

The staff reviewed the applicant’s TLAA for the feedwater nozzles 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.

The BWR Feedwater Nozzle AMP is predicated on enhancing in-service inspections specified in ASME Code Section XI and NUREG-0619, Revision 1, “BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking: Resolution of Generic Technical Activity A-10 (Technical Report),” as modified by the NRC-approved BWR Owners Group Licensing Topical Report GE-NE-523-A71-0594-A, Revision 1, “Alternate BWR Feedwater Nozzle Inspection Requirements.” The program specifies periodic ultrasonic testing inspections of critical regions of the feedwater nozzles during each 10-year in-service inspection interval.

Therefore, the staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of fatigue cracking on the intended functions of the feedwater nozzles will be adequately managed for the PEO.

Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 because the applicant leveraged NRC-approved aging management guidance to disposition the TLAA according to 10 CFR 54.21(c)(1)(iii).

4.6.5.3 UFSAR Supplement

LRA Section A.2.6.5 provides the UFSAR supplement summarizing the partial feedwater heating fatigue TLAA. The staff reviewed LRA Section A.2.6.5 consistent with the review procedures in SRP-LR Section 4.7.3.2.

Based on its review, the staff finds that the UFSAR 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 feedwater nozzle fatigue TLAA, as required by 10 CFR 54.21(d).

4.6.5.4 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 fatigue cracking on the intended functions of the feedwater nozzles will be adequately managed by the BWR Feedwater Nozzle AMP for the PEO.

The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6.6 Fatigue due to Single Recirculation Loop Operation

4.6.6.1 Summary of Technical Information in the Application

LRA Section 4.6.6 describes the applicant’s TLAA on the fatigue due to the vibratory loading of the single recirculation loop operation (also called single loop operation or SLO) for the reactor vessel internal components. As indicated in UFSAR Appendix 15F.7.3, the in-core guide tube is the limiting reactor vessel internal component in terms of fatigue due to the vibratory loading. Since the 37 years of operation as of March 1, 2023, involved approximately 77 days of SLO, the 60-year operation is projected to involve SLO significantly less than one year. The CUF accumulation rate for the in-core guide tube is 0.11 per one year of SLO. Accordingly, the 60-year CUF due to the vibratory loading of SLO is significantly less than 0.11.

The applicant dispositioned the fatigue TLAA on the fatigue due to SLO for the reactor vessel internal components in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the PEO.

4.6.6.2 Staff Evaluation

The staff reviewed the applicant’s TLAA on the fatigue due to the vibratory loading of SLO for the reactor vessel internal component 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 4.3.3.1.1.2.

LRA Section 4.6.6 addresses the fatigue analysis for the reactor vessel internal components subject to the SLO. The applicant explained that, as described in UFSAR Appendix 15F.7.3, the cyclic stress amplitudes are below the endurance limit for all the reactor vessel internal components except the in-core guide tube. The staff finds that the applicant appropriately determined that the other reactor vessel internal components are not subject to the effects of fatigue due to the SLO based on the stress amplitudes less than the fatigue endurance limit, consistent with the existing fatigue analysis in UFSAR Appendix 15F.7.3.

Accordingly, the applicant estimated the 60-year CUF value due to the SLO for the in-core guide tube as follows. The applicant indicated that the CUF accumulation rate for the in-core guide tube is 0.11 per one year of SLO, as described in the CLB fatigue analysis in UFSAR Appendix 15F.7.3. The applicant also explained that 37 years of operation as of March 1, 2023, involved approximately 77 days of SLO, and therefore, the 60-year operation is projected to involve SLO significantly less than one year. Considering the CUF accumulation rate of 0.11 per one year of SLO, the applicant determined that the 60-year projected CUF due to the SLO is significantly less than 0.11. The staff finds that the applicant's evaluation is reasonable because it is consistent with the existing CLB fatigue analysis.

In addition, the applicant explained that the 40-year CUF of the in-core tube due to the design transients other than SLO is 0.1 as described in UFSAR Appendix 15F.7.3 and, therefore, the 60-year CUF of the in-core tube due to the transients other than SLO is estimated to be 0.15. The staff finds that the applicant adequately determined that the 60-year CUF of the in-core tube by projecting the 40-year CUF. Considering that the 60-year CUF due to the SLO is significantly less than 0.11, the applicant determined that the total CUF of the in-core tube due to the SLO and other design transients is less than 0.26, which is in turn significantly less than the fatigue design limit (1.0).

The staff reviewed the applicant's CUF projections including the related UFSAR information and finds the fatigue analysis for the in-core tube subject to the vibratory loading of SLO and the associated effect of fatigue is acceptable for the following reasons:

- The applicant demonstrated that the 60-year CUF due to the SLO is significantly less than 0.11 based on the 60-year projected time duration of SLO (77 days) that is significantly less than one year of SLO.
- The applicant appropriately estimated the 60-year CUF (0.15) due to the design transients other than SLO based on the existing 40-year CUF.
- Accordingly, the applicant demonstrated that the total 60-year CUF due to SLO and other design transients is less than 0.26, which meets the design fatigue limit (1.0).
- These CUF calculations are consistent with the existing fatigue analyses in UFSAR Appendix 15F.7.3.

As discussed above, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the fatigue analysis for the reactor vessel internal components due to the vibratory loading of SLO has been projected to the end of the PEO. Additionally, it meets the acceptance criteria in SRP-LR Section 4.3.2.1.1.2 because the applicant demonstrated that the CUF value based on the projected cycles is less than the fatigue design limit (1.0) for the PEO.

4.6.6.3 UFSAR Supplement

LRA Section A.2.6.6 provides the UFSAR supplement summarizing the fatigue analysis for the reactor vessel internal components subject to the SLO. The staff reviewed the LRA section for UFSAR supplement, consistent with the review procedures in SRP-LR Section 4.3.3.2. Based on its review of the UFSAR supplement, the staff finds that it meets the acceptance criteria in SRP-LR Section 4.3.2.2, and is, therefore, acceptable. The staff also finds that the applicant provided an adequate summary description to address the TLAA on the fatigue due to SLO for the reactor vessel internal components subject to SLO, as required by 10 CFR 54.21(d).

4.6.6.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis on the fatigue due to SLO for the reactor vessel internal components has been projected to the end of the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6.7 Steam Piping Erosion

4.6.7.1 Summary of Technical Information in the Application

LRA Section 4.6.7, describes the applicant’s TLAA for steam piping erosion, based on an analysis that determined steam erosion could not prevent safe shutdown for the 40-year plant life. The applicant dispositioned the TLAA for the steam piping erosion in accordance with 10 CFR 54.21(c)(1)(iii) by noting that the Perry monitors the main, reheat, extraction, and miscellaneous drains system (system designation N22) through the Flow-Accelerated Corrosion AMP. The LRA also noted that the although the extraction steam (system designation N36) and high-pressure and low-pressure heater drains and vents (system designation N25/26) are not within the scope for license renewal, all of these systems (including N22) are monitored through the in-service inspection program to mitigate/detect any effects of steam erosion, as provided by the “Steam Erosion Hazards Analysis,” dated May 4, 1984, in response to Atomic Safety and Licensing Board Issue Number 15 (ML20084R791).

4.6.7.2 Staff Evaluation

The staff reviewed the applicant’s TLAA evaluation for steam piping erosion 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. The staff notes that although the TLAA evaluation states Perry had previously committed to monitoring the N22 system with the in-service inspection program, none of the aging management review items in LRA Table 3.4.2-9 for the N22 system credit the site’s ASME Section XI In-service Inspection AMP. However, piping components in LRA Table 3.4.2-9 appropriately credit the Flow-Accelerated Corrosion Program as noted in the TLAA evaluation, which is considered by both the applicant and the staff as part of the augmented in-service inspection program. The staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of aging on the intended function(s) for the main, reheat, extraction, and miscellaneous drains system will be adequately managed for the PEO because the Flow-Accelerated Corrosion Program manages wall thinning due to various erosion mechanisms and includes the appropriate components of the applicable system.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of steam erosion on the intended functions of main, reheat, extraction, and miscellaneous drains system will be adequately managed by the Flow-Accelerated Corrosion Program for the PEO.

Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 because the Flow-Accelerated Corrosion Program addresses wall thinning due to various erosion mechanisms and manages loss of material for components in the main, reheat, extraction, and miscellaneous drains system, as provided in LRA Table 3.4.2-9.

4.6.7.3 UFSAR Supplement

LRA Section A.2.6.7 provides the UFSAR supplement summarizing the steam piping erosion analysis. The staff reviewed LRA Section A.2.6.7 consistent with the review procedures in SRP-LR Section 4.7.3.2. Based on its review, the staff finds that the UFSAR 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 steam piping erosion, as required by 10 CFR 54.21(d).

4.6.7.4 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 steam piping erosion on the intended functions of the main, reheat, extraction, and miscellaneous drains system will be adequately managed by the Flow-Accelerated Corrosion Program for the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6.8 Silicon Sealant in Engineered Safety Features (ESF) HVAC Ductwork

4.6.8.1 Summary of Technical Information in the Application

LRA Section 4.6.8 describes the applicant’s TLAA for silicone sealants used in the ESF heating, ventilation, and air conditioning (HVAC) ductwork. The applicant qualified the silicone sealant by demonstrating the capability of the sealant to perform its intended function for the 40-year life of the plant. In addition, the applicant committed to performing routine monitoring of the applicable ductwork and samples of ductwork/sealant combination. Routine monitoring of the ductwork and samples will demonstrate compliance under 10 CFR 54.21(c)(1)(iii), that the effects of aging, such as hardening, on the intended function of the sealant will be adequately managed by the External Surfaces Monitoring of Mechanical Components Program for the PEO.

4.6.8.2 Staff Evaluation

The staff reviewed the applicant’s TLAA, as modified by Supplement 1 (ML24220A270) and Supplement 3 (ML24206A150), for the ESF HVAC ductwork 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. The staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of aging on the intended function of the sealant will be adequately managed by the External Surfaces Monitoring of Mechanical Components Program for the PEO, because the monitoring program implemented by the External Surfaces Monitoring of Mechanical Components Program is capable of ensuring that the silicone sealant maintains the capability to perform its intended sealing function.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of aging, such as hardening, on the intended functions of the sealant will be adequately managed for the PEO. Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 because the effects of aging will be monitored through the PEO.

4.6.8.3 UFSAR Supplement

LRA Section A.2.6.8 provides the UFSAR supplement summarizing the sealing of the ESF HVAC ductwork with silicone sealant. The staff reviewed LRA Section A.2.6.8 consistent with the review procedures in SRP-LR Section 4.7.3.2. Based on its review, the staff finds that the UFSAR 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 aging of the silicone sealant, as required by 10 CFR 54.21(d).

