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

Safety Evaluation

Related to the Subsequent License Renewal
of Monticello Nuclear Generating Plant, Unit 1

Docket No. 50-263

Northern States Power Company, a
Minnesota corporation

Revision 0

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Office of Nuclear Reactor Regulation

ABSTRACT

This safety evaluation (SE) documents the technical review by the U.S. Nuclear Regulatory Commission (NRC) staff of the Monticello Nuclear Generating Plant, Unit 1 (MNGP) subsequent license renewal application (SLRA).

MNGP is located within the city limits of Monticello, Minnesota, on the south bank of the Mississippi River. It is a single-cycle, forced-circulation, General Electric BWR-3, low-power-density boiling water reactor (BWR) that produces steam for direct use in a steam turbine. Its licensed power output is 2,004 megawatts thermal (MWt). The NRC issued the initial Unit 1 operating license for MNGP on September 8, 1970, and renewed operating license on November 8, 2006.

By letter dated January 9, 2023 (Agencywide Documents Access and Management System [ADAMS] Package Accession No. ML23009A352), as supplemented, Northern States Power Company, a Minnesota corporation (NSPM), submitted an application for a subsequent license renewal for MNGP. NSPM requested renewal for a period of 20 years beyond the current expiration at midnight on September 8, 2030, for Unit 1 (Renewed Facility Operating License No. DPR-22).

In performing its review, the staff used the SLRA, SLRA supplements, NUREG-2191, Revision 0, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report,” issued July 2017 (ML17187A031 and ML17187A204), NUREG 2192, Revision 0, “Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants,” issued July 2017 (ML17188A158) (SRP-SLR) and the applicant’s responses to requests for additional information (RAIs). As part of its SLRA review, the staff conducted a regulatory audit from February 27, 2023, to May 25, 2023, in accordance with the audit plan dated February 24, 2023 (ML23048A023) and as detailed in the audit report dated August 31, 2023 (ML23214A232).

This SE documents the staff’s technical review of the information submitted by NSPM through February 29, 2024. Based on its review of the SLRA, the staff determined that NSPM has met the requirements of Title 10 of the *Code of Federal Regulations* Section 54.29(a), which states that a renewed license may be issued if the Commission finds that aging effects are or will be managed and time-limited aging analyses have been addressed.

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ABBREVIATIONS AND ACRONYMS

ACSR	Aluminum conductor steel reinforced
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
BSW	Biological shield wall
BWR	Boiling-water reactor
BWRVIP	Boiling Water Reactor Vessel Internals Project
°C	degrees Celsius
CAP	Corrective action program
CASS	Cast austenitic stainless steel
CBR	Condensate backwash receiving
CLB	Current licensing basis
CMTR	Certified Material Test Reports
CRD	Control rod drive
CUF	Cumulative usage factor
DBA	design basis accident
DBE	Design-basis event
DMW	Dissimilar metal welds
DOTS	Diesel Oil Storage Tank
EAF	Environmentally assisted fatigue
ECP	Electrochemical potential
EFPY	Effective full-power years

EPRI	Electric Power Research Institute
EPU	Extended power uprate
EQ	Environmental qualification
ESF	Engineered safety features
°F	degrees Fahrenheit
FSAR	final safety analysis report
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
HPCI	High-pressure coolant injection
HS	High-strength
I&C	Instrumentation and controls
IASCC	irradiation-assisted stress corrosion cracking
IGSCC	intergranular stress corrosion cracking
INPO	Institute of Nuclear Power Operations
IPA	Integrated plant assessment
ISI	Inservice inspection
ISP	Integrated Surveillance Program
LOCA	Loss-of-coolant accident
LPCI	low pressure coolant injection
LR	License renewal
LRA	License renewal application
LRBD	License renewal boundary drawings
LWR	light water reactor
MEB	Metal Enclosed Bus
MIC	microbiologically induced corrosion
MNGP	Monticello Nuclear Generating Plant
NDT	Nil-ductility transition
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NOC	Normal operating condition
NRC	Nuclear Regulatory Commission
NSPM	Northern States Power Company, a Minnesota
OBE	Operating basis earthquake
OE	Operating experience

PCAC	Primary Containment Atmospheric Control
PTLR	Pressure-temperature limits report
PWR	Pressurized-water reactors
QA	Quality assurance
RAI	Requests for additional information
RAMA	Radiation Analysis Modeling Application
RB	Reactor building
RCI	request for confirmation of information
RCIC	Reactor core isolation cooling
RCS	Reactor Coolant System
RCSC	Research Council for Structural Connections
RHR	Residual heat removal
RIL	Research Information Letter
RIVE	Radiation induced volumetric expansion
RPV	Reactor pressure vessel
RT	Reference temperature
RTNDT	Reference temperature for nil ductility transition
RV	Reactor vessel
RVI	Reactor vessel internal
SBA	Small break accident
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
SPEO	Subsequent period of extended operation
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 subsequent license renewal application (SLRA) for Monticello Nuclear Generating Plant, Unit 1 (MNGP). Northern States Power Company, a Minnesota corporation (NSPM, the applicant), filed the SLRA by letter dated January 9, 2023, (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML23009A352), as supplemented by letters dated April 3, 2023 (ML23094A136); June 26, 2023 (ML23177A218); July 11, 2023 (ML23193B026); July 18, 2023 (ML23199A154); August 15, 2023 (ML23227A175); August 28, 2023 (ML23240A695); September 5, 2023 (ML23248A474); September 22, 2023 (ML23265A158); October 3, 2023 (ML23276B433); November 9, 2023 (ML23313A158); November 30, 2023 (ML23334A147); January 11, 2024 (ML24012A051) and February 29, 2024 (ML24060A269).

In its application, NSPM seeks to renew Monticello Renewed Facility Operating License No. DPR-22 for an additional 20 years beyond the current expiration of their renewed license on September 8, 2030. The staff performed a safety review of NSPM's application in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants" (10 CFR Part 54). The NRC project manager for the SLRA review is Mrs. Marieliz Johnson, who can be contacted by email at marieliz.johnson@nrc.gov.

MNGP is located in Monticello, Minnesota, which is 35 miles northwest of Minneapolis, Minnesota. Unit 1 is a single-cycle, forced circulation, General Electric BWR-3, low power density boiling water reactor (BWR) producing steam for direct use in a steam-turbine. MNGP operates at a licensed power output of 2,004 megawatts thermal (MWt). The staff issued the initial operating license for Unit 1 on September 8, 1970, and renewed operating license on November 8, 2006. The MNGP updated final safety analysis report (UFSAR) describes the plant and the site (ML23006A133).

Section 54.29, "Standards for issuance of a renewed license," of 10 CFR sets forth the license renewal standards. It states that a renewed license may be issued if the Commission finds that aging effects are or will be managed and time-limited aging analyses have been addressed; the NRC's requirements in 10 CFR Part 51 concerning environmental review have been satisfied, and, when applicable, matters raised concerning consideration of Commission rules and regulations in adjudicatory proceedings have been addressed. Accordingly, the NRC license renewal process consists of (1) a safety review, and (2) an environmental review. Regulations in 10 CFR Part 54 and 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," set forth requirements for safety reviews and environmental reviews, respectively. The safety review for the MNGP subsequent license renewal (SLR) is based on NSPM's SLRA, the staff's audits, responses to the staff's requests for additional information (RAIs), and responses to the staff's requests for confirmation of information (RCIs). NSPM supplemented its application and provided clarifications through its responses to the staff's questions in RAIs, RCIs, audits, meetings, and docketed correspondence. The staff reviewed and considered the information submitted through February 29, 2024.

The public may view the SLRA and material 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 SLRA. It describes technical details the staff considered in evaluating the safety aspects of the proposed operation of Unit 1 for an additional 20 years beyond the term of the current renewed operating license. The staff reviewed the SLRA in accordance with NRC regulations and the guidance in NUREG-2192, Revision 0, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" (SRP-SLR), dated July 2017 (ML17188A158).

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

- Appendix A, "License Renewal Commitments," contains a table showing NSPM's commitments for subsequent renewal of the operating license.
- Appendix B, "Chronology," contains a chronology of the principal correspondence between the staff and the applicant as well as other relevant correspondence regarding the SLRA review.
- 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 staff's review.

1.2 License Renewal Background

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

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

1.2.1 Safety Review

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

(1) The regulatory process is adequate to ensure that the licensing bases of all currently operating plants maintain an acceptable level of safety with the possible exception of the

detrimental aging effects on the functions of certain systems, structures, and components (SSCs) and a few other safety-related issues during the period of extended operation.

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

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

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

   i. The integrity of the reactor coolant pressure boundary;

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

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

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

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

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

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

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

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

In the MNGP SLRA, NSPM stated that it used the process defined in the NUREG 2191, Revision 0, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report, dated July 2017 (ML17187A031 and ML17187A204) 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 SLRA review can be greatly reduced, improving the efficiency and effectiveness of the SLR review process. The GALL-SLR Report summarizes the aging management evaluations, programs, and activities credited for managing aging for most of the SCs used throughout the nuclear power plant industry. The report is also a quick reference for both applicant and staff reviewers on AMPs and activities that can manage aging adequately during the subsequent period of extended operation.

1.2.2 Environmental Review

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

1.3 Principal Review Matters

Part 54 of 10 CFR describes the requirements for renewal of operating licenses for nuclear power plants. The staff's technical review of the SLRA was performed in accordance with NRC guidance and 10 CFR Part 54 requirements. This SE describes the results of the staff's safety review in accordance with 10 CFR Part 54 requirements.