4.6.8.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of aging, such as hardening, on the intended functions of the ESF HVAC ductwork will be adequately managed by the External Surfaces Monitoring of Mechanical Components Program for the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6.9 Top Guide Beam Neutron Fluence

4.6.9.1 Summary of Technical Information in the Application

LRA Section 4.6.9 describes the applicant’s TLAA for neutron irradiation embrittlement of the top guide beam. The applicant dispositioned the TLAA for the top guide beam in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of irradiation embrittlement on the intended functions will be adequately managed by the BWR Vessel Internals AMP for the PEO.

4.6.9.2 Staff Evaluation

The staff reviewed the applicant’s TLAA for the top guide beam 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. The BWR Vessel Internals AMP is predicated on a series of BWRVIP topical reports. These topical reports address several engineering aspects of aging management of vessel internals, including but not limited to safety significance of vessel internals components, examination guidance, and flaw evaluation procedures. They specifically address reduction in fracture toughness through examinations to detect flaws that may challenge the structural integrity of the top guide beam. The BWRVIP continuously updates the guidance based on operating experience and research results, subject to NRC staff review. The NRC staff independently reviewed and approved the BWRVIP topical reports credited as part of the applicant’s BWR Vessel Internals AMP for technical adequacy and ability to manage age-related degradation of the reactor vessel internals as part of the topical report review process. The staff’s evaluation of the BWR Vessel Internals Program is documented in SE Section 3.0.3.2.6. Therefore, the staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of irradiation embrittlement on the intended functions of the top guide beam will be adequately managed for the PEO.

Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 and the disposition of 10 CFR 54.21(c)(1)(iii) because the applicant is crediting previously NRC reviewed and approved aging management guidance contained in BWRVIP topical reports, which are implemented as part of the applicant's BWR Vessel Internals Program, to adequately manage the effects of aging on the intended functions of the reactor vessel internals during the PEO.

4.6.9.3 UFSAR Supplement

LRA Section A.2.6.9 provides the UFSAR supplement summarizing the top guide beam embrittlement TLAA. The staff reviewed LRA Section A.2.6.9 consistent with the review procedures in SRP-LR Section 4.7.2.2.

Based on its review, the staff finds that the UFSAR 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 top guide beam embrittlement TLAA, as required by 10 CFR 54.21(d).

4.6.9.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of neutron irradiation embrittlement on the intended functions of the top guide grid beam will be adequately managed by the BWR Vessel Internals AMP for the PEO. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address aging of the top guide beam neutron fluence, as required by 10 CFR 54.21(d).

4.6.10 Jet Pump Fatigue Analysis

4.6.10.1 Summary of Technical Information in the Application

LRA Section 4.6.10 describes the applicant's TLAA for fatigue of the jet pump assembly. The applicant dispositioned the TLAA for the jet pump assembly in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of fatigue damage on the intended functions will be adequately managed by the BWR Vessel Internals AMP for the PEO.

4.6.10.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the jet pump assembly 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. The BWR Vessel Internals AMP is predicated on a series of BWRVIP topical reports. These topical reports address several engineering aspects of aging management of vessel internals, including but not limited to safety significance of vessel internals components, examination guidance, and flaw evaluation procedures. They specifically address fatigue damage through examinations to detect flaws that may challenge the structural integrity of the jet pump assembly. The BWRVIP continuously updates the guidance based on operating experience and research results, subject to NRC staff review. The NRC staff independently reviewed and approved the BWRVIP topical reports credited as part of the applicant's BWR Vessel Internals AMP for technical adequacy and ability to manage age-related degradation of the reactor vessel internals as part of the topical report review process. The staff's evaluation of the BWR Vessel Internals Program is documented in SE Section 3.0.3.2.6. Therefore, the staff finds the applicant has demonstrated pursuant to

10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the jet pump assembly will be adequately managed for the PEO.

Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1 and the disposition of 10 CFR 54.21(c)(1)(iii) because the applicant is crediting previously NRC reviewed and approved aging management guidance contained in BWRVIP topical reports, which are implemented as part of the applicant's BWR Vessel Internals Program, to adequately manage the effects of aging on the intended functions of the reactor vessel internals during the PEO.

4.6.10.3 UFSAR Supplement

LRA Section A.2.6.10 provides the UFSAR supplement summarizing the jet pump assembly TLAA. The staff reviewed LRA Section A.2.6.10 consistent with the review procedures in SRP-LR Section 4.7.2.2.

Based on its review, the staff finds that the UFSAR 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 jet pump assembly fatigue TLAA, as required by 10 CFR 54.21(d).

4.6.10.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the jet pump assembly will be adequately managed by the BWR Vessel Internals AMP for the PEO. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to fatigue of the jet pump, as required by 10 CFR 54.21(d).

4.6.11 Allowable Stress Analysis of Balance of Plant (BOP) ASME Code Class 1, 2 and 3 Components

In its supplement dated August 7, 2024 (ML24220A270), the applicant deleted LRA Section 4.6.11 related to the fatigue analyses for Class 1, 2 and 3 components because the section was redundant to LRA Section 4.3.1 (Class 1 fatigue analysis) and LRA Section 4.3.2 (non-Class 1 allowable stress analysis). The staff agreed with the applicant's determination because LRA Sections 4.3.1 and 4.3.2 already address the Class 1 fatigue analysis and non-Class 1 allowable stress analysis (i.e., implicit fatigue analysis), respectively. The staff's safety evaluation for the Class 1 fatigue analysis and non-Class 1 allowable stress analysis are documented in SER Sections 4.3.1 and 4.3.2, respectively.

4.6.12 RPV Annealing

4.6.12.1 Summary of Technical Information in the Application

LRA Section 4.6.12 describes the applicant's TLAA related to RPV annealing. The applicant dispositioned the TLAA related to whether in-place annealing of the RPV is necessary in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analysis remains valid for the PEO.

4.6.12.2 Staff Evaluation

The staff reviewed the applicant's TLAA related to whether in-place annealing of the RPV is necessary 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 applicant stated that UFSAR Section 5.3.3.1.1.1 indicates in-place annealing of the reactor vessel was evaluated and determined to be unnecessary because shifts in transition temperature caused by irradiation during the 40-year life could be accommodated. The staff noted that the shifts in transition temperature (i.e., ART) is addressed as a TLAA in LRA Section 4.2.3.

Specifically, the ART of the limiting beltline material is used to adjust the beltline P-T limit curves to account for neutron irradiation effects on the RPV. RG 1.99, Revision 2, provides the methodology for determining the ART, which is defined as the sum of the initial (unirradiated) reference temperature (initial RT_{NDT}), the mean value of the adjustment in reference temperature caused by irradiation (ΔRT_{NDT}), and a margin (M) term (i.e., the ART is defined as: Initial RT_{NDT} + ΔRT_{NDT} + Margin). The staff's evaluation of initial material property values (i.e., initial RT_{NDT}, Cu (wt. %), Ni (wt. %)), use of available surveillance data, and calculation of ART in accordance with RG 1.99, Rev 2, through 54 EFPY is documented in SER Section 4.2.3. Additionally, the staff's evaluation of the use of ART to adjust the TLAA for P-T Limits is documented in SER Section 4.2.4.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i), that the analysis that determined that in-place annealing of the RPV is not necessary remains valid for the PEO and meets the acceptance criteria in SRP-LR Section 4.7.2.1.1 because the applicant has addressed the effects of neutron fluence on the reactor vessel in the form of ART for 54 EFPY and demonstrated that ART will be accounted for in the PT-Limits for the PEO; thus, the applicant's determination that in-place annealing of the reactor vessel is not necessary remains valid for the PEO.

4.6.12.3 UFSAR Supplement

LRA Section A.2.6.12 provides the UFSAR supplement that summarizes the TLAA related to the necessity of in-place annealing of the RPV. The staff reviewed LRA Section A.2.6.12 consistent with the review procedures in SRP-LR Section 4.7.3.2.

Based on its review, the staff finds that the UFSAR 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 necessity of in-place annealing of the RPV, as required by 10 CFR 54.21(d).

4.6.12.4 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 determining that in-place annealing of the RPV is not necessary remains valid for the PEO. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7 Conclusion for TLAAs

The NRC staff reviewed LRA Section 4, "Time-Limited Aging Analyses and Exemptions." 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:

- The TLAAs remain valid for the PEO, as required by 10 CFR 54.21(c)(1)(i);
- The TLAAs have been projected to the end of the PEO, as required by 10 CFR 54.21(c)(1)(ii); or
- The effects of aging on the intended function(s) will be adequately managed for the PEO, as required by 10 CFR 54.21(c)(1)(iii).

The staff also reviewed the UFSAR supplements for the TLAAs and finds that they contain summary descriptions of the TLAAs for the PEO 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 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 10 CFR 54.25, “Report of the Advisory Committee on Reactor Safeguards,” the LRA for the Perry Nuclear Power Plant, Unit 1, 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 license renewal application (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 Perry 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). Regulations in 10 CFR 54.29, "Standards for issuance of a renewed license," set 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 (1) 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 (2) 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 Perry 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 for review under 10 CFR 54.21(a)(1) and (2) time-limited aging analyses that have been identified for 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, has been completed. NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," Supplemental 61, Regarding License Renewal of Perry Nuclear Power Plant, Final Report," was published in April 2025 (ML25113A032).

APPENDIX A

LICENSE RENEWAL COMMITMENTS

A. License Renewal Commitments

During the U.S. Nuclear Regulatory Commission (NRC) staff's review of the Perry Nuclear Power Station, Unit 1 (Perry or PNPP) license renewal application, Vistra Operations Company (Vistra or the applicant) made commitments related to the aging management programs (AMPs) used to manage aging effects for structures and components. The following table lists these commitments along with the implementation schedules and sources for each commitment. The period of extended operation (PEO) for Perry, Unit 1 begins on March 18, 2026.

Table A-1 Unit 1 Perry License Renewal Commitments

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
1	10 CFR Part 50, Appendix J (A.1.1 & B.2.1)	XI.S4	Continue the existing 10 CFR 50, Appendix J Program	Ongoing	LRA Rev. 0 ML23184A081
2	Aboveground Metallic Tanks (A.1.2 & B.2.2)	XI.M29	Implement the new Aboveground Metallic Tanks Program	May 8, 2026	LRA Rev. 0 ML23184A081
3	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (A.1.3 & B.2.3)	XI.M1	Continue the existing ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program	Ongoing	LRA Rev. 0 ML23184A081
4	ASME Section XI, Subsection IWE (A.1.4 & B.2.4)	XI.S1	Continue the existing ASME Section XI, Subsection IWE Program	Ongoing	LRA Rev. 0 ML23184A081
5	ASME Section XI, Subsection IWF (A.1.5 & B.2.5)	XI.S3	Complete the following enhancements to the existing ASME Section XI, Subsection IWF Program: 1. The program will be enhanced to include preventive actions delineated in NUREG-1339 and in EPRI NP-5769, NP-5067, and TR-104213 that emphasize proper selection of bolting material, installation torque or tension, and the use of lubricants and sealants for high strength bolting (actual measured yield strength greater than or equal to 150 kilo-pounds per square inch (ksi)). 2. The program will be enhanced to include preventive actions for storage, lubricants, and stress corrosion cracking potential consistent with the requirements of Section 2 of RCSC (Research Council for Structural Connections) publication “Specification for Structural Joints Using ASTM A325 or A490 Bolts.” Lubricants that contain molybdenum disulfide (MoS2) shall not be applied to structural high strength bolts within the scope of license renewal. 3. The program will be enhanced to specify that, in addition to VT-3 examination, high strength bolting (actual measured yield strength greater than or equal to 150 ksi) in sizes greater than 1-inch nominal diameter, shall receive a volumetric examination in accordance with the requirements of ASME Code Section V, Article 5, Appendix IV. The representative sample size will be equal to 20 percent (rounded up to the nearest whole number) of the entire IWF population (for a given ASTM specification) of high strength bolts in sizes greater than 1-inch nominal diameter, with a maximum sample size of 25 bolts. The selection of the representative sample will consider susceptibility to stress corrosion cracking (e.g., actual measured yield strength) and ALARA principles. The frequency of examination will be once each 10-year ISI interval. 4. The program will be enhanced to revise plant procedures to specify the following conditions as unacceptable: • Loss of material due to corrosion or wear that reduces the load bearing capacity of the component support.	May 8, 2026	LRA Rev. 0 ML23184A081 Supplement 3 (ML24206A150)

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
			• Cracked or sheared bolts, including high strength bolts, and anchors. 5. The program will be enhanced to provide guidance, regarding the selection of supports to be examined in subsequent inspection intervals, when a support that is acceptable for continued service as defined in IWF-3400, is restored in accordance with the corrective action program. The enhanced guidance will ensure that the sample is increased to include another support, of the same type and function, that has not been restored to correct the observed condition.		
6	ASME Section XI, Subsection IWL (A.1.6 & B.2.6)	XI.S2	Complete the following enhancements to the existing ASME Section XI, Subsection IWL Program: 1. Areas of concrete deterioration and distress will be recorded in accordance with the guidance provided in ACI 349.3R 2002. 2. The acceptance criteria will be based on ACI 349.3R 2002 and ACI 201.1R 2008 for identification of concrete degradation. Quantitative acceptance criteria based on the "Evaluation Criteria" provided in Chapter 5 of ACI 349.3R will be used to augment the qualitative assessment of the Responsible Engineer.	May 8, 2026	LRA Rev. 0 ML23184A081 Supplement 3 (ML24206A150)
7	Bolting Integrity (A.1.7 & B.2.7)	XI.M18	Complete the following enhancements to the existing Bolting Integrity Program: 1. High strength bolting (regardless of code classification) will be monitored for cracking in accordance with ASME Section XI, Table IWB-2500-1, Examination Category B-G-1. 2. Perform visual inspection of submerged bolting for the Emergency Service Water pumps, diesel and motor fire pumps, emergency service water screen-wash pumps and Spent Fuel Rack Grid Structure for loss of material and loss of preload on a 10-year frequency. Submerged bolting is visually inspected 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 period of extended operation a representative sample of bolt heads and threads is inspected. The representative sample consists of 20 percent of the population of bolt heads and threads (defined as bolts with the same material and environment combination) or a maximum of 25 bolts per population. 3. Perform visual inspection of submerged bolting for the Emergency Core Cooling Systems (ECCS) and Reactor Core Isolation Cooling (RCIC) system suction strainer in the suppression pool for loss of material and loss of preload (loose or missing nuts and bolts) on a 10-year frequency. 4. Preventive measures will include using bolting material that has an actual measured yield strength limited to less than 1,034 megapascals (MPa) (150 kilo-pounds per square inch [ksi]).	May 8, 2026	LRA Rev. 0 ML23184A081 Supplement 2 (ML24180A010)
8	Buried and Underground Piping and Tanks (A.1.8 & B.2.8)	XI.M41	Complete the following enhancements to the existing Buried and Underground Piping and Tanks Program: 1. The program will be enhanced as follows:	May 8, 2026	LRA Rev. 0 ML23184A081 Supplement 2 (ML24180A010)

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
			• Coating inspectors who evaluate the type and extent of coating degradation will be certified to one of the following: 1. National Association of Corrosion Engineers (NACE) Coating Inspector Level II or III. 2. An individual who has completed both the EPRI Comprehensive Coatings Course and the EPRI Buried Pipe Condition Assessment and Repair Computer Based Training (CBT) Course. 3. An ASTM coating specialist qualified through an ASTM Standard endorsed by RG 1.54 Rev. 2. • Where damage to the coating has been evaluated as significant and the damage was caused by nonconforming backfill, an extent of condition evaluation will be conducted to determine the extent of degraded backfill in the vicinity of the observed damage. • 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 period of extended operation meets minimum wall thickness requirements, recommendations for expansion of sample size is not required. • 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 period of extended, operation, an expansion of sample size shall be implemented as prescribed by LR-ISG- 2015-01. • Sources of leakage detected during pressure tests are identified and corrected. • When using the option of monitoring the activity of a jockey pump instead of inspecting buried Fire Water System piping, and unexplained changes in jockey pump activity (or equivalent equipment or parameter) are observed, a flow test or system leak rate test is conducted by the end of the next refueling outage or as directed by the current licensing basis, whichever is shorter. • Visual inspection of stainless-steel piping for cracking will be performed when the surface is exposed. • For steel piping cathodic protection, the acceptable Instant OFF criteria is greater than or equal to -850 mV with a maximum of -1,200 mV. • Alternatively, for steel piping cathodic protection, the acceptable Capacitive Shift criteria will be at least 100 mV from the Corrosion Potential. If this alternative acceptance criterion is implemented, then:		Response to RAI Set 1 (ML24260A266)

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
			Additional confirmatory testing then will be performed to validate acceptable external loss of material rate and subsequently confirmed every 2 years thereafter. The impact of significant site features such as shielding due to large objects in the vicinity of the protected pipe and local soil conditions will be factored into placement of the electrical resistance corrosion rate probes. Where it is determined electrical resistance corrosion rate probes are required, the location and use of the probes will be determined by a NACE Level CP4 Cathodic Protection Specialist. • Unacceptable cathodic protection survey results are entered into the plant corrective action program.		
9	BWR Control Rod Drive Return Line Nozzle (A.1.9 & B.2.9)	XI.M6	Continue the existing BWR Control Rod Drive Return Line Nozzle Program	Ongoing	LRA Rev. 0 ML23184A081
10	BWR Feedwater Nozzle (A.1.10 & B.2.10)	XI.M5	Continue the existing BWR Feedwater Nozzle Program	Ongoing	LRA Rev. 0 ML23184A081
11	BWR Penetrations (A.1.11 & B.2.11)	XI.M8	Complete the following enhancement to the existing BWR Penetrations Program: a) The in-service inspections procedures will be revised to incorporate BWRVIP-14-A, BWRVIP-59-A, and BWRVIP-60-A as guidelines for evaluation of crack growth in stainless steels, nickel alloys, and low-alloy steels, respectively.	May 8, 2026	LRA Rev. 0 ML23184A081
12	BWR Stress Corrosion Cracking (A.1.12 & B.2.12)	XI.M7	Continue the existing BWR Stress Corrosion Cracking Program.	Ongoing	LRA Rev. 0 ML23184A081
13	BWR Vessel ID Attachment Welds (A.1.13 & B.2.13)	XI.M4	Complete the following enhancement to the existing BWR Vessel ID Attachment Welds Program: a) The in-service inspections procedures will be revised to incorporate BWRVIP-14-A, BWRVIP-59-A, and BWRVIP-60-A as guidelines for evaluation of crack growth in stainless steels, nickel alloys, and low-alloy steels, respectively.	May 8, 2026	LRA Rev. 0 ML23184A081
14	BWR Vessel Internals (A.1.14 & B.2.14)	XI.M9	Complete the following enhancement to the existing BWR Vessel Internals Program: a) The BWR Vessel Internals Program implementing station procedures will be revised to incorporate BWRVIP-14-A, BWRVIP-59-A, and BWRVIP-60-A as guidelines for evaluation of crack growth in stainless steels, nickel alloys, and low-alloy steels, respectively. b) An evaluation of the 60-year fluence for the six (6) critical components identified in BWRVIP-234, Table 6-1, will be performed to verify the applicability of the BWRVIP to PNPP. In the unlikely circumstance that the 60-year fluence limits for one or more these components are exceeded, an assessment of the susceptibility of reactor vessel internal components fabricated from CASS to loss of fracture toughness due to thermal aging and neutron irradiation embrittlement will be performed. The required periodic inspections of CASS components determined to be susceptible to loss of fracture toughness due to thermal aging and neutron irradiation embrittlement will be determined based on this assessment.	May 8, 2026	LRA Rev. 0 ML23184A081