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

Section 54.19(b) of 10 CFR requires that the SLRA include "conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license." On this issue, NSPM stated in SLRA Section 1.1.8:

> The requirements of 10 CFR 54.19(b) state that SLRAs must include, "…conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license." The current indemnity agreement No. B-42 for MNGP (References ML113201358 and ML080920368) states that the agreement shall terminate at the time of expiration of the license. In addition, Amendment 12 to indemnity agreement No. B-42 could not be located in official record, however the NRC provided confirmation that NSP is in compliance with regulations (Reference ML080920368). The license number in indemnity agreement No. B-42 was

originally SNM-1114 but was updated to the current operating license No. DPR-22 (Reference ML113201377).

NSPM has reviewed the original indemnity agreement and Amendments 1 through 14, and there is no expiration date specified for operating license DPR-22. Therefore, no changes to the indemnity agreement are deemed necessary as part of this SLRA. Should the license numbers be changed upon issuance of the subsequent renewed license, NSPM requests that conforming changes be made to the indemnity agreement as appropriate. If the SLR is approved, when issued, the staff intends to maintain the original license numbers. Therefore, the staff finds that conforming changes to the indemnity agreement need not be made and that the 10 CFR 54.19(b) requirements are met.

Section 54.21, “Contents of application—technical information,” of 10 CFR requires that the SLRA contain:

- an integrated plant assessment
- a description of any CLB changes during the staff’s review of the SLRA
- an evaluation of TLAAs
- a UFSAR supplement

SLRA Sections 3 and 4 and Appendix B address the license renewal requirements of 10 CFR 54.21(a), (b), and (c). The staff finds that SLRA Appendix A addresses the license renewal requirements of 10 CFR 54.21(d).

Section 54.21(b) of 10 CFR requires that each year following submittal of the SLRA and at least 3 months before the scheduled completion of the staff’s review, the applicant submit an SLRA amendment identifying any CLB changes that materially affect the contents of the SLRA, including the UFSAR supplement. By letter dated February 29, 2024, NSPM submitted an SLRA update that summarizes the CLB changes that have occurred during the staff’s review of the SLRA (ML24060A269). The staff finds that this submission satisfies the 10 CFR 54.21(b) requirements.

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

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

As required by 10 CFR 54.25, “Report of the Advisory Committee on Reactor Safeguards,” the ACRS issues a report documenting its evaluation of the staff’s SLRA review and SE. Section 5 of the SE 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 is a living program. The staff, industry, and other interested stakeholders gain experience and develop lessons-learned with each renewed license. The lessons-learned contribute to the staff's performance goals of maintaining safety, improving effectiveness and efficiency, reducing regulatory burden, and increasing public confidence. The staff identifies lessons learned in interim staff guidance (ISG) for the staff, industry, and other interested stakeholders to use until the NRC incorporates the information into license renewal guidance documents such as the SRP-SLR and GALL-SLR Report.

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

Table 1.4-1 Current License Renewal Interim Staff Guidance

License Renewal ISG Topic (Approved LR-ISG Number)	Title	SE Section
SLR-ISG-2021-04-ELECTRICAL (ML20181A395)	Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance	SE Sections 3.0.3.1.14, 3.0.3.1.15, 3.0.3.2.28
SLR-ISG-2021-02-MECHANICAL (ML20181A434)	Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance	SE Sections 3.0.3.1.1, 3.0.3.1.6, 3.0.3.1.12, 3.0.3.2.3, 3.0.3.2.9, 3.0.3.2.12, 3.3.2.1.8, 3.5.2.3.2
SLR-ISG-2021-03-STRUCTURES (ML20181A381)	Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance	SE Sections 3.0.3.2.25, 3.5.2.2.1.5, 3.5.2.2.2.6
SLR-ISG-2021-01-PWRVI (ML20217L203)	Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized-Water Reactors	SE Section 3.1.2.2.9

1.5 Summary of Open Items

An item is considered to be open if, in the staff's judgment, the staff has not determined that the item meets all applicable regulatory requirements at the time of the issuance of this SE. After reviewing the SLRA, including additional information NSPM submitted through February 29, 2024, the staff identified no open items.

1.6 Summary of Confirmatory Items

An item is considered confirmatory if, in the staff's judgment, the staff and the applicant have reached an acceptable resolution that meets all applicable regulatory requirements, but at the time of the issuance of this SE, the staff had not received the necessary documentation to confirm the resolution. After reviewing the SLRA, including additional information NSPM submitted through February 29, 2024, the staff finds that no confirmatory items exist that require a formal response from NSPM.

1.7 Summary of Proposed License Conditions

After reviewing the SLRA, including additional information NSPM submitted through February 29, 2024, the staff deemed two license conditions appropriate and necessary:

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

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

SECTION 2 STRUCTURES AND COMPONENTS SUBJECT TO AGING MANAGEMENT REVIEW

2.1 Scoping and Screening Methodology

2.1.1 Introduction

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

2.1.2 Summary of Technical Information in the Application

Monticello Nuclear Generating Plant (MNGP) SLRA Section 2.0, “Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review and Implementation Results,” provides the technical information required by 10 CFR 54.21. SLRA Section 2.0 states, in part, that the applicant considered the following in developing the scoping and screening methodology described in SLRA Section 2.0:

- 10 CFR Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants” (the Rule)

- Nuclear Energy Institute (NEI) 17-01, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal,” issued December 2017 ((ML17339A599), endorsed by U.S. Nuclear Regulatory Commission (NRC) Regulatory Guide 1.188, Revision 2, “Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses,” issued April 2020 (ML20017A265)

SLRA Section 2.1, “Scoping and Screening Methodology,” describes the methodology MNGP used to identify the SSCs within the scope of SLR (scoping) and the SCs therein subject to an AMR (screening).

2.1.3 Scoping and Screening Program Review

The NRC staff evaluated the applicant’s scoping and screening methodology in accordance with the guidance in Section 2.1, “Scoping and Screening Methodology,” of NUREG-2192, “Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants” (SRP-SLR), issued July 2017 (ML1788A158). The following regulations provide the basis for the acceptance criteria the staff used to assess the adequacy of the applicant’s SLRA scoping and screening methodology:

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

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

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

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

2.1.3.1 Documentation Sources for Scoping and Screening

2.1.3.1.1 Summary of Technical Information in the Application

SLRA Section 2.1.3, "Information Sources Used for Scoping and Screening," discusses the following information sources for the SLR scoping and screening processes:

- updated safety analysis report (USAR)
- design-basis documents
- controlled plant component database
- plant drawings
- environmental qualification (EQ) documentation
- operations manuals
- evaluations under 10 CFR 50.59, "Changes, tests and experiments"
- original license renewal documents:
  - application for initial renewed operating licenses for MNGP and related docketed regulatory correspondence
  - NUREG-1865, "Safety Evaluation Report Related to the License Renewal of the Monticello Nuclear Generating Plant," issued April 2006 (ML061170030)
- other current licensing basis (CLB) references:
  - NRC safety evaluation reports, including NRC staff review of MNGP major licensing submittals (including the alternative source term methodology amendment) (ML062790015), extended power uprate (ML13316B298 and ML13343A006), MELLLA+, AREVA fuel and safety analysis methods, and extended flow window
  - licensing correspondence, including relief requests, licensee event reports, and responses to NRC communications such as NRC bulletins, generic letters, or enforcement actions
  - engineering evaluations, calculations, and engineering change packages that can provide additional information about the requirements of characteristics associated with the evaluated SSCs

2.1.3.1.2 Staff Evaluation

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

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

2.1.3.1.3 Conclusion

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

2.1.4 Plant Systems, Structures, and Components Scoping Methodology

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

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

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

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

> SR [safety-related] classifications for systems and structures are based on system and structure descriptions and analysis in the USAR. SR structures are those structures listed in the USAR Chapter 12 and classified as Class 1. Systems and structures identified as SR in the USAR meet the criteria of 10 CFR 54.4(a)(1) and are included within the scope of SLR. SR components in the Functional Location Classification database were also reviewed, and the systems and structures that contained these components were also included within the scope of SLR. The review also confirmed that all plant conditions, including conditions of normal operation, internal events, anticipated operational occurrences, DBAs [design-basis accidents], external events, and natural phenomena as described in the CLB, were considered for SLR scoping.

2.1.4.1.2 Staff Evaluation

In accordance with 10 CFR 54.4(a)(1), the applicant must consider all safety-related SSCs relied on to remain functional during and following a design-basis event (DBE) (as defined in 10 CFR 50.49(b)(1)) to ensure the following functions: (1) the integrity of the reactor coolant pressure boundary, (2) the capability to shut down the reactor and maintain it in a safe-shutdown condition, or (3) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to those referred to in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11, "Determination of exclusion area, low population zone, and population center distance," as applicable.

Regarding the identification of DBEs, SRP-SLR Section 2.1.3, "Review Procedures," 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]. Examples of DBEs that may not be described in this chapter include external events, such as floods, storms, earthquakes, tornadoes, or hurricanes, and internal events, such as a high-energy line break. Information regarding DBEs as defined in 10 CFR 50.49(b)(1) may be found in any chapter of the facility UFSAR, the Commission's regulations, NRC orders, exemptions, or license conditions within the CLB. These sources should also be reviewed to identify SSCs that are relied upon to remain functional during and following DBEs…to ensure the functions described in 10 CFR 54.4(a)(1).