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
15	Closed Treated Water Systems (A.1.15 & B.2.15)	XI.M21A	Complete the following enhancement to the existing Closed Treated Water Systems Program: 1. The program will be enhanced to ensure aging effects are detected through periodic inspections. Visual inspections will be conducted whenever the system boundary is opened. Additionally, a representative sample of piping and components will be selected based on likelihood of corrosion or cracking and inspected at an interval not to exceed once in 10 years. 2. The program will be enhanced to change the chemical treatment of the Building Heating System from a hydrazine-based regime to one more suitable to the elevated system temperatures experienced at PNPP.	May 8, 2026	LRA Rev. 0 ML23184A081
16	Compressed Air Monitoring (A.1.16 & B.2.16)	XI.M24	Complete the following enhancement to the existing Compressed Air Monitoring Program: 1. Include opportunistic inspections of accessible internal surfaces of piping, receivers, compressors, dryers, aftercoolers, and filters within the compressed air systems. 2. A new monitoring and trending program will be developed to monitor and trend periodic dew point readings, results of each opportunistic visual inspection, and annual air samples.	May 8, 2026	LRA Rev. 0 ML23184A081
17	Environmental Qualification (EQ) of Electrical Components (A.1.17 & B.2.17)	X.E1	Continue the existing Environmental Qualification (EQ) of Electrical Components Program.	Ongoing	LRA Rev. 0 ML23184A081
18	External Surfaces Monitoring of Mechanical Components (A.1.18 & B.2.18)	XI.M36	Implement the new External Surfaces Monitoring of Mechanical Components Program. Additionally, this program will manage “cracking” by periodically replacing stainless-steel flexible hoses subject to aging management. These hoses supply compressed air/gas to various components and are potentially subject to chloride exposure from the accumulation of leak detector solution residue.	May 8, 2026	LRA Rev. 0 ML23184A081 Supplement 9 (ML25112A167)
19	Fatigue Monitoring (A.1.19 & B.2.19)	X.M1	Complete the following enhancements to the existing Fatigue Monitoring Program: 1. Clarify the scope of the Fatigue Monitoring Program within the implementing station procedures. 2. Include environmental correction factors (F_{en} multipliers) for the locations where monitoring the environmental fatigue has been determined to be applicable to ensure the cumulative fatigue, including environmental fatigue, does not exceed the ASME Code, Section III limits. 3. The program will be modified to incorporate managing the effects of fatigue on the containment piping penetrations bellows.	May 8, 2026	LRA Rev. 0 ML23184A081 Supplement 2 (ML24180A010)
20	Fire Protection (A.1.20 & B.2.20)	XI.M26	Complete the following enhancements to the existing Fire Protection Program: 1. The station implementing procedures will be revised/updated to specifically identify structural commodity component types with a fire barrier (FB) intended function cited in LRA Table 3.5.2-4.	May 8, 2026	LRA Rev. 0 ML23184A081 Supplement 2 (ML24180A010)

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
			2. The station implementing procedures will be updated to revised/updated to specifically address aging management program inspection attributes that include ceilings. Inspection from top is adequate as any degradation should be visible from both sides. 3. Fire protection implementing procedures will reflect examples that illustrate the presence of aging effects of loss of material, cracking, cracking/delamination, change in material properties, loss of sealing, and separation, as applicable for each of the inspected materials with a fire barrier function cited in the program description of this section.		
21	Fire Water System (A.1.21 & B.2.21)	XI.M27	Complete the following enhancements to the existing Fire Water System Program: 1. The program will include inspections and testing consistent with Appendix L, Table 4a, Fire Water System Inspection and Testing Recommendations, of License Renewal Interim Staff Guidance LR-ISG-2012-02. Specific enhancements below must be considered in light of the program exceptions. Sprinkler Systems: • Program documents will be enhanced to require visual inspection of all in-scope sprinklers in addition to those that are directly protecting safe shutdown equipment as specified in the Fire Protection Functional Specifications. The functional specifications in the Fire Protection Program describe inspecting sprinklers in fire areas containing safe shutdown equipment on an 18-month frequency. This frequency is applied for these additional sprinklers consistent with the currently required inspection of sprinklers in fire areas containing safe shutdown equipment. Where sprinklers are inaccessible during power operation, the frequency will be per each cycle (two years) instead of 18 months. • Program periodic inspection criteria will be revised to require sprinklers to be free of corrosion, foreign materials, and paint and installed in the correct orientation to meet Section 5.2.1.1.1 criteria. • Program instructions will be enhanced to require inoperable sprinklers to be replaced. The criteria used to determine the impact on sprinkler operability include: when showing signs of (1) leakage (any), (2) severe corrosion, (3) physical damage, (4) loss of fluid in the glass bulb heat responsive element, (5) severe loading (e.g., with dust), or (6) painting unless painted by the sprinkler manufacturer; or (7) any sprinkler installed incorrectly. Additionally, Annex A of NFPA 25 regarding cleaning of dust "loaded" sprinklers will be adapted. • The program will be enhanced to perform representative sprinkler head sampling (laboratory field service testing) or replacement of sprinkler heads within the scope of license renewal prior to exceeding the in-service (installed) limits specified in the 2011 Edition of NFPA 25. In the case of testing, requirements are selected in accordance with the 2011 Edition of NFPA 25 and repeated at the specified intervals. Testing is continued through the period of	May 8, 2026	LRA Rev. 0 ML23184A081 Supplement 2 (ML24180A010) Supplement 7 (ML24354A265) Response to RAI Set 5 (ML25079A062)

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
			extended operation, or until there are no untested sprinkler heads that will exceed the service limits through the remainder of the period of extended operation. Standpipe and Hose Systems • Program documentation will be revised, or new test instructions developed to add main drains testing of the in-scope water-based standpipes including those associated with automatic water suppression systems. Program documentation will require testing of 20% of the necessary standpipe systems every refueling outage/cycle. These tests will occur every 10 years and throughout the PEO. Private Fire Service Mains • Program documentation will be revised to acknowledge compliance per Section 7.3.1.3 of NFPA 25, where underground piping supplies individual fire sprinkler, standpipe, water spray, or foam-water sprinkler systems and there are no means to conduct full flow tests, tests generating the maximum available flows shall be permitted. (Note: PNPP does not have a foam-water sprinkler system.) • Program documentation will be revised to require that flow tests shall be made at flows representative of those expected during a fire, for the purpose of comparing the friction loss characteristics of the pipe with those expected for the particular type of pipe involved, with due consideration given to the age of the pipe and to the results of previous flow tests. Any flow test results that indicate deterioration of available waterflow and pressure shall be investigated to the complete satisfaction of the authority having jurisdiction to ensure that the required flow and pressure are available for fire protection. • Program documentation will be revised to include a 60-minute hydrant drainage limit requirement during testing to meet Section 7.3.2.4, NFPA 25. A note will be added to include words to the effect that due to the Plant Foundation Underdrain system, groundwater level around the nuclear island does not normally reach the level of the relevant hydrants. PNPP monitors ground water level. However, if water level were to be too high or other conditions exist to prevent drainage, the hydrant drain shall be plugged and water in the barrel shall be pumped out. • Relevant test instructions will be revised to include a statement that dry barrel hydrants that are located in areas subject to freezing weather and that have plugged drains shall be identified clearly as needing pumping after operation.		

Valves and System Wide Testing

- See enhancement for Main Drain Testing under Standpipe and Hose Systems above.
- Main Drains Testing shall require identification and correction of the cause of any 10% reduction in full flow pressure.

Water Spray Fixed Systems

- PNPP Fire Protection Program documentation will be revised to require the removal, inspection for damaged and corroded parts, and cleaning of mainline strainers in water spray fixed nozzle systems in scope of license renewal every 5 years consistent with Section 10.2.1.7 of NFPA 25, 2011 Edition. Adverse findings will be entered into the corrective action program for evaluation for increased frequency of inspection and trending.
- In addition to flush activities currently associated with periodic flow testing, PNPP Fire Protection Program documentation will be revised to ensure that mainline strainers are flushed after each actuation of an associated water spray fixed system.

Foam-Water Systems

- PNPP Fire Protection Program documentation will be revised to require that the foam liquid storage tank shall be drained of foam liquid and flushed every 10 years.

Obstruction Investigation

- New PNPP Fire Protection Program documentation will be added to meet the requirements of NFPA 25, 2011 Edition, Section 14.2, Internal Inspection of Piping and Section 14.3 Obstruction Investigation and Prevention. Inspection scope established in other program elements or elsewhere in this program element, collectively referred to as existing enhancements, shall remain in effect. Where overlap or conflicts exist between existing enhancements and this enhancement: a) the existing enhancements shall take precedence, b) Section 14.2 requirements shall not apply to existing enhancements, and c) Section 14.3 guidance shall continue to apply to all inspection activities.

2. As an enhancement to detect aging effects of internal surfaces of buried piping, a portion of the aboveground inspection locations will be selected where above-grade and underground or buried piping environments and material are similar, the above-grade can be extrapolated to evaluate the condition of the underground or buried piping.
3. The program will be enhanced to require that when visual inspections are used to detect loss of material in the piping within the scope of license renewal, the inspection technique is capable of detecting surface irregularities that could

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
			indicate wall loss to below nominal pipe wall thickness due to corrosion and corrosion product deposition. Where such irregularities are detected, follow-up volumetric wall thickness examinations will be performed. 4. Enhancement i. below was implemented and identified piping configurations causing piping not to drain, hence Enhancement ii. is applicable at PNPP. i. Prior to the period of extended operation, all accessible dry pre-action, sprinkler, horizontal pipe configurations (including fittings and pipe components) within the scope of license renewal were walked down to provide reasonable assurance that the as-built, flow path piping system may be drained without areas that will allow water to accumulate and potentially contain corrosion products that could block the installed sprinklers. For those portions that are inaccessible, as-built drawings were used to identify such configurations. ii. The program will be enhanced to include augmented testing and inspections beyond those of Table 4a for portions of water-based fire protection system components within the scope of license renewal that are (a) normally dry but periodically subjected to flow (e.g., dry-pipe or pre-action sprinkler system components) and (b) cannot be drained or allow water to collect. The augmented inspections and activities are: 1. Within 5 years prior to the PEO, inspect 100% of the subject piping segment locations for trapped water and any condition such as organic and inorganic materials that might cause blockage of the sprinkler heads if the system were actuated. Any segments found to be wet or contain significant corrosion or organic matter will be cleaned and minimum wall thickness determined for the worst areas of wall loss. Results will be entered into the corrective action program for disposition and correction, as required. 2. After the completion of these inspections, monitor and record all actuations of the dry sprinkler systems within the scope of license renewal, and 3. For any system that actuates, ensure baseline conditions are established as noted in part 1 above prior to putting the dry sprinkler system back in service: the affected system piping segments that are the subject of this issue will be inspected and any pooling water eliminated; and the actuated system will be inspected per NFPA 25-2011 Section 14.2.1 by opening a flushing connection at the end of one main and by removing a sprinkler toward the end of one branch line for the purpose of inspecting for the presence of foreign organic and inorganic material. 5. Fire protection procedures will be revised, or new procedures developed to require periodic replacement of the coolant heat exchanger tube bundle on the diesel		