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

2.1.4.1.3 Conclusion

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

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

2.1.4.2.1 Summary of Technical Information in the Application

The applicant addressed the methods used to identify SSCs included within the scope of SLR, in accordance with the requirements of 10 CFR 54.4(a)(2), in SLRA Section 2.1.4.2, "Nonsafety-Related Affecting Safety-Related—10 CFR 54.4(a)(2)," and its subsections. In addition, SLRA Section 2.0 states the applicant's methodology is consistent with the guidance contained in NEI 17-01. NEI 17-01 (which also refers to NEI 95-10, Revision 6, "Industry Guideline for Implementing The Requirements of 10 CFR Part 54—The License Renewal Rule," issued June 2005, endorsed by the NRC in Regulatory Guide 1.188) discusses the implementation of the 10 CFR 54.4(a)(2) scoping criteria to include non-safety-related SSCs whose failure can prevent the satisfactory accomplishment of safety functions.

Non-Safety-Related SSCs Supporting Safety Functions

SLRA Section 2.1.4.2.1, "Nonsafety-Related SSCs with Potential to Prevent Satisfactory Accomplishment of Safety Functions," discusses non-safety-related systems identified in the MNGP CLB, such as cranes, high-energy line break pipe whip restraints and jet impingement shields and barriers, internally and externally generated missile barriers, steam dryer assembly, main steam lines, main steam bypass lines, condenser, electrical commodities associated with the neutron monitoring system, some thermal insulation, the condensate storage tanks, and flood mitigation features, which were included within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

Non-Safety-Related SSCs Attached to Safety-Related SSCs

SLRA Section 2.1.4.2.2, "Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs that Provide Structural Support for the Safety-Related SSCs," states, in part, the following:

> Section 4 of Appendix F of NEI 95-10 states that for NSR [non-safety-related] SSCs that are directly connected to SR SSCs (typically piping systems), the NSR piping and supports, up to and including the first equivalent anchor beyond the safety/non-safety interface, are within the scope of SLR per 10 CFR 54.4(a)(2).

In addition, SLRA Section 2.1.4.2.2 states, in part, the following:

> The following methods were used to determine end points for the portion of NSR piping attached to SR piping to be included in-scope for SLR for cases where there is no equivalent anchor.
>
> - NSR Branch lines may have been excluded from scope if their mass and stiffness relative to the SR piping was small. In the MNGP piping analysis guidelines, a moment of inertia ratio greater than 40-to-1, the effects of the branch line on the run pipe are considered negligible. An NSR branch pipe meeting this criterion would not need to be in-scope for SLR for impact/support but may need to be considered for spray/leakage.
> - Primary Containment Atmospheric Control (PCAC) piping off the torus and drywell transition into ducting. Due to the relative flexibility of the ducting, the NSR ducting was considered to have a negligible impact on the piping, and therefore the NSAS [nonsafety affecting safety] scoping boundary for these lines was at the ducting transition point.
> - Small bore vent and drain lines off SR piping or equipment. Typically, the first valve off the main header is SR, and then is NSR thereafter. Many of these have few or no supports on the NSR portion, and in these instances, the entire NSR portion of the line is in-scope for SLR.
> - Small bore piping often transitions to tubing. Due to the relative flexibility of the tubing with respect to the piping, the tubing was considered to have a negligible impact on the piping. Therefore, the NSAS boundary would be at the tubing transition point.

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

> For NSR SSCs directly connected to SR SSCs, the in-scope boundary for SLR extends into the NSR portion of the piping and supports up to and including the first equivalent anchor beyond the safety/non-safety interface. For MNGP, the first equivalent anchor is that point beyond which failure of the NSR piping system will not prevent the satisfactory accomplishment of the SR function of the connected SSCs.

SLRA Section 2.1.4.2.4, “Abandoned Equipment,” states, in part, the following:

> Abandoned piping components within structures containing SR components were excluded from scope when the following conditions were met:
>
> (1) The abandoned piping components do not provide structural or seismic support to attached SR piping, and
>
> (2) The abandoned piping is separated from sources of water by blanks, blind flanges, pipe caps, or closed valves (if an open drain is available to identify leak-by), and
>
> (3) The abandoned piping is empty of liquid. Piping was verified to be empty by establishing configuration (such as the piping being open-ended at the low point), by review of documents that abandoned the equipment, or by other methods that are capable of confirming the absence of trapped fluid.

The abandoned equipment does not need to be managed for leakage or spray but may need to be managed for potential impact (supports in-scope and managed). This is consistent with the plant “spaces” approach for spatial interaction if safety-related SSCs are located within the same space. SLRA Section 2.1.4.2.3, “Nonsafety-Related SSCs which Have the Potential to Affect Safety-Related SSCs through Spatial Interactions,” discusses this approach.

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

SLRA Section 2.1.4.2.3 discusses the evaluation of non-safety-related SSCs that could potentially impact safety-related SSCs through spatial interaction (i.e., impact, spray, or leakage).

SLRA Section 2.1.4.2.3 states, in part, the following:

> NSR SSCs that are not connected to SR piping or components; or are outside the structural support boundary for the attached SR piping system and have a spatial relationship such that their failure could adversely impact the performance of a SR SSC intended function, must be evaluated for SLR scope in accordance with 10 CFR 54.4(a)(2) requirements. To address this requirement, MNGP has chosen to use the preventative option (i.e., spaces approach) as described in Appendix F to NEI 95-10.

SLRA Section 2.1.4.2.4, “Abandoned Equipment,” states the following:

> There are mechanical fluid components at MNGP that have been abandoned in-place, using a site procedure. Abandoned piping components within structures containing SR components were excluded from scope when the following conditions were met:
>
> (1) The abandoned piping components do not provide structural or seismic support to attached SR piping, and
>
> (2) The abandoned piping is separated from sources of water by blanks, blind flanges, pipe caps, or closed valves (if an open drain is available to identify leak-by), and
>
> (3) The abandoned piping is empty of liquid. Piping was verified to be empty by establishing configuration (such as the piping being open-ended at the low point), by review of documents that abandoned the equipment, or by other methods that are capable of confirming the absence of trapped fluid.

The abandoned equipment does not need to be managed for leakage or spray but may need to be managed for potential impact (supports in scope and managed). This is consistent with the plant “spaces” approach for spatial interaction if safety-related SSCs are located within the same space.

2.1.4.2.2 Staff Evaluation

The staff reviewed SLRA sections 2.1.4.2, 2.1.4.2.1, 2.1.4.2.2, 2.1.4.2.3, and 2.1.4.2.4, in which the applicant described the scoping methodology for non-safety-related SSCs in accordance with 10 CFR 54.4(a)(2). During the review, the staff followed the guidance contained in SRP-SLR Section 2.1.3.1.2, “Nonsafety-Related,” which states that the applicant should not consider hypothetical failures that are not part of the CLB and that have not previously been experienced, but rather should base its evaluation on the plant’s CLB, engineering judgment and analyses, and relevant operating experience.

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

The staff reviewed SLRA Section 2.1.4.2.1, which describes non-safety-related SSCs, such as cranes, high-energy line break pipe whip restraints and jet impingement shields and barriers, internally and externally generated missile barriers, steam dryer assembly, main steam lines, main steam bypass lines, condenser, electrical commodities associated with the neutron monitoring system, some thermal insulation, the condensate storage tanks, and flood mitigation features. These non-safety-related, non-plant SSCs support safety functions and were included within the scope of SLR in accordance with 10 CFR 54.4(a)(2). The staff confirmed the applicant reviewed the USAR, plant drawings, the equipment database, and other CLB documents to identify the non-safety-related support SSCs whose failure could prevent the performance of a safety-related intended function. The staff determined the applicant identified the non-safety-related SSCs that perform or support a safety function and included those SSCs within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

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

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

<u>Non-Safety-Related SSCs Directly Connected to Safety-Related SSCs</u>

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

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

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

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

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

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

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

2.1.4.2.3 Conclusion

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

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

2.1.4.3.1 Summary of Technical Information in the Application

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

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

SLRA Section 2.1.4.3 further states the following:

> With the exception of Pressurized Thermal Shock (not applicable to BWRs), Section 2.1.2.4 identifies the references to source documents used to determine the scope of components within a system that are credited to demonstrate compliance with each of the applicable regulated events. SSCs credited in the regulated events have been classified as satisfying criteria of 10 CFR 54.4(a)(3) and have been included within the scope of SLR.

2.1.4.3.2 Staff Evaluation

The staff reviewed SLRA Section 2.1.4.3, which describes the method used to identify and include within the scope of SLR those SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the agency’s regulations for fire protection (10 CFR 50.48, “Fire protection”), EQ (10 CFR 50.49, “Environmental qualification of electric equipment important to safety for nuclear power plants”), pressurized thermal shock (10 CFR 50.61, “Fracture toughness requirements for protection against pressurized thermal shock events”), anticipated transients without scram (ATWS) (10 CFR 50.62, “Requirements for reduction of risk from anticipated transients without scram (ATWS) events for light-water-cooled nuclear power plants”), and station blackout (SBO) (10 CFR 50.63, “Loss of all alternating current power”).

The staff determined that the applicant’s scoping process considered information sources used for scoping and screening to verify that the appropriate SSCs were included within the scope of SLR, evaluated CLB information to identify SSCs that perform functions addressed in 10 CFR 54.4(a)(3), and included those SSCs within the scope of SLR. Based on the review of information contained in the SLRA and the CLB documents reviewed, the staff determined that the applicant’s methodology is sufficient for identifying and including SSCs credited in performing functions within the scope of SLR in accordance with the requirements of 10 CFR 54.4(a)(3).