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
			driven fire pump engine during the period of extended operation at a frequency of every 14 years. The program will also require internal visual inspection of the heat exchanger shell and channel for loss of material, and inspection for internal tube fouling every 3 cycles (6 years) with remediation of adverse conditions (for example by performing cleaning or replacement of affected components). 6. The program will provide that if the presence of sufficient foreign organic or inorganic material to obstruct pipe or sprinklers is detected during pipe inspections, the material will be removed, and its source will be determined and corrected. 7. The program will be augmented to perform periodic (initially, every other cycle, [i.e., 4-year intervals), non-intrusive pipe thickness measurements in above ground or underground (not buried), wetted, metallic Fire Water System piping. Each 4-year sample will include at least three locations for a total of 100 feet of piping. Locations selected will be based upon system susceptibility to corrosion, evidence of performance degradation during system flow testing or periodic flushes or prior wall thickness measurements. The method used will attempt to detect localized degradation in pipe wall thickness (e.g., Low Frequency Electromagnetic Technique (LFET), or equivalent. The idea is to use the method as a screening tool to identify "spots of interest" which are then followed up with ultrasonic (UT) testing or phased array testing (PAUT) on the spots of interest. Additionally, proximity to Safety Related or high-risk equipment will be favored locations when given equivalent susceptibility or evidentiary factors. Significant finding shall be entered into the corrective action program for remediation and additional corrective actions. Significant findings will be any wall thickness less than min wall or localized minimum wall thickness more than 50 percent less when compared to its surroundings. 8. The program will be augmented for subsequent or existing leaks not yet repaired, when practical, to determine or confirm the corrosion mechanism(s) causing the leaks. The results will be processed through the corrective action program to determine further actions and adjustments to the period of augmented inspections.		
22	Flow Accelerated Corrosion (A.1.22 & B.2.22)	XI.M17	Complete the following enhancements to the existing Flow Accelerated Corrosion Program: 1. Site procedures will be enhanced to include pump casings and valve bodies that retain pressure in systems susceptible to FAC. Opportunistic inspections of internal surfaces are conducted during routine maintenance activities to identify degradation.	May 8, 2026	LRA Rev. 0 ML23184A081
23	Fuel Oil Chemistry (A.1.23 & B.2.23)	XI.M30	Complete the following enhancements to the existing Fuel Oil Chemistry Program: 1. Additional information will be placed in periodic maintenance tasks. Periodic Maintenance tasks for the Diesel Fire Pump Fuel Oil Storage Tank will be revised to reflect that the minimum required schedule for inspections to satisfy Aging Management Program requirements are consistent with a 10-year interval.	May 8, 2026	LRA Rev. 0 ML23184A081

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
			2. Volumetric inspection will be performed if visual inspection is not possible, or evidence of degradation is observed during visual inspection.		
24	Fuse Holders (A.1.24 & B.2.24)	XI.E5	Implement the new Fuse Holders Program	May 8, 2026	LRA Rev. 0 ML23184A081
25	Miscellaneous Piping and Ducting Components (A.1.25 & B.2.25)	XI.M38	Implement the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program	May 8, 2026	LRA Rev. 0 ML23184A081
26	Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (A.1.26 & B.2.26)	XI.M23	Continue the existing Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program	Ongoing	LRA Rev. 0 ML23184A081
27	Internal Coating/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (A.1.27 & B.2.27)	XI.M42	Implement the new Internal Coating/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program	May 8, 2026	LRA Rev. 0 ML23184A081
28	Lubricating Oil Analysis (A.1.28 & B.2.28)	XI.M39	Continue the existing Lubricating Oil Analysis Program	Ongoing	LRA Rev. 0 ML23184A081
29	Masonry Walls Monitoring (A.1.29 & B.2.29)	XI.S5	Implement the new Masonry Walls Monitoring Program	May 8, 2026	LRA Rev. 0 ML23184A081
30	Monitoring of Neutron-Absorbing Materials Other Than Boraflex (A.1.30 & B.2.30)	XI.M40	Continue the existing Monitoring of Neutron-Absorbing Materials Other Than Boraflex Program beginning in situ testing of the Boral® panels in the spent fuel pool 12 months prior to the period of extended operation.	Ongoing	LRA Rev. 0 ML23184A081 Supplement 2 (ML24180A010)
31	Non-EQ Electrical Cable Connections (A.1.31 & B.2.31)	XI.E6	Implement the one-time Non-EQ Electrical Cable Connections Program	May 8, 2026	LRA Rev. 0 ML23184A081
32	Non-EQ Inaccessible Power Cables (A.1.32 & B.2.32)	XI.E3	Complete the following enhancements to the existing Non-EQ Inaccessible Power Cables Program: a) Dewatering sump pumps and alarms will be installed in all electrical manholes containing cable with a license renewal intended function. 2. Daily operator rounds will confirm that sump pumps and associated alarms are operable. When the high-water-level alarm has been on two days in a row, the need for supplemental pumps will be evaluated. When high level has occurred three days in a row, supplemental pumps will be used, as needed, and an engineering evaluation of affected power cable ≥400 V in that manhole will be performed. The evaluation may use testing as a diagnostic tool but will consider the significance of the inspection results, the functionality of affected component, potential reportability of the event, the extent of the concern, the potential causes	May 8, 2026	LRA Rev. 0 ML23184A081

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
			for not meeting the inspection criteria, the corrective actions required, and the likelihood of recurrence. 3. Inspections will be conducted at least annually to determine that cables are not wetted or submerged, that cables/splices and cable support structures are intact, and that sump pumps and associated alarms operate properly. 4. Maintenance plans will be enhanced to ensure all underground in-scope cable ≥400V is tested every 6 years and after any exposure to significant moisture (wetting or submergence lasting more than a few days).		
33	Non-EQ Instrumentation Circuits (A.1.33 & B.2.33)	XI.E2	Implement the new Non-EQ Instrumentation Circuits Program	May 8, 2026	LRA Rev. 0 ML23184A081
34	Non-EQ Insulated Cables and Connections (A.1.34 & B.2.34)	XI.E1	Complete the following enhancements to the existing Non-EQ Insulated Cables and Connections Program: a) The program will be enhanced to include a plant-specific procedure for plant walkdowns of adverse localized environments.	May 8, 2026	LRA Rev. 0 ML23184A081
35	One-Time Inspection (A.1.35 & B.2.35)	XI.M32	Implement the new One-Time Inspection Program	May 8, 2026	LRA Rev. 0 ML23184A081
36	One-Time Inspection of ASME Code Class 1 Small Bore Piping (A.1.36 & B.2.36)	XI.M35	Implement the new One-Time Inspection of ASME Code Class 1 Small Bore Piping Program	May 8, 2026	LRA Rev. 0 ML23184A081
37	Open-Cycle Cooling Water System (A.1.37 & B.2.37)	XI.M20	Complete the following enhancement to the existing Open-Cycle Cooling Water System Program: 1. The implementing procedures for heat exchanger thermal performance testing will be enhanced to require each heat exchanger thermal performance periodic test instruction to include the following steps (or similar) to evaluate the test results: • Provide the work order and planned date for the next scheduled test or cleaning for this heat exchanger. • Since the latest cleaning of this heat exchanger, if 2 or more valid heat exchanger test results are available, project the date for no margin to the acceptance criteria based on the current performance trend. • If the projected date for no margin will occur before the planned date for the next heat exchanger test or cleaning, initiate a Condition Report. 2. The OCCW System program documentation will be revised as follows: Include periodic maintenance inspections of the external portions of components submerged in the Emergency Service Water pump bay: • Emergency Service Water pump casings for loss of material: • Emergency Service Water screen-wash pump casings for loss of material;	May 8, 2026	LRA Rev. 0 ML23184A081 Supplement 5 (ML24295A352) Response to RAI Set 5 (ML25079A062)

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
			• Emergency Service Water traveling screens for loss of material and flow blockage; • Motor driven fire pump casing and its suction strainer for loss of material and flow blockage; • Diesel driven fire pump casing and its suction strainer for loos of material and flow blockage. The minimum frequency of these inspections is once every operating cycle.		
38	Protective Coating Monitoring and Maintenance (A.1.38 & B.2.38)	XI.S8	Complete the following enhancement to the existing Protective Coating Monitoring and Maintenance Program: a) The existing PNPP Protective Coating Monitoring and Maintenance Program will be enhanced to comply with the requirements of ASTM D5163-08.	May 8, 2026	LRA Rev. 0 ML23184A081
39	Reactor Head Closure Stud Bolting (A.1.39 & B.2.39)	XI.M3	Complete the following enhancements to the existing Reactor Head Closure Stud Bolting Program: a) The purchasing requirements for reactor head closure stud material will be revised to assure that any studs procured in the future will have measured yield strength of less than 150 ksi.	May 8, 2026	LRA Rev. 0 ML23184A081
40	Reactor Vessel Surveillance (A.1.40 & B.2.40)	XI.M31	Continue the existing Reactor Vessel Surveillance Program	Ongoing	LRA Rev. 0 ML23184A081
41	RG 1.127, Inspection of Water Control Structures Associated with Nuclear Power Plants (A.1.41 & 41)	XI.S7	Complete the following enhancements to the existing RG 1.127, Inspection of Water Control Structures Associated with Nuclear Power Plants Program: a) The scope of the program will be enhanced to manage aging effects associated with the ESW swale, and the flood mitigating features of the major stream, major stream culvert (earthen portion), remnant minor stream, and the diversion stream channel and diversion stream berm. The program implementing procedure will also include a listing of existing procedures/instructions that are credited to manage the aging effects of water control structures that are within the scope of this aging management program. Parameters monitored will include settlement, depressions, sink holes, slope stability (e.g., irregularities in alignment and variances from originally constructed slopes), seepage, proper functioning of drainage systems, and degradation of slope protection features. The aging effects associated with concrete are loss of material, cracking, and various changes in material properties (that is, loss of bond, increase in porosity and permeability, reduction of strength, and differential settlement). The aging effects associated with earthen structures (rock, stone and soil) are loss of form and loss of material. b) The program will be enhanced to include monitoring and inspection of the flood mitigation features of the major stream, major stream culvert (earthen portion), remnant minor stream, the diversion stream berm and channel, and the ESW	May 8, 2026	LRA Rev. 0 ML23184A081 Supplement 3 (ML24206A150) Response to RAI Set 4 (ML25036A154)

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
			swale. The program implementing procedure will also include a listing of existing procedures/instructions that are credited to manage the aging effects of water control structures that are within the scope of this aging management program. Parameters monitored will include settlement, depressions, sink holes, slope stability (e.g., irregularities in alignment and variances from originally constructed slopes), seepage, proper functioning of drainage systems, and degradation of slope protection features. c) The program will be enhanced to monitor steel components for rust, erosion, corrosion, cavitation and weld cracks. d) The program will be enhanced to include monitoring and inspection of earthen embankment structures associated with the major stream, remnant minor stream and the new diversion stream channel including the inline spillway structure at the outfall of the new channel. The berm inspections will include the following items: a) Identify if there are any wet areas, erosion, or slides b) Identify if there are obstructions in the stream that could partially block or prevent flow c) Identify bare spots needing re-vegetation d) Locate any riprap or erosion protection that has been displaced e) Identify cracks that may indicate potential excessive settlement (>1 foot) or slope instability f) Identify any burrowing rodent holes that could impact the performance or stability of the berm		
42	Selective Leaching (A.1.42 & B.2.42)	XI.M33	Implement the new Selective Leaching Program.	May 8, 2026	LRA Rev. 0 ML23184A081
43	Structures Monitoring (A.1.43 & B.2.43)	XI.S6	Complete the following enhancements to the existing Structures Monitoring Program: a) The program implementing procedure will be enhanced to include an attachment listing names and/or unique identifiers of structures and structural bulk commodities (including plant systems containing the bulk commodities) within the scope of license renewal that credit the Structures Monitoring Program for aging management. b) The program implementing procedure will be enhanced to include an attachment listing the supporting procedures, instructions, and maintenance plans that are credited to manage the aging effects of the structures and structural bulk commodities that are within the scope of the structures monitoring aging management program for license renewal. For example, the list of procedures, instructions, and maintenance plans will cite documents that address: Monitoring for building settlement; groundwater level monitoring; monitoring site groundwater chemistry; monitoring in-scope masonry structures for loss of material and cracking; plant underdrain system inspection and maintenance; Monitoring storm drain piping for flow blockage and loss of material; monitoring	May 8, 2026	LRA Rev. 0 ML23184A081 Supplement 3 (ML24206A150) Supplement 7 (ML24354A265) Response to RAI Set 4 (ML25030A014)

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
			concrete for damage from freeze-thaw, and all other topics that are credited in the license renewal structures monitoring aging management program. c) The program will be enhanced to monitor the aging effects of the porous concrete sub-foundation and the porous concrete pipe associated with the plant underdrain system. d) The program will be enhanced to include the aging management of plant storm drain piping in the scope of the program. e) The program implementing procedures will be enhanced to monitor unimpregnated and impregnated (with elastometer) fiberglass fabric of aging effects. f) The program will be enhanced to inspect accessible areas of concrete for the signs of alkali-silica reaction (ASR). g) The program implementing procedure will be enhanced to include monitoring of in-scope nonsafety-related/no-seismic masonry walls for aging management. h) The program implementing documents will be enhanced to inspect accessible areas of concrete for the signs of alkali-silica reaction, (ASR), such as, map or patterned cracking, alkali-silica gel exudations, surface staining, expansion causing structural deformation, relative movement or displacement, or misalignment/distortion of attached components. i) The program implementing procedure will be enhanced to include the monitoring of in-scope masonry walls for loss of material (spalling, scaling), change in material properties and cracking due to freeze-thaw. j) The program will be enhanced to include preventive actions delineated in NUREG- 1339 and in EPRI NP-5769, NP-5067, and TR-104213 that emphasize proper selection of bolting material, installation torque or tension, and the use of lubricants and sealants for high strength bolting (actual measured yield strength greater than or equal to 150 ksi) k) The program will be enhanced to include preventive actions for storage, lubricants, and stress corrosion cracking potential consistent with the requirements of Section 2 of RCSC (Research Council for Structural Connections) publication “Specification for Structural Joints Using ASTM A325 or A490 Bolts.” Lubricants that contain molybdenum disulfide (MoS2) shall not be applied to structural high strength bolts within the scope of license renewal. l) The program will be enhanced to include a preventive action for cleaning and inspection of storm drain piping for a periodicity not to exceed five years. m) The implementing procedures will be enhanced to monitor the porous concrete sub-foundation for: a. Loss of material (erosion of porous concrete subfoundation) b. Change in material properties (leaching of calcium hydroxide) c. Increase in porosity and permeability, loss of strength d. Reduction of foundation strength and cracking due to differential settlement and erosion of the porous concrete sub-foundation.		

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
			n) The program will be enhanced to monitor ground water chemistry for pH, chlorides, and sulfates and verify that it remains non-aggressive, or evaluate results exceeding criteria to assess impact, if any, on below-grade concrete. o) The program will be enhanced to specify that a representative sample of high strength (actual measured yield strength ≥ 150 ksi or 1,034 MPa) structural bolts greater than 1 inch (25 mm) in diameter are monitored for stress corrosion cracking (SCC). The visual inspection is supplemented with volumetric or surface examinations to detect cracking. p) The program will be enhanced to monitor accessible sliding surfaces to detect significant loss of material due to wear, corrosion, debris, dirt, distortion, or overload that could restrict or prevent sliding of surfaces as required by design. q) The program will be enhanced to require inspection of elastomeric components for cracking, loss of material and hardening. Visual inspections of elastomeric components are to be supplemented by feel or manipulation to detect hardening. Include instructions to enhance the visual examination of elastomeric material with physical manipulation of at least 10 percent of available surface area. r) The program implementing procedures will be enhanced to require (a) evaluation of 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 and (b) examination of representative samples of the exposed portions of the below-grade concrete, when excavated for any reason. If normally inaccessible areas become accessible due to planned activities, an inspection of these areas shall be conducted. s) The program will be enhanced to require the plant storm drain piping to be monitored for: Unacceptable flow blockage in the storm drain piping irrespective of piping material. During opportunistic excavations of piping: a. Loss of material in steel (corrugated metal), concrete and polymer piping, b. Loss of material, cracking and blistering in polymer piping, c. Cracking, change in material properties, increase in porosity and permeability; loss of strength, increase in porosity and permeability; cracking; loss of material (spalling, scaling), and loss of material (Corrosion of embedded steel reinforcing) in concrete piping. 1. The program will be enhanced to inspect the in-scope concrete structures for loss of material, cracking, change in material properties, increase in porosity and permeability; loss of strength, increase in porosity and permeability; cracking; loss of material (spalling, scaling), and loss of material due to corrosion of embedded steel reinforcing. 2. Groundwater chemistry parameters will be monitored on a frequency of at least once every 5 years.		

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
			3. The program will be enhanced to require that structures and structural components within the program are monitored at a frequency of at least 5 years. 4. The program will be enhanced to require the plant storm drain piping is inspected: • 100 percent of internal surfaces by either direct visual observation or remote visual (camera) at least every 5 years. • This will be done either all at one time or spread out of various locations over a period of 5 years. This meets the NUREG 1801 recommendations of inspection once every 5 years. • External by direct visual observation during opportunistic excavations. • The thickness of steel piping will be measured over a general area and not a point measurement reflective of a local pit or gouge either directly measured or NDE methods utilized. • Additionally, the site’s implementing document will include required storm drain system inspections following offsite agency confirmation that an earthquake has occurred in the area of the plant for any sign of ground settlement that could be an indication of storm drain piping collapse to ensure the integrity of the piping. • Internal inspections of the storm drain system for assurance of continued functionality immediately (within 30 days) following the occurrence of significant natural phenomena, such as large floods, earthquakes, hurricanes, tornadoes, and intense local rainfalls. 5. Plant procedures will be enhanced to prescribe quantitative acceptance criteria based on the acceptance criteria of ACI 349.3R-2002, ACI 201.1R-2008, ACI 349-1976, ACI 318-71, ACI 301-72, AISC-1969 and 1978, ANSI N18.1-1971 and ASCE 11-90. Industry and plant specific operating experience will also be considered in the development of the acceptance criteria. 6. Plant implementing procedures will be updated to indicate that loose bolts or nuts and cracked high strength bolts will not be acceptable unless accepted by engineering evaluation. 7. Plant implementing procedures will be updated to indicate that structural sealants will be acceptable if the observed loss of material, cracking, and hardening will not result is loss of sealing. 8. Plant implementing procedures will be updated to indicate that elastomeric vibration isolation elements will be acceptable if there is no loss of material, cracking, or hardening that could lead to the reduction or loss of isolation function.		

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
			9. Plant implementing procedures will be updated to indicate that acceptance criteria for sliding surfaces will be (a) no indications of excessive loss of material due to corrosion or wear and (b) no debris or dirt that could restrict or prevent sliding of the surfaces as required by design. 10. The program will be enhanced to require that personnel performing inspections and evaluations meet the qualifications specified within ACI Report 349.3R-2002 with respect to knowledge of in-service inspection of concrete and visual acuity requirements. 11. The program implementing procedures will be enhanced to monitor unimpregnated and impregnated (with elastomer) fiberglass fabric for loss of material, separation, cracking/delamination, and change in material properties and visible deterioration. 12. Implementing documents will be updated to prescribe the acceptance criterion for flow blockage in storm drain piping is less than a 10 percent flow capacity reduction based on cross-sectional geometry. 13. Implementing documents will be updated to prescribe the acceptance criterion for storm drain piping corrugated metal pipe wall thickness in no less than 50 percent of the original thickness. 14. The implementing procedures will be updated to reflect when cracking or separation are observed in in-scope masonry walls, a condition report shall be initiated to document an evaluation of the effect of the condition for acceptability on the intended function of the masonry wall. 15. Acceptance criteria for indication of leaching of calcium hydroxide will be as follows: Groundwater parameters are no longer be considered non-aggressive if they exceed: • pH < 5.5 • chlorides > 500 ppm • sulfates >1500 ppm 16. The program implementing procedures will be enhanced to monitor the wooden clamps for loss of material and change in material properties.		
44	Water Chemistry (A.1.44 & B.2.44)	XI.M2	Continue the existing Water Chemistry Program	Ongoing	LRA Rev. 0 ML23184A081

Item No.	Program/Topic	NUREG 1801 Section	Commitment	Implementation Schedule	Source
45	(A.1 & B.1.4)	N/A	Continue the existing operating experience program to evaluate age-related degradation or aging management impacts to structures and components to manage aging management program effectiveness and determine the need for new programs consistent with LR-ISG-2011-05.	Ongoing	LRA Rev. 0 ML23184A081
46	(A.1.45 & B.2.45)	PS-SL	Implement the new Plant-Specific Periodic Inspections for Selective Leaching Program	May 8, 2026	Supplement 4, Revision 1 (ML24249A123)

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). The license renewal application for Perry Nuclear Power Plant, Unit 1 (Perry), was filed by Energy Harbor Nuclear Corporation by letter dated July 3, 2023 (ML23184A081). Effective March 1, 2024, the facility operating license for Perry was transferred from Energy Harbor Nuclear Generation LLC (owner) and Energy Harbor Nuclear Corp. (operator) to Energy Harbor Nuclear Generation LLC (owner) and Vistra Operations Company LLC (Vistra; operator) (ML24057A092). This appendix also lists other correspondence under Perry, Unit 1 Docket No. 50-440 related to the staff's review of the Perry license renewal application. These documents may be obtained online in the NRC's Agencywide Documents Access and Management System (ADAMS) Public Documents collection at https://www.nrc.gov/reading-rm/adams.html. To begin the search, select "Begin Web-based ADAMS Search." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov.