2.1.4.3.3 Conclusion

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

2.1.4.4 Scoping of Systems and Structures

2.1.4.4.1 Summary of Technical Information in the Application

SLRA Section 2.0 states, in part, the following:

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

SLRA Section 2.1.1, "Introduction," states, in part, the following:

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

SLRA Section 2.1.1 further states, for mechanical, structural, and electrical systems, the following, in part:

> If any portion of a mechanical system met the scoping criteria of 10 CFR 54.4(a)(1), (a)(2), and [or] (a)(3), it was included within the scope of SLR. The mechanical systems in the scope of SLR were then further evaluated to determine the system components that support the identified system intended function(s).
>
> If any portion of a structure met the scoping criteria of 10 CFR 54.4(a)(1), (a)(2), and [or] (a)(3), the structure was included within the scope of SLR. Structures in the scope of SLR were then further evaluated to determine those structural components that are required to perform or support the identified structure intended function(s).
>
> Electrical and I&C [instrumentation and controls] systems were scoped using the same methodology as mechanical systems and structures per the scoping criteria in 10 CFR 54.4(a)(1), (a)(2), and [or] (a)(3). Electrical and I&C components that are part of in-scope electrical and I&C systems and in-scope mechanical systems were included within the scope of SLR.

2.1.4.4.2 Staff Evaluation

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

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

2.1.4.4.3 Conclusion

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

2.1.5 Screening Methodology

2.1.5.1 Summary of Technical Information in the Application

SLRA Section 2.1.1 states, in part, the following:

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

SLRA Section 2.1.1 further states, in part, the following:

> Selected components, such as equipment supports, structural items, and passive electrical components, were scoped and screened as commodities. The structural commodities and electrical commodities were evaluated collectively.

SLRA Section 2.1.5, "Screening Methodology," states, in part, the following:

> For mechanical systems and civil structures, this process establishes evaluation boundaries, determines the SCs that comprise the system or structure, determines which of those SCs support system/structure intended functions, and identifies specific SC intended functions. Consequently, not all the SCs for in-scope systems or structures are within the evaluation boundaries for SLR because they are not in the scope of SLR. Once these in-scope SCs are

> identified, the screening process then determines which SCs are subject to an AMR per the criteria of 10 CFR 54.21(a)(1).

SLRA Section 2.1.5 further states, in part, the following:

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

SLRA Section 2.1.5.3, “Electrical and Instrumentation & Control Systems,” states, in part, the following:

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

2.1.5.2 Staff Evaluation

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

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

<u>Mechanical and Structural</u>

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

Electrical

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

2.1.5.3 Conclusion

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

2.1.6 Summary of Evaluation Findings

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

2.2 Plant Level Scoping Results

2.2.1 Introduction

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

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

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

- all non-safety-related SSCs whose failure could prevent satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1)(i), (ii), or (iii)

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

2.2.2 Summary of Technical Information in the Application

SLRA Section 2.2, Table 2.2-1, "Plant Level Scoping Report Results," lists the plant mechanical, structural, electrical, and I&C systems and indicates those systems that are within the scope of SLR.

2.2.3 Staff Evaluation

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

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

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

2.2.4 Conclusion

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

2.3 Scoping and Screening Results: Mechanical Systems

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

- reactor coolant system
- engineered safety features
- auxiliary systems
- steam and power conversion systems

In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant must list the passive, long-lived SCs that are within the scope of SLR and that are subject to an AMR. To verify that the applicant properly implemented its methodology, the staff focused 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-SLR Section 2.3, “Scoping and Screening Results: Mechanical Systems,” and considered the system function(s) as described in the USAR. 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 SLR. Similarly, the staff evaluated the applicant’s screening results to verify that all passive, long-lived components are subject to an AMR, as required by 10 CFR 54.21(a)(1).

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

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

2.3.1 Summary of Technical Information in the Application

SLRA Section 2.3.1, “Reactor 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 SLR. The applicant described the supporting SCs of the mechanical systems in the following SLRA sections:

- SLRA Section 2.3.1.1, “Reactor Pressure Vessel”
- SLRA Section 2.3.1.2, “Reactor Pressure Vessel Internals”
- SLRA Section 2.3.1.3, “Reactor Coolant System Boundary and Connected Piping”
- SLRA Section 2.3.2.1, “Core Spray”
- SLRA Section 2.3.2.2, “High Pressure Coolant Injection”
- SLRA Section 2.3.2.3, “Primary Containment Mechanical”
- SLRA Section 2.3.2.4, “Reactor Core Isolation Cooling”
- SLRA Section 2.3.2.5, “Residual Heat Removal”
- SLRA Section 2.3.2.6, “Secondary Containment”
- SLRA Section 2.3.3.1, “Alternate Nitrogen”
- SLRA Section 2.3.3.2, “Chemistry Sampling”
- SLRA Section 2.3.3.3, “Circulating Water”
- SLRA Section 2.3.3.4, “Control Rod Drive”
- SLRA Section 2.3.3.5, “Demineralized Water”
- SLRA Section 2.3.3.6, “Emergency Diesel Generator”
- SLRA Section 2.3.3.7, “Emergency Filtration Train”
- SLRA Section 2.3.3.8, “Emergency Service Water”
- SLRA Section 2.3.3.9, “Fire System”

- SLRA Section 2.3.3.10, "Fuel Pool Cooling and Cleanup"
- SLRA Section 2.3.3.11, "Heating and Ventilation"
- SLRA Section 2.3.3.12, "Instrument and Service Air"
- SLRA Section 2.3.3.13, "Radwaste Solid and Liquid"
- SLRA Section 2.3.3.14, "Reactor Building Closed Cooling Water"
- SLRA Section 2.3.3.15, "Reactor Water Cleanup"
- SLRA Section 2.3.3.16, "Service and Seal Water"
- SLRA Section 2.3.3.17, "Standby Liquid Control"
- SLRA Section 2.3.3.18, "Wells and Domestic Water"
- SLRA Section 2.3.4.1, "Condensate Storage"
- SLRA Section 2.3.4.2, "Condensate and Feedwater"
- SLRA Section 2.3.4.3, "Main Condenser"
- SLRA Section 2.3.4.4, "Off-Gas"
- SLRA Section 2.3.4.5, "Turbine Generator"

2.3.2 Staff Evaluation

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

Using the evaluation methodology described in SLRA Section 2.1 and the guidance in SRP-SLR, Section 2.3, "Scoping and Screening Results: Mechanical Systems," the staff reviewed the MNGP LRBDs, USAR, and additional documents, as detailed in the table below:

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
SLRA Section	**SLRA Section Title**	**Documents Reviewed by Staff**		
		SLRA Tables	**USAR**	**SLRA Drawings**
SLRA Section 2.3.1, "Reactor Coolant System"				
2.3.1.1	Reactor Pressure Vessel	Table 2.3.1-1, Reactor Pressure Vessel Components Subject to Aging Management Review Table 3.1.2-1, Reactor Pressure Vessel—Summary of Aging Management Evaluation	Section 4.2	SLR-36241 SLR-36241-1 SLR-36242 SLR-36242-1 SLR-36246 SLR-36247 SLR-36248 SLR-36249 SLR-36250 SLR-36251 SLR-36252 SLR-36253 SLR-91197 SLR-96042-1

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
2.3.1.2	Reactor Pressure Vessel Internals	Table 2.3.1-2, Reactor Vessel Internals System Components Subject to Aging Management Review Table 3.1.2-2, Reactor Vessel Internals—Summary of Aging Management Evaluation	Section 3.6	None
2.3.1.3	Reactor Coolant System Boundary and Connected Piping	Table 2.3.1-3, Reactor Coolant Pressure Boundary and Connected Piping System Components Subject to Aging Management Review Table 3.1.2-3, Reactor Coolant Pressure Boundary and Connected Piping—Summary of Aging Management Evaluation	Sections 3.6, 4.3.1.1, 4.4, and 7.4	SLR-36248 SLR-36664
SLRA Section 2.3.2, "Engineered Safety Features"				
2.3.2.1	Core Spray	Table 2.3.2-1, Core Spray System Components Subject to Aging Management Review Table 3.2.2-1, Core Spray—Summary of Aging Management Evaluation	Section 6.2.2	SLR-36248 SLR-36664
2.3.2.2	High Pressure Coolant Injection	Table 2.3.2-2, High Pressure Coolant Injection System Components Subject to Aging Management Review	Section 6.2.4	SLR-36241 SLR-36249 SLR-36249-1 SLR-36250 SLR-36254

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		Table 3.2.2-2, High Pressure Coolant Injection System—Summary of Aging Management Evaluation		
2.3.2.3	Primary Containment Mechanical	Table 2.3.2-3, Primary Containment Mechanical System Components Subject to Aging Management Review Table 3.2.2-3, Primary Containment Mechanical—Summary of Aging Management Evaluation	Sections 5.2.2.1, 5.2.2.2, 5.2.2.3, 5.2.2.5.3, 5.2.2.6, 5.2.2.7, 5.2.2.9, 7.3.5.4, and 10.3.10	SLR-36049-14 SLR-36246 SLR-36247 SLR-36258 SLR-36267 SLR-46162 SLR-91197 SLR-96042-1 SLR-116629 SLR-161004
2.3.2.4	Reactor Core Isolation Cooling	Table 2.3.2-4, Reactor Core Isolation Cooling System Components Subject to Aging Management Review Table 3.2.2-4, Reactor Core Isolation Cooling—Summary of Aging Management Evaluation	Section 10.2.5	SLR-36241 SLR-36251 SLR-36252 SLR-36254
2.3.2.5	Residual Heat Removal	Table 2.3.2-5, Residual Heat Removal System Components Subject to Aging Management Review Table 3.2.2-5, Residual Heat Removal—Summary of Aging Management Evaluation	Section 6.2.3	SLR-36042-2 SLR-36049-13 SLR-36243 SLR-36246 SLR-36247 SLR-36248 SLR-36256 SLR-36664 SLR-96042-1
2.3.2.6	Secondary Containment	Table 2.3.2-6, Secondary Containment System	Section 5.3	SLR-36159 SLR-36258 SLR-36266

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		Components Subject to Aging Management Review Table 3.2.2-6, Secondary Containment—Summary of Aging Management Evaluation		SLR-36267 SLR-36267-3 SLR-36807 SLR-36808 SLR-36881 SLR-46162 SLR-51142-1 SLR-67588 SLR-9288-14
SLRA Section 2.3.3, "Auxiliary Systems"				
2.3.3.1	Alternate Nitrogen	Table 2.3.3-1, Alternate Nitrogen System Components Subject to Aging Management Review Table 3.3.2-1, Alternate Nitrogen—Summary of Aging Management Evaluation	Sections 4.4.2.1, 5.2.2.5.3.1, 5.2.2.5.4, 8.12, 10.3.4, and Appendix J	SLR-36049-10 SLR-36049-14 SLR-36241-1
2.3.3.2	Chemistry Sampling	Table 2.3.3-2, Chemistry Sampling System Components Subject to Aging Management Review Table 3.3.2-2, Chemistry Sampling—Summary of Aging Management Evaluation	Section 10.3.7	SLR-36037 SLR-36038 SLR-36038-1 SLR-36038-2 SLR-36042 SLR-36243 SLR-36254 SLR-36257 SLR-36829 SLR-36908
2.3.3.3	Circulating Water	Table 2.3.3-2, Circulating Water System	Section 11.5	SLR-36489 SLR-36666 SLR-36667
2.3.3.4	Control Rod Drive	Table 2.3.3-4, Control Rod Drive System Components Subject to Aging Management Review Table 3.3.2-4, Control Rod Drive—Summary of Aging Management Evaluation	Section 3.5.3	SLR-36036 SLR-36039 SLR-36042 SLR-36043 SLR-36044 SLR-36242-1 SLR-36242-2 SLR-36244 SLR-36245 SLR-36254

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
2.3.3.5	Demineralized Water	Table 2.3.3-5, Demineralized Water System Components Subject to Aging Management Review	Section 10.3.3 and Table 5.2-3a	SLR-36036 SLR-36039 SLR-36040 SLR-36041-2 SLR-36042 SLR-36046 SLR-36050 SLR-36052 SLR-36159 SLR-36253 SLR-36255 SLR-36261 SLR-36348 SLR-36664 SLR-36881 SLR-96042-1
2.3.3.6	Emergency Diesel Generator	Table 2.3.3-6, Emergency Diesel Generators System Components Subject to Aging Management Review	Section 8.4	SLR-36051 Sheet 1, Revision 87 SLR-36051-1 Sheet 2, Revision 77 SLR-36664, Revision 97
2.3.3.7	Emergency Filtration Train	Table 2.3.3-7, Emergency Filtration System Components Subject to Aging Management Review Table 3.3.2-7, Emergency Filtration Train—Summary of Aging Management Evaluation	Section 6.7 and Appendix J	SLR-36041 SLR-170037
2.3.3.8	Emergency Service Water	Table 2.3.3-8, Emergency Service Water System Components Subject to Aging Management Review	Sections 10.4.2 and 10.4.4	SLR-36041, Revision 118 SLR-36248, Revision 94 SLR-36246, Revision 90 SLR-36247, Revision 90

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
				SLR-36664, Revision 97 SLR-36665, Revision 105 SLR-36667, Revision 85 SLR-36807, Revision 80
2.3.3.9	Fire System See below the table for additional review in "Additional Discussion"	Table 2.3.3-9, Fire System Components Subject to Aging Management Review Table 3.3.2-9, Fire System—Summary of Aging Management Evaluation	Section 10.3.1	SLR-36048 SLR-36048-2 SLR-36051 SLR-36516 SLR-36664 SLR-36665-2 SLR-36666 SLR-36667 SLR-170021 SLR-170037
2.3.3.10	Fuel Pool Cooling and Cleanup	Table 2.3.3-10, Fuel Pool Cooling and Cleanup System Components Subject to Aging Management	Sections 10.2.1 and 10.2.2	SLR-36042, Revision 79 SLR-36247, Revision 94 SLR-36256, Revision 79 SLR-36257, Revision 79 SLR-36908, Revision 79
2.3.3.11	Heating and Ventilation	Table 2.3.3-11, Heating and Ventilation System Components Subject to Aging Management Review	Sections 5.3.4, 10.3.1, and 10.3.2	SLR-36033 SLR-36041 SLR-36259 SLR-36259-1 SLR-36259-2 SLR-36260 SLR-36261 SLR-36263 SLR-36266 SLR-36267-3 SLR-36267 SLR-36348 SLR-36664

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
				SLR-36776 SLR-36807 SLR-36808 SLR-36881 SLR-46162 SLR-51142-1 SLR-67588
2.3.3.12	Instrument and Service Air	Table 2.3.3-12, Instrument and Service Air System Components Subject to Aging Management Review Table 3.3.2-12, Instrument and Service Air—Summary of Aging Management Evaluation	Section 10.3.4	SLR-36049-4 SLR-36049-10 SLR-36049-12 SLR-36049-14 SLR-36258 SLR-161004
2.3.3.13	Radwaste Solid and Liquid	Table 2.3.3-13, Radwaste Solid and Liquid System Components Subject to Aging Management Review	Sections 5.2, 9.2, and 9.4	SLR-36035-2 SLR-36038-3 SLR-36043 SLR-36044 SLR-36045 SLR-36046 SLR-36047-1 SLR-36241 SLR-36247 SLR-36248 SLR-36908
2.3.3.14	Reactor Building Closed Cooling Water See below the table for additional review in "Additional Discussion"	Table 2.3.3-14, Reactor Building Closed Cooling Water System Components Subject to Aging Management Review	Sections 5.2 and 10.4.3	SLR-36042, Revision 82 SLR-36042-2, Revision 77 SLR-36044, Revision 90 SLR-36243-1, Revision 85 SLR-36254, Revision 89 SLR-96042-1, Revision 78

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
2.3.3.15	Reactor Water Cleanup	Table 2.3.3-15, Reactor Water Cleanup System Components Subject to Aging Management Review	Section 10.2.3	SLR-36254, Revision 0 SLR-36255, Revision 0 SLR-252182, Revision 0 SLR-74945-3, Revision 0
2.3.3.16	Service and Seal Water	Table 2.3.3-16, Service and Seal Water System Components Subject to Aging Management Review	Section 10.4.1	SLR-36035-2, Revision 83 SLR-36037-3, Revision 2 SLR-36041-2, Revision 79 SLR-36041, Revision 119 SLR-36048, Revision 84 SLR-36050, Revision 82 SLR-36052, Revision 5 SLR-36489, Revision 85 SLR-36664, Revision 97 SLR-36665-2, Revision 79 SLR-36665-3, Revision 76 SLR-36665, Revision 105 SLR-36666-2, Revision 3

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
				SLR-36666, Revision 96 SLR-36667, Revision 85 SLR-36807, Revision 80 SLR-155483-1, Revision 78
2.3.3.17	Standby Liquid Control	Table 2.3.3-17, Standby Liquid Control System Components Subject to Aging Management Review	Section 6.6	SLR-36242-1, Revision 81 SLR-36253, Revision 80
2.3.3.18	Wells and Domestic Water	Table 2.3.3-18, Wells and Domestic Water System Components Subject to Aging Management Review	Sections 10.3.5 and 10.3.6.2.4	SLR-36044 SLR-155483-1
SLRA Section 2.3.4, "Steam and Power Conversion Systems"				
2.3.4.1	Condensate Storage	Table 2.3.4-1, Condensate Storage System Components Subject to Aging Management Review	Sections 6.2.4.2.2, 6.2.4.2.11, 8.12, 10.2.5, and 14.7.2.3	SLR-36033 SLR-36035-2 SLR-36036 SLR-36039 SLR-36045 SLR-36047-1 SLR-36244 SLR-36246 SLR-36247 SLR-36248 SLR-36250 SLR-36252 SLR-36255 SLR-36256 SLR-36257 SLR-36260 SLR-85509
2.3.4.2	Condensate and Feedwater	Table 2.3.4-2, Condensate and Feedwater System Components Subject to Aging Management Review	Sections 11.7 and 11.8	SLR-36034 SLR-36035 SLR-36036 SLR-36037-2 SLR-36037-3 SLR-36037 SLR-36038-1

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
				SLR-36038-2 SLR-36038-3 SLR-36038 SLR-36039 SLR-36041 SLR-36044 SLR-36047-1 SLR-36241 SLR-54817-4 SLR-85509 SLR-100320 SLR-11929 SLR-252182 SLR-236609
2.3.4.3	Main Condenser	Table 2.3.4-3, Main Condenser System Components Subject to Aging Management Review	Sections 11.3 and 14.7.4.6.3	SLR-36033 SLR-36034 SLR-36035-2 SLR-36035 SLR-36036 SLR-36041 SLR-54817-4 SLR-54818-1
2.3.4.4	Main Steam	Table 2.3.4-4, Main Steam System Components Subject to Aging Management Review Table 3.4.2-4, Main Steam System—Summary of Aging Management Evaluation	Sections 6.3, 14.7.2.4.3, and 14.7.3.2.2	SLR-36033 SLR-36034 SLR-36035 SLR-36035-2 SLR-36241 SLR-36249 SLR-36251 SLR-54817-4
2.3.4.5	Off-Gas	Table 2.3.4-5, Off-Gas System Components Subject to Aging Management Review Table 3.4.2-5, Off-Gas—Summary of Aging Management Evaluation	Sections 9.3, 11.3.2, and 14.7.1	SLR-36034 SLR-36035 SLR-36035-2 SLR-36159 SLR-36249 SLR-54817-4 SLR-54818-1 SLR-100320
2.3.4.6	Turbine Generator	Table 2.3.4-6, Turbine Generator System Components Subject to Aging Management Review	Section 11.2	SLR-8435-35-1, Revision B SLR-36033, Revision 96

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
				SLR-36034 Sheet 1, Revision 91 SLR-36035 Sheet 2, Revision 90 SLR-36037, Revision 93 SLR-36041, Revision 119 SLR-36050, Revision 82 SLR-36052, Revision 85 SLR-M8107L-087, Revision 0

Additional Discussion

SLRA Section 2.3.3.9, "Fire System"

The staff reviewed the SLRA; NUREG-1865; the initial license renewal application; LRBDs; USAR Section 10.3.1, "Fire Protection System," and Appendix J, "Fire Protection Program"; and the following fire protection CLB documents listed in MNGP License Condition 2.C.4:

- MNGP License Amendment 41, dated August 29, 1979 (ML020870358), adds license conditions relating to completion of facility modifications for fire protection

- MNGP License Amendment 1, dated February 12, 1981 (ML020880540), revises license conditions relating to completion of facility modifications for fire protection in accordance with the requirements of 10 CFR 50.48 and 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979"

- NRC fire protection safety evaluation report, dated October 2, 1985 (ML112971069 non-publicly available)

- MNGP License Amendment 33, dated October 7, 1985 (ML020910203), revises license conditions relating to completion of facility modifications for fire protection in accordance with the requirements of 10 CFR 50.48 and 10 CFR Part 50, Appendix R

- MNGP exemption from the requirements of 10 CFR Part 50, Appendix R, Section III.G.2 (CAC No. MF9586, EPID L-2017-LLE-0012), dated May 1, 2018 (ML18093A108)

- MNGP exemption from the requirements of 10 CFR Part 50, Appendix R, Section III.G.2.A (EPID L-2018-LLE-0001), dated February 14, 2019 (ML18289A735)

During its review, the NRC staff evaluated the fire protection components described in the SLRA, USAR, and LRBDs to verify that the applicant included within the scope of SLR all components with intended functions as described in 10 CFR 54.4(a). The NRC staff then reviewed those components the applicant identified as within the scope of SLR and verified that the applicant included all passive or long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

A virtual audit took place with the Northern States Power Company staff for fire protection on the scoping and screening topics through a breakout session on April 19, 2023. The staff discussed fire protection and scoping and screening audit questions, interviewed staff, and reviewed documentation provided by the applicant.

During the discussion, the Northern States Power Company staff clarified the NRC staff's concerns identified in the SLRA Section 2.3.3.9 audit question (ML23214A242) related to the fire protection components, halon bottles, sprinklers, standpipe risers, valve bodies, strainer housing, filter housing, hanger and piping support, seismic support for standpipes system piping, intake traveling screen/trash rack, floor drains for removal of fire-fighting water, curbs and dikes for oil spill confinement, and the station transformer fire suppression system and components.

The staff requested that the applicant verify whether the above fire protection components are within the scope of SLRA in accordance with 10 CFR 54.4(a) and whether they are subject to an AMR in accordance with 10 CFR 54.21(a)(1). If any of the listed components are not within the scope of SLRA and are not subject to an AMR, the staff requested that the applicant provide justification for the exclusion.

The applicant stated that the following are included in SLRA Table 2.3.3-9:

- halon bottles, under the component type of "Tank (Halon)" with pressure boundary as its intended function
- sprinklers and valve bodies with intended functions of pressure boundary and spray
- standpipe and strainer housings under the component type "Piping"
- seismic standpipe under the component type "Piping"

Filter housing is included in the component type "Ducting and Components" in SLRA Table 2.3.2-6. Hangers and piping supports are addressed in the "Hanger and Support Commodity Group" in SLRA Table 2.4-7.

The intake traveling screen is not within the scope of SLR, as the applicant treated it as an active component. Trash racks are addressed under the component type "Miscellaneous Structural Components" in SLRA Table 2.4-9, "Intake Structure Components Subject to Aging Management Review." SLRA Section 2.3.3.13 identifies all credited drainage piping tanks and drains. Floor drains are within the scope of SLR in the radwaste solid and liquid system for the areas within the scope of SLR with fixed fire suppression (i.e., turbine building, diesel generator building, and reactor building as shown on LRBDs SLR-36043 and SLR-36044). Curbs and dikes are identified on SLRA pages 2.1-15 and 2.4-15 as evaluated as part of the building structure where they are located. The station transformer fire suppression system and components are included within the "Piping, Piping Components" and "Spray Nozzles" component types shown in SLRA Table 2.3.3-9. They are also shown on SLRA page 33 of the boundary drawing consolidated packet (drawing SLR-36046, quadrants C2 and C3).

Based on its review, the NRC staff did not identify the need for any additional information. The staff confirmed that the fire protection system and associated components are included in SLRA Table 2.3.3.2-9 with AMR results in SLRA Table 3.3.2-9. The staff confirmed that these components were highlighted in the LRBDs. On the basis of the information in the LRBDs, the USAR, and the CLB documents identified above, the NRC staff did not identify any omissions by the applicant in the scoping of the fire protection systems and components, according to 10 CFR 54.4(a).

SLRA Section 2.3.3.14, "Reactor Building Closed Cooling Water"

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

Regarding the reactor building cooling water system (M-111-1), the staff asked the applicant (Request for Additional Information (RAI) 2.3.3.14-1) to confirm that the non-safety-related piping connected to penetrations X-24 and X-23 (and other similar non-safety-related piping as applicable) is seismically supported consistent with the guidance in NUREG-2192 and NEI 95-10, Revision 6.

In their response (ML23227A175), the applicant stated (in part):

> "NEI 95-10 Appendix F Section 4.4 states that an alternative to specifically identifying a seismic anchor or series of equivalent anchors that support the SR/NSR piping interface is to include enough of the NSR piping run to ensure these anchors are included and thereby ensure the piping and anchor intended functions are maintained....The NSR piping connected to Penetrations X-24 and X-23 does not require seismic supports to be identified on the SLRBD to be consistent with the guidance in NUREG-2192 Section 2.1.3.1.2 and NEI 95-10 Appendix F. As shown on boundary drawing SLR-36042-2, all NSR piping within containment connected to Penetrations X-24 and X-23 is highlighted green to identify that it is all in scope per 10 CFR 54.4(a)(2) for spatial/structural impacts of the NSR components on SR components."

As a result of the response to RAI 2.3.3.14-1, the staff was able to conclude that scoping and screening results for SLRA Section 2.3.3.14 are acceptable because the applicant verified that the structural supports for the non-safety-related piping connected to penetrations X-24 and X-23 are in scope in accordance with 10 CFR 54.4(a)(2) and subject to AMR under the requirements of 10 CFR 54.21(a)(1).

2.3.3 Conclusion

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

2.4 Scoping and Screening Results: Structures

This section documents the NRC staff's review of the applicant's scoping and screening results for structures and structural components. In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant must list passive, long-lived SCs that are within the scope of SLR and that are subject to an AMR. To verify that the applicant properly implemented its methodology, the staff 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 SLRA was the same for all structures and structural components. The objective was to determine whether the applicant identified, in accordance with 10 CFR 54.4, structures and structural components that meet the SLR scoping criteria. Similarly, the staff evaluated the applicant's screening results to verify that all passive, long-lived SCs are subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

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

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

2.4.1 Summary of Technical Information in the Application

SLRA sections 2.4.1 through 2.4.18, as listed below, describe the structures and structural components subject to an AMR and the boundaries of the structures:

- SLRA Section 2.4.1, "Primary Containment"
- SLRA Section 2.4.2, "Cranes, Heavy Loads, Rigging"
- SLRA Section 2.4.3, "Diesel Fuel Oil Transfer House"
- SLRA Section 2.4.4, "Emergency Diesel Generator Building"
- SLRA Section 2.4.5, "Emergency Filtration Train Building"
- SLRA Section 2.4.6, "Fire Protection Barriers Commodity Group"
- SLRA Section 2.4.7, "Hangers and Supports Commodity Group"
- SLRA Section 2.4.8, "High Pressure Coolant Injection Building"
- SLRA Section 2.4.9, "Intake Structure"
- SLRA Section 2.4.10, "Miscellaneous Station Blackout Yard Structures"
- SLRA Section 2.4.11, "Off-Gass Stack"
- SLRA Section 2.4.12, "Ogg-Gass Storage and Compressor Building"

- SLRA Section 2.4.13, "Plant Control and Cable Spreading Structure"
- SLRA Section 2.4.14, "Radioactive Waste Building"
- SLRA Section 2.4.15, "Reactor Building"
- SLRA Section 2.4.16, "Structures Affecting Safety"
- SLRA Section 2.4.17, "Turbine Building"
- SLRA Section 2.4.18, "Underground Duct Bank"

SLRA tables 2.4-1 through 2.4-18 list the structures and structural component types subject to an AMR and their intended functions. SLRA tables 3.5.2-1 through 3.5.2-18 provide the results of the applicant's AMR for structures and structural components.

2.4.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and USAR to verify that the applicant included within the scope of SLR all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of SLR to verify that the applicant included all passive, 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 SLRA, USAR, and LRBDs, the staff concludes that the applicant appropriately identified the structures and structural components within the scope of SLR, as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the passive, long-lived SCs subject to an AMR in accordance with the requirements in 10 CFR 54.21(a)(1).

2.5 Scoping and Screening Results: Electrical and Instrumentation & Controls

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

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

In the scoping evaluation, the staff reviewed the applicable SLRA sections, focusing on components that had not been identified as within the scope of SLR. The staff reviewed relevant licensing basis documents, including the USAR, for each component to determine whether the applicant omitted from the scope of SLR components with intended functions delineated under

10 CFR 54.4(a). The staff also reviewed the licensing basis documents to determine whether the SLRA specified all intended functions delineated under 10 CFR 54.4(a).

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

2.5.1 Summary of Technical Information in the Application

SLRA Section 2.5.1 describes the electrical and I&C system components that were evaluated and determined to be subject to an AMR. SLRA Table 2.5-2, "Electrical and I&C System Commodity Groups Subject to Aging Management Review," lists the electrical and I&C system components subject to an AMR and their intended functions. SLRA Table 3.6.2-1, "Electrical and I&C Component Commodity Groups Installed at MNGP for In-Scope Systems," 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 SLRA and USAR to verify that the applicant included within the scope of SLR all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of SLR to verify that the applicant included all passive, 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-SLR and NEI 17-01.

The regulations in 10 CFR 54.4(a) identify plant SSCs that perform specific functions within the scope of SLR. The SRP-SLR and NEI 17-01 provide the guidance on the scoping of electrical and I&C SSCs based on the SLR intended functions identified in 10 CFR 54.4(a).

The applicant performed an initial plant-level scoping of the plant's systems and structures in accordance with the scoping criteria identified in 10 CFR 54.4(a) using the scoping methodology described in SLRA Section 2.1.4. The applicant included in the scope of SLR: (1) safety-related electrical and I&C systems described in the USAR in accordance with 10 CFR 54.4(a)(1), (2) non-safety-related electrical and I&C systems whose failure could prevent the accomplishment of safety functions in accordance with 10 CFR 54.4(a)(2), and (3) electrical and I&C systems credited in the regulated events identified in 10 CFR 54.4(a)(3). The electrical and I&C components that are part of in-scope electrical and I&C systems and in-scope mechanical systems were included within the scope of SLR. SLRA table 2.2-1 provides the results of the applicant's plant-level scoping for electrical and I&C systems. Section 2.2 of this SE gives the staff's evaluation for the plant-level scoping results for the electrical and I&C systems.

The SRP-SLR and NEI 17-01 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 that have a similar function, design, material of construction, or environment. SRP-SLR Table 2.1-6, "Typical Structures, Components, and Commodity Groups, and 10 CFR 54.21(a)(1)(i) Determinations for Integrated Plant Assessment," provides typical electrical and I&C component commodity groups that are within the scope of SLR.

SRP-SLR Section 2.5.2.1.1, “Components Within the Scope of SBO (10 CFR 50.63),” contains guidance to identify components in the onsite and offsite power systems that are relied upon during the coping and recovery phases of an SBO event to meet the requirements of 10 CFR 50.63 for SLR.

SLRA Section 2.1.5.3 describes the MNGP screening methodology for the in-scope electrical and I&C components. The applicant used a component commodity group approach, as described in the SRP-SLR and NEI 17-01, to screen the electrical and I&C components subject to AMR. This screening methodology involved (1) placing the electrical and I&C components for the systems listed in SLRA Table 2.2-1 in commodity groups, (2) identifying the component intended functions, which are provided in SLRA Table 2.1-1, “Passive Structure/Component Intended Function,” for each commodity group, and (3) applying the screening criteria of 10 CFR 54.21(a)(1) to the commodity groups to identify passive, long-lived commodity groups that perform/support a license renewal intended function and require an AMR.

The applicant grouped the electrical and I&C components within the in-scope electrical and I&C and mechanical systems in SLRA Table 2.2-1 into commodity groups based on the similarity of design or functional characteristics, or both. SLRA Table 2.5-1, “Electrical and I&C Component Commodity Groups Installed at MNGP for In-Scope Systems,” provides the in-scope electrical and I&C component commodity groups for MNGP.

SLRA Table 2.5-1 includes the switchyard commodities of switchyard bus and connections, high-voltage electrical insulators, transmission conductors and connections, metal enclosed bus (MEB), and inaccessible medium voltage cables (in the insulated cables and connections commodity). In SLRA Section 2.5.1.4, “Application of Screening Criteria 10 CFR 54.21(a)(1)(ii) to Electrical and I&C Commodity Groups,” the applicant stated that these switchyard commodities perform an intended function for restoration of offsite power following an SBO event. In addition, in SLRA Section 2.1.2.4.5, “Station Blackout (10 CFR 50.63),” the applicant described the in-scope electrical and I&C systems that are relied upon to meet the requirements in 10 CFR 50.63 in accordance with the guidance in the SRP-SLR. The applicant included within the scope of SLR components from the plant 13.8-kilovolt (kV) and 4.16 kV buses through and including interconnecting transformers, disconnect switches, and buses out to and including the switchyard circuit breakers that connect to the 345 kV, 115 kV, and 13.8 kV offsite sources, which are used for offsite power restoration following an SBO event. The offsite power recovery paths following an SBO event are shown in SLRA Figure 2.5-1, “MNGP Simplified One-Line Diagram (For SBO Offsite Power Recovery).”

The NRC staff verified the in-scope electrical systems in SLRA Table 2.2-1 and the electrical commodities in SLRA Table 2.5-1 to confirm that the applicant did not omit any equipment required to comply with 10 CFR 50.63. Based on its review of the SBO information in the USAR and the SLRA, the staff finds that the electrical commodities provided in SLRA Table 2.5-1 for the restoration of offsite power following an SBO event conform to the guidance in the SRP-SLR for meeting the requirements in 10 CFR 50.63 and are, therefore, acceptable.

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

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

The applicant eliminated cable tie wraps from the passive commodity groups. The applicant stated that cable tie wraps are used to hold groups of cables together for restraint and neat bundles, are not required to remain functional during and following DBEs, do not function as cable supports in raceway support analyses, and are not credited in seismic qualification of cable trays. The staff reviewed the USAR and confirmed that cable tie wraps are not credited in the MNGP design basis and have no requirements associated with them. Therefore, the staff finds it acceptable to eliminate cable tie wraps from the scope of SLR since the cable tie wraps have no SLR intended function, as described in 10 CFR 54.4.

The applicant eliminated uninsulated ground cables from the passive commodity groups. The applicant stated that the uninsulated ground cables are non-safety related, their failure will not prevent the satisfactory accomplishment of any functions identified in 10 CFR 54.4(a)(1), and they are not relied upon to perform a function related to any regulated events identified by 10 CFR 54.4(a)(3). The staff reviewed the USAR and confirmed that uninsulated ground cables are not credited for the MNGP DBEs and do not support an SLR intended function, as identified in 10 CFR 54.4. Therefore, the staff finds it acceptable to eliminate uninsulated ground cables from the scope of SLR since they have no SLR intended function, as described in 10 CFR 54.4.

SLRA Table 2.5-1 includes elements, resistance temperature detectors, sensors, thermocouples, transducers, and electric heaters commodity groups. SRP-SLR Table 2.1-6 indicates that these electrical and I&C commodity groups meet the passive component screening criterion of 10 CFR 54.21(a)(1)(i) if they have a pressure boundary function. In SLRA Section 2.3, the applicant evaluated components, including the above-mentioned electrical and I&C commodity groups, that have pressure boundary functions. Section 2.3 of this SE contains the staff’s evaluation of the pressure boundary function for in-scope components.

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

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

The applicant also excluded from the AMR the isolated (iso) phase bus that was included in the MEB commodity group. In SLRA Section 2.5.1.4, the applicant stated that the iso-phase bus, which is one of the two types of MEB used at MNGP, does not perform or support an SLR intended function. The applicant further stated that the nonsegregated phase buses, which are the second type of MEB at MNGP, located in the 13.8 kV and 4.16 kV systems perform an SLR intended function and are not included the EQ Program. According to USAR Chapter 8, the iso-phase bus is associated with the main generator. The staff reviewed the USAR and finds that the iso-phase bus does not perform an SLR intended function since it is a non-safety-related component whose failure will not prevent satisfactory accomplishment of the functions identified in 10 CFR 54.4(a)(1), and it is not relied upon to perform a function related to any regulated events identified by 10 CFR 54.4(a)(3). Therefore, the staff finds the exclusion of the iso-phase MEB from the AMR acceptable.

The applicant subjected all remaining passive, long-lived electrical and I&C component commodity groups that perform SLR intended functions to AMR. SLRA Table 2.5-2 lists the following electrical and I&C component commodity groups that required an AMR with their associated component intended functions:

- non-EQ insulated cables and connections—electrical continuity
- electrical portions of non-EQ electrical and I&C penetration assemblies—electrical continuity
- MEB—electrical continuity, insulate (electrical), shelter, protection
- fuse holders, metallic clamps (not part of an active assembly)—electrical continuity
- high-voltage electrical insulations (for SBO recovery)—insulate (electrical)
- switchyard bus and connections (for SBO recovery)—electrical continuity
- transmission conductors and connections (for SBO recovery)—electrical continuity
- cable connections (metallic parts)—electrical continuity

The non-EQ insulated cables and connections commodity group includes the insulated materials for the fuse holders (not part of active equipment), as stated in SLRA Section 2.5.1.4. Also, the intended function of “Shelter, Protection” for the MEB is performed by the structural components of the MEB.

The staff reviewed the commodity groups in SLRA Table 2.5-2 to verify that the applicant did not omit any passive, long-lived components that meet the screening criteria of 10 CFR 54.21(a)(1). The staff finds that the MNGP electrical and I&C component commodity groups subject to an AMR are consistent with the guidance in SRP-SLR table 2.1-6 and meet the criteria in 10 CFR 54.21(a)(1)(i) and 10 CFR 54.21(a)(1)(ii). Therefore, the staff concludes that there is reasonable assurance that the applicant identified the electrical and I&C components subject to an AMR in accordance with 10 CFR 54.21(a)(1).

2.5.3 Conclusion

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

2.6 Conclusion for Scoping and Screening

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

Based on its review, the staff finds that the applicant adequately identified those SSCs within the scope of SLR, 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 or the Commission) staff's evaluation of the Northern States Power Company, a Minnesota corporation (NSPM or the applicant), aging management reviews (AMRs) and aging management programs (AMPs) for Monticello Nuclear Generating Plant, Unit 1 (MNGP).

The applicant described these AMRs and AMPs in its subsequent license renewal application (SLRA) for MNGP. SLRA Section 3 provides the results of the applicant's AMRs for those structures and components (SCs) identified in SLRA Section 2 as within the scope of subsequent license renewal (SLR) and subject to an AMR. SLRA 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 Applicant's Use of the Generic Aging Lessons Learned for Subsequent License Renewal Report

In preparing its SLRA, the applicant credited NUREG-2191, Revision 0, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," issued July 2017 (ML17187A031 and ML17187A204) (GALL-SLR Report) for programs and AMR items as modified by the following:

- SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance," issued February 2021 (ML20181A395)
- SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance," issued February 2021 (ML20181A434)
- SLR-ISG-2021-03-STRUCTURES, "Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance," issued February 2021 (ML20181A381)
- SLR-ISG-2021-01-PWRVI, "Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized-Water Reactors, issued January 2021 (ML20217L203)

As stated in Title 10 of the *Code of Federal Regulations* (10 CFR) 54.29(a)(1), the NRC may issue a renewed license if the agency finds that actions have been identified and have been or will be taken to manage the effects of aging during the period of extended operation on the functionality of SCs that have been identified to require review under 10 CFR 54.21(a)(1). The GALL-SLR Report provides summaries of 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-SLR Report identifies the following AMPs:

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

3.0.1 Format of the Subsequent License Renewal Application

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

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

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

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

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

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

3.0.2 Staff's Review Process

The staff conducted three types of evaluations of NSPM's AMR items and the AMPs listed in SLRA 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-SLR Report, the staff conducted either an audit or a technical review to determine consistency. Because GALL-SLR Report AMPs and AMR analyses are one acceptable method for managing the effects of aging, the staff did not reevaluate those AMPs and AMRs that were determined to be consistent with the GALL-SLR Report.

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

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

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

As part of its SLRA review, the staff conducted a regulatory audit from February 27, 2023, to May 25, 2023, in accordance with the audit plan dated February 24, 2023 (ML23048A023) and as detailed in the audit report dated August 31, 2023 (ML23214A232).

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

3.0.2.1 Review of Aging Management Programs

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

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

(2) "preventive actions"—should prevent or mitigate aging degradation.

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

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

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

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

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

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

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

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

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

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

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

The staff reviewed the information on the "operating experience" program element (i.e., program element 10) and documented its evaluation in SE Sections 3.0.3 and 3.0.5.

3.0.2.2 Review of Aging Management Review Results

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

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

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

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

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

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

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

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

3.0.2.3 Updated Final Safety Analysis Report Supplement

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

3.0.2.4 Documentation and Documents Reviewed

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

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

3.0.3 Aging Management Programs

SE Table 3.0.3-1 below presents the AMPs credited by the applicant and described in SLRA Appendix B, “Aging Management Programs.” The table also indicates (1) whether the AMP is an existing or new program, (2) the staff’s final disposition of the AMP, (3) the GALL-SLR 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. Monticello Aging Management Programs

Monticello Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-2191 GALL-SLR Report	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in This Safety Evaluation
Fatigue Monitoring	A.2.1.1, B.2.2.1	Existing	Consistent with enhancements	X.M1 Fatigue Monitoring	3.0.3.2.1

Monticello Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-2191 GALL-SLR Report	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in This Safety Evaluation
Neutron Fluence Monitoring	A.2.1.2, B.2.2.2	Existing	Consistent	X.M2 Neutron Fluence Monitoring	3.0.3.1.1
Environmental Qualification of Electric Equipment	A.2.1.3, B.2.2.3	Existing	Consistent with enhancements	X.E1 Environmental Qualification (EQ) of Electric Equipment	3.0.3.2.2
ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	A.2.2.1 B.2.3.1	Existing	Consistent	XI.M1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	3.0.3.1.2
Water Chemistry	A.2.2.2, B.2.3.2	Existing	Consistent with exception	XI.M2 Water Chemistry as modified by SLR-ISG-2021-02-MECHANICAL	3.0.3.2.3
Reactor Head Closure Stud Bolting	A.2.2.3, B.2.3.3	Existing	Consistent with exception and enhancements	XI.M3 Reactor Head Closure Stud Bolting	3.0.3.2.4
BWR Vessel ID Attachment Welds	A.2.2.4, B.2.3.4	Existing	Consistent	XI.M4 BWR Vessel ID Attachment Welds	3.0.3.1.3
BWR Stress Corrosion Cracking	A.2.2.5, B.2.3.5	Existing	Consistent	XI.M7 BWR Stress Corrosion Cracking	3.0.3.1.4
BWR Penetrations	A.2.2.6, B.2.3.6	Existing	Consistent	XI.M8 BWR Penetrations	3.0.3.1.5
BWR Vessel Internals	A.2.2.7, B.2.3.7	Existing	Consistent with exception and enhancements	XI.M9 BWR Vessel Internals	3.0.3.2.5
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	A.2.2.8, B.2.3.8	New	Consistent	XI.M12 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	3.0.3.1.6
Flow-Accelerated Corrosion	A.2.2.9, B.2.3.9	Existing	Consistent with enhancements	XI.M17 Flow-Accelerated Corrosion (FAC)	3.0.3.2.6
Bolting Integrity	A.2.2.10, B.2.3.10	Existing	Consistent with enhancements	XI.M18 Bolting Integrity	3.0.3.2.7
Open-Cycle Cooling Water System	A.2.2.11, B.2.3.11	Existing	Consistent with enhancements	XI.M20 Open-Cycle Cooling Water System	3.0.3.2.8
Closed Treated Water Systems	A.2.2.12, B.2.3.12	Existing	Consistent with enhancements	XI.M21A Closed Treated Water Systems	3.0.3.2.9
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	A.2.2.13, B.2.3.13	Existing	Consistent with enhancements	XI.M23 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	3.0.3.2.10

Monticello Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-2191 GALL-SLR Report	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in This Safety Evaluation
Compressed Air Monitoring	A.2.2.14, B.2.3.14	Existing	Consistent with enhancements	XI.M24 Compressed Air Monitoring	3.0.3.2.11
Fire Protection	A.2.2.15, B.2.3.15	Existing	Consistent with enhancements	XI.M26 Fire Protection as modified by SLR-ISG-2021-02-MECHANICAL	3.0.3.2.12
Fire Water System	A.2.2.16, B.2.3.16	Existing	Consistent with exception and enhancements	XI.M27 Fire Water System	3.0.3.2.13
Outdoor and Large Atmospheric Metallic Storage Tanks	A.2.2.17, B.2.3.17	New	Consistent	XI.M29 Outdoor and Large Atmospheric Metallic Storage Tanks	3.0.3.1.7
Fuel Oil Chemistry	A.2.2.18, B.2.3.18	Existing	Consistent with exception and enhancements	XI.M30 Fuel Oil Chemistry	3.0.3.2.14
Reactor Vessel Material Surveillance	A.2.2.19, B.2.3.19	Existing	Consistent with enhancement	XI.M31 Reactor Vessel Material Surveillance	3.0.3.2.15
One-Time Inspection	A.2.2.20, B.2.3.20	New	Consistent	XI.M32 One-Time Inspection	3.0.3.1.8
Selective Leaching	A.2.2.21, B.2.3.21	Existing	Consistent with enhancements	XI.M33 Selective Leaching	3.0.3.2.16
ASME Code Class 1 Small-Bore Piping	A.2.2.22, B.2.3.22	New	Consistent	XI.M35 ASME Code Class 1 Small-Bore Piping	3.0.3.1.9
External Surfaces Monitoring of Mechanical Components	A.2.2.23, B.2.3.23	Existing	Consistent with enhancements	XI.M36 External Surfaces Monitoring of Mechanical Components	3.0.3.2.17
Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	A.2.2.24, B.2.3.24	New	Consistent	XI.M38 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	3.0.3.1.10
Lubricating Oil Analysis	A.2.2.25, B.2.3.25	Existing	Consistent with Enhancements	XI.M39 Lubricating Oil Analysis	3.0.3.2.18
Monitoring of Neutron-Absorbing Materials Other Than Boraflex	A.2.2.26, B.2.3.26	Existing	Consistent	XI.M40 Monitoring of Neutron-Absorbing Materials Other Than Boraflex	3.0.3.1.11
Buried and Underground Piping and Tanks	A.2.2.27, B.2.3.27	Existing	Consistent with exceptions and enhancements	XI.M41 Buried and Underground Piping and Tanks	3.0.3.2.19
Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	A.2.2.28, B.2.3.28	New	Consistent	XI.M42 Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	3.0.3.1.12

Monticello Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-2191 GALL-SLR Report	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in This Safety Evaluation
ASME