Table B-1 Chronology

Date	ADAMS Accession No.	Subject
5/13/2020	ML20134H987	Vistra. Perry Nuclear Power Plant, Unit 1 - License Renewal Application Letter of Intent
7/21/2022	ML2201A542	NRC. Pre-Submittal Meeting for License Renewal Application for Perry Nuclear Power Plant, Unit 1 - Safety
2/8/2021	ML21034A553	NRC. Pre-Submittal Meeting Summary for License Renewal Application for Perry Nuclear Power Plant, Unit 1 - Environmental
8/29/2022	ML22213A036	NRC. Pre-Submittal Meeting Summary for License Renewal Application for Perry Nuclear Power Plant, Unit 1 - Safety
4/18/2023	ML23069A290	NRC. Second Pre-Submittal Meeting Summary for License Renewal Application for Perry Nuclear Power Plant, Unit 1 - Environmental
2/16/2023	ML23046A184	NRC. Second Pre-Submittal Meeting for License Renewal Application for Perry Nuclear Power Plant, Unit 1 - Safety
3/15/2023	ML23065A219	NRC. Second Pre-Submittal Meeting Summary for License Renewal Application for Perry Nuclear Power Plant, Unit 1 - Safety
7/3/2023	ML23184A081	Vistra. License Renewal Application
8/3/2023	ML23198A036	NRC. Notice of Availability Letter
9/22/2023	ML23256A358 (Package) ML23256A359 (Letter) ML23256A360 (88 FR 67373)	NRC. Perry Nuclear Power Plant, Unit 1 – 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
9/22/2023	ML23261C364	NRC. Perry Nuclear Power Plant, Unit 1 – License Renewal Application Online Reference Portal
9/25/2023	ML23261B019	NRC. Perry Nuclear Power Plant, Unit 1 – Aging Management Audit Plan Regarding the License Renewal Application Review
4/9/2024	ML24095A328	NRC. Perry Nuclear Power Plant, Unit 1 – Schedule Change Letter
5/30/2024	ML54151A637 (non-public) ML24220A270 (public)	Vistra. License Renewal Application Supplement 1

Date	ADAMS Accession No.	Subject
6/4/2024	ML24156A153 (Breakout Questions- non-public) ML24156A154 (Breakout Questions – public) ML24239A778 (Audit Summary)	NRC. Perry Nuclear Power Plant, Unit 1 – Breakout Questions and Audit Summary
6/27/2024	ML24180A010	Vistra. License Renewal Application Supplement 2
7/3/2024	ML24185A092	Vistra. Annual Update
7/24/2024	ML24206A150	Vistra. License Renewal Application Supplement 3
8/8/2024	ML24221A093	Vistra. License Renewal Application Supplement 4, Revision 0
8/14/2024	ML24227A956	NRC. Request for Additional Information – Set 1
8/28/2024	ML24241A100	NRC. Request for Additional Information – Set 2
9/5/2024	ML24249A123	Vistra. License Renewal Application Supplement 4, Revision 1
9/19/2024	ML24260A266	Vistra. Response to Request for Additional Information – Set 1
10/2/2024	ML24276A083	Vistra. Response to Request for Additional Information – Set 2
10/2/2024	ML24276A129	NRC. Request for Additional Information – Set 3
10/2/2024	ML24276A094	NRC. Request for Confirmation of Information - Set 1
10/21/2024	ML24295A352	Vistra. License Renewal Application Supplement 5
10/31/2024	ML24305A134	Vistra. Response to Request for Confirmation of Information - Set 1
11/19/2024	ML24324A185	Vistra. Response to Request for Additional Information – Set 3
11/8/2024	ML24312A368	Vistra. License Renewal Application Supplement 6
11/4/2024	ML24309A167	NRC. Request for Confirmation of Information - Set 2
12/4/2024	ML24339A066	Vistra. Response to Request for Confirmation of Information - Set 2
12/19/2024	ML24354A265	Vistra. License Renewal Application Supplement 7
1/6/2025	ML25006A049	NRC. Request for Additional Information – Set 4
1/10/2025	ML25010A123	NRC. Request for Confirmation of Information - Set 3
1/27/2025	ML25027A327	Vistra. License Renewal Application Supplement 8
1/30/2025	ML25030A014	Vistra. Response to Request for Confirmation of Information - Set 3
2/5/2025	ML25036A154	Vistra. Response to Request for Additional Information – Set 4
2/18/2025	ML25049A245	NRC. Request for Additional Information – Set 5
3/20/2025	ML25079A062	Vistra. Response to Request for Additional Information – Set 5
4/22/2025	ML25112A167	Vistra. License Renewal Application Supplement 9

APPENDIX C

PRINCIPAL CONTRIBUTORS

C. Principal Contributors

This appendix lists the principal contributors for the development of this safety evaluation and their areas of responsibility.

Table C-1 Principal Contributors

Name	Area of Responsibility
Allik, Brian	Reviewer—Mechanical and Materials
Alvarado, Lydiana	Reviewer—Mechanical and Materials
Bedi, Gurjendra	Reviewer—Structural
Benson, Michael	Reviewer—Mechanical and Materials
Bhatt, Santosh	Reviewer—Nuclear
Bloom, Steven	Management Oversight
Boruk, Reena	Reviewer—Structural
Buford, Angela	Management Oversight
Candelario-Quintana, Luissette	Reviewer—Structural
Cintron-Rivera, Jorge	Reviewer—Electrical
Curran, Gordon	Reviewer—Scoping and Screening Methodology
Davidson, Evan	Management Oversight
Dijamco, David	Reviewer—Mechanical and Materials
Fairbanks, Carolyn	Reviewer—Mechanical and Materials
Foli, Adakou	Reviewer—Electrical
Forsaty, Fred	Reviewer—Nuclear
Fu, Bart	Reviewer—Mechanical and Materials
Gavula, James	Reviewer—Mechanical and Materials
Ghosh, Amita	Reviewer—Structural
Gibson, Lauren	Management Oversight
Haywood, Emma	Reviewer—Mechanical and Materials
Hoang, Dan	Reviewer—Structural
Iqbal, Naeem	Reviewer—Scoping and Screening Methodology
Im, Austin	Project Manager
Istar, Ata	Reviewer—Structural
Jenkins, Joel	Reviewer—Mechanical and Materials
Johnson, Andrew	Reviewer—Mechanical and Materials
Jung, Se-Kwon	Reviewer—Structural
Kalikian, Varoujan	Reviewer—Mechanical and Materials
Klien, Paul	Reviewer—Mechanical and Materials
Lai, Shaohua	Reviewer—Structural
Lee, Brian	Reviewer—Scoping and Screening Methodology
Lingam, Siva	Project Manager
Makar, Gregory	Reviewer—Mechanical and Materials
McConnel, Matthew	Reviewer—Electrical
Medoff, James	Reviewer—Mechanical and Materials
Moyer, Carol	Reviewer—Mechanical and Materials
Min, Seung	Reviewer—Mechanical and Materials
Mitchell, Matthew	Management Oversight

Name	Area of Responsibility
Nold, David	Reviewer—Scoping and Screening Methodology
Paige, Jason	Management Oversight
Park, Si Hwan	Reviewer—Structural
Parker, Cory	Reviewer—Mechanical and Materials
Prinaris, Andrew	Reviewer—Structural
Ramadan, Liliana	Reviewer—Electrical
Rezai, Ali	Reviewer—Mechanical and Materials
Rogers, Bill	Reviewer—Scoping and Screening Methodology
Sahd, Phillip	Management Oversight
Siwy, Andrew	Project Manager
Terry, Leslie	Reviewer—Mechanical and Materials
Thomas, George	Reviewer—Structural
Tyree, Christopher	Project Manager
Tseng, Ian	Management Oversight
Valentin, Milton	Management Oversight
Wang, George	Reviewer—Structural
Xi, Zuhan	Reviewer—Structural
Yoder, Matthew	Reviewer—Chemical
Yee, On	Reviewer—Mechanical and Materials

APPENDIX D

REFERENCES

D. References

This appendix lists the references used throughout this safety evaluation for review of the Perry, Unit 1, license renewal application.

Table D-1 References

References
U.S. Nuclear Regulatory Commission (NRC)
Title 10 Code of Federal Regulations, Part 54 (10 CFR 54), “Requirements for the Renewal of Operating Licenses Nuclear Power Plants.”
Title 10 Code of Federal Regulations, Section §50.49 (10 CFR 50.49), “Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants.”
Title 10 Code of Federal Regulations, Part 50 Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants.”
Title 10 Code of Federal Regulations, Part 50, Appendix J, “Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors.”
NRC Audit Report, “Aging Management Audit, Perry Nuclear Power Plant, Unit 1, License Renewal Application,” August 2024 (ML24239A778).
LR-ISG-2012-02, “Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation,” November 22. 2013 (ML13227A361).
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,” November 6, 2014 (ML14225A0059).
LR-ISG-2011-03, “Changes to the Generic Aging Lessons Learned (GALL) Report Revision 2 Aging Management Program XI.M41, ‘Buried and Underground Piping and Tanks,’” July 30, 2012 (ML12128A296).
LR-ISG-2011-01, Revision 1, “Aging Management of Stainless-Steel Structures and Components in Treated Borated Water,” dated December 18, 2012 (ML12233A367).
LR-ISG-2012-01, Wall Thinning due to Erosion Mechanisms (ML12352A057).
LR-ISG-2015-01, “Changes to Buried and Underground Piping and Tank,” January 28, 2016(ML15308a018).
SLR-ISG-2021-02-MECHANICAL, “Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance,” February 2021, ML20181A434.
SLR-ISG-2021-03-STRUCTURES, “Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance, Interim Staff Guidance,” February 2021 (ML20181A381).
NUREG-0619, “BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking: Resolution of Generic Technical Activity A-10,” November 1980 (ML031600712).
NUREG-0612, “Control of Heavy Loads at Nuclear Power Plants, Resolution of Generic Technical Activity A36,” Nuclear Regulatory Commission, Washington, DC, July 1980. (ML070250180).
NUREG 0737, “Clarification of TMI Action Plan Requirements,” issued November 1980 (ML051400209).
NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition,” March 2007 (ML070810350).
NUREG-0800, Branch Technical Position MEB 3-1, “Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment,” Revision 1, July 1981 (ML19137A333).
NUREG-1339, “Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants,” June 1990 (ML031430208).
NUREG-1557, “Summary of Technical Information and Agreements from Nuclear Management and Resources Council Industry Reports Addressing License Renewal,” October 1996 (ML20134K187).
NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” Revision 2, December 2010 (ML103490036).
NUREG-1801, “Generic Aging Lessons Learned for License Renewal (GALL Report),” Revision 2, December 2010 (ML103490041).

References
NUREG-2191, Volumes 1, and 2, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report,” July 2017 (ML17187A031 and ML17187A204).
NUREG-2192, “Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants,” July 2017 (ML17188A158).
NUREG/CR-4513, “Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems,” Revision 1, August 1994 (ML052360554).
NUREG/CR-4513, “Estimation of Fracture Toughness of Cast Stainless Steels during Thermal Aging in LWR Systems,” Revision 2, May 31, 2016 (ML16145A082).
NUREG/CR-6260, “Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components,” March 1995 (ML9503280383).
NUREG/CR–6909, “Effect of LWR Coolant Environments on the Fatigue Life of Reactor Materials,” Revision 1, March 2014 (ML14087A068).
Regulatory Guide 1.89, “Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants,” Revision 1, June 1984 (ML003740271).
Regulatory Guide 1.99, “Radiation Embrittlement of Reactor Vessel Material,” Revision 2, May 1988 (ML003740284).
Regulatory Guide 1.188, “Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses,” Revision 2, April 2020 (ML20017A265).
Regulatory Guide 1.190, “Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence,” Revision 0, March 2001 (ML010890301).
Regulatory Guide 1.207, “Guidelines for Evaluating the Effects of Light-Water Reactor Water Environments in Fatigue Analyses of Metal Components,” Revision 1, June 2018 (ML16315A130).
Regulatory Guide 1.127, “Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP Basis Document,” Revision 2, February 2016 (ML15107A412).
Regulatory Guide 1.147, “Inservice Inspection Code Case Acceptability ASME Section XI Division 1,” Revision 9, April 1992 (ML13064A120).
Safety Evaluation, “Topical Report PWROG-17011-NP, Revision 2,” July 25, 2019 (ML19198A056).
Industry Codes and Standards, By Source
American Concrete Institute (ACI)
ACI 201.1R, “Guide for Making a Condition Survey of Concrete in Service,” July 2008.
ACI-318.71, “Building Code Requirements for Reinforced Concrete,” American Concrete Institute, 1971.
ACI 201.1R-08, “Guide for Conducting a Visual Inspection of Concrete in Service,” 2008 Edition.
ACI 349.3R-02, “Report on Evaluation and Repair of Existing Nuclear Safety-Related Concrete Structures,” 2002 Edition.
American Society of Mechanical Engineers (ASME)
ASME B&PV Code, Section III, “Rules for Construction of Nuclear Facility Components.”
ASME B&PV Code, Section III, “Rules for Construction of Nuclear Facility Components” Subsections NB and NE, 1974 Edition with 1976 Addenda.
ASME B&PV Code, Section VIII, “Rules for Construction of Pressure Vessels,” Division 2.
ASME B&PV Code, Section XI, “Rules for In-Service Inspection of Nuclear Power Plant Components,” 2013 Edition.
ASME Code Case N-481, “Alternative Examination Requirements for Cast Austenitic Pump Casings, Section XI, Division 1,” March 5, 1990.
American National Standards Institute
ANSI/ASME B31.1, “Power Piping,” New York: ANSI.
ANSI B30.2.0-1976, “Overhead and Gantry Cranes,” NAVFAC-Dept of the Navy, American Society of Mechanical Engineers, New York, NY.

References
National Associated of Corrosion Engineers (NACE)
NACE Recommended Practice RP0285-2002, “Standard Recommended Practice Corrosion Control of Underground Storage Tank Systems by Cathodic Protection,” April 2002.
NACE Standard Practice SP0169-2007, “Control of External Corrosion on Underground or Submerged Metallic Piping Systems,” 2007.
National Fire Protection Association (NFPA)
NFPA 25, “Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems. 2011 Edition,” Quincy, Massachusetts: NFPA, 2011.
Industry Sources
Electric Power Research Institute (EPRI)
EPRI Letter MRP 2017-009, “Transmittal of NEI-03-08 “Needed” Interim Guidance Regarding Baffle Former Bolt Inspections for PWR Plants as Defined in Westinghouse NSAL 16-01 Rev.1,” March 15, 2017 (ML17087A106).
EPRI NP-5067, “Good Bolting Practices, A Reference Manual for Nuclear Power 7 Plant Maintenance Personnel.” Volume 1: “Large Bolt Manual.” 1987 and Volume 2: “Small Bolts and Threaded Fasteners.” Palo Alto, California: Electric Power Research Institute. 1990.
EPRI NP-5769, "Degradation and Failure of Bolting in Nuclear Power Plants," Volumes 1 and 2, April 1988.
EPRI TR 104213, “Bolted Joint Maintenance & Applications Guide," Palo Alto, California: EPRI, December 1995.
EPRI TR 1007820, “Closed Cooling Water Chemistry Guideline: Revision 1,” Palo Alto, California: EPRI, 2004.
EPRI TR 3002000505, “Pressurized Water Reactor Primary Water Chemistry Guidelines,” Revision 7, April 24, 2014 (proprietary).
EPRI. EPRI 1010639, “Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools,” Revision 4.” Palo Alto, California: Electric Power Research Institute. 2006.
EPRI TR 3002000590, “Closed Cooling Water Chemistry Guideline,” Revision 2, December 9, 2013 (proprietary).
EPRI Report 3002002623, “BWRVIP-190: BWR Vessel and Internals Project: BWR Water Chemistry Guidelines,” Revision 1, April 2014. (proprietary).
EPRI 3002013084, “Long-Term Operations: Subsequent License Renewal Aging Affects for Structures and Structural Components (Structural Tools),” November 2018.
EPRI TR 3002007856, In-Situ Pressure Test Guidelines, Revision 5, November 2016 (proprietary).
EPRI TR 3002010399, “Materials Reliability Program: Inspection Standard for Pressurized Water Reactor Internals (MRP-228),” Revision 4, December 2020 (ML21019A003).
EPRI TR 3002010645, “PWR Secondary Water Chemistry Guidelines,” Revision 8 (proprietary).
EPRI TR 3002017168, “Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227, Revision 1-A)” June 22, 2020 (ML20175A112).
EPRI TR 3002018267, “Primary-to-Secondary Leakage Guidelines,” Revision 5, December 2020 (proprietary).
Nuclear Energy Institute (NEI)
NEI 03-08, “Guideline for the Management of Materials Issues,” Revision 3, February 2017 (ML19079A256).

References
NEI 94-01, 1 “Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50 Appendix J.” Revision 2-A. Washington, DC: Nuclear Energy Institute. October 2008.
NEI 94-01, “Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50 Appendix J.” Revision 3-A (ML12221A202).
NEI 95-10, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule, Nuclear Energy Institute, Revision 6.
NEI 14-12, “Aging Management Program Effectiveness,” December 2014 (ML15090A665).
Vistra Operations Company LLC
Perry Nuclear Power Plant, Unit 1, Licensee Renewal Application, July 3, 2023 (ML23184A081).
License Renewal Application – Annual Update, July 3, 2024 (ML24185A092).
License Renewal Application – Supplement 1, May 30, 2024 & August 7, 2024 (ML54151A637; ML24220A270).
License Renewal Application – Supplement 2, June 27, 2024 (ML24180A010).
License Renewal Application – Supplement 3, July 24, 2024 (ML24206A150).
License Renewal Application – Supplement 4, Revision 0, August 8, 2024, 2024 (ML24221A093).
License Renewal Application – Supplement 4, Revision 1 September 5, 2024 (M ML24249A123).
License Renewal Application – Supplement 5, October 21, 2024 (ML24295A352).
License Renewal Application – Supplement 6, November 8, 2024 (ML24312A368).
License Renewal Application – Supplement 7, December 19, 2024 (ML24354A265).
License Renewal Application – Supplement 8, January 27, 2025 (ML25027A327).
License Renewal Application – Supplement 9, April 22, 2025 (ML25112A167).
License Renewal Application, Response to Aging Management Requests for Confirmation Information Set 1, October 31, 2024 (ML24305A134).
License Renewal Application – Response to Aging Management Requests for Confirmation Information Set 2, December 4, 2024 (ML24305A134).
License Renewal Application – Response to Aging Management Requests for Additional Information Set 1, September 19, 2024 (ML24260A266).
License Renewal Application – Response to Aging Management Requests for Additional Information Sets 2, October 2, 2024 (ML24276A083).
License Renewal Application – Response to Aging Management Requests for Additional Information Set 3, November 19, 2024 (ML24324A185).
License Renewal Application – Response to Aging Management Requests for Additional Information Set 4, February 5, 2025 (ML25036A154).
License Renewal Application – Response to Aging Management Requests for Confirmation Information Set 3, January 30, 2025 (ML25030A014).
License Renewal Application – Response to Aging Management Requests for Additional Information Set 5, March 20, 2025 (ML25079A062).
Perry Updated Final Safety Analysis Report (UFSAR), Energy Harbor Nuclear Corp., Revision 21.
Perry Updated Final Safety Analysis Report (UFSAR), Energy Harbor Nuclear Corp., Revision 22.
Perry Updated Final Safety Analysis Report, Energy Harbor Nuclear Corp., Revision 23, October 2023.
Other Sources
The Cleveland Electric Illuminating Company, Perry Power Plant, Confirmatory Program of the January 31, 1986, Ohio Earthquake Effect, Docket Nos. 50-440; 50-441, Gilbert/Commonwealth, June 1986.
Crane Manufacturers Association of America (CMAA)-70, “Specifications for Electric Overhead Traveling Cranes,” Crane Manufacturers Association of America, Inc., Pittsburgh, PA, 1975.
Research Council on Structural Connections (RCSC), “Specification for Structural Joints Using High-Strength Bolts.” Chicago, Illinois: RCSC, June 11, 2020.

References
ASM International. ASM Handbook Volume 13B, Corrosion: Materials. 2005.
ASM International. ASM Handbook Volume 13C, Corrosion: Environments and Industries.
Freeze/Thaw Protection during Construction of Recompacted Soil Liners and Recompacted Soil Barrier Layers, Division of Materials and Waste Management, Ohio Environmental Protection Agency, September 2023. (https://dam.assets.ohio.gov/image/upload/epa.ohio.gov/Portals/34/document/guidance/gd_158.pdf).
NSAC-202L-R4, Recommendations for an Effective Flow-Accelerated Corrosion Program (EPRI 3003000563) November 2013.
Forwards, “Steam Erosion Hazards Analysis,” per ASLB Issue in Response to NRC 830722 Request Effects to Steam Erosion on Safey Class Systems and Components cannot Prevent Safe Shutdown. (ML20084R789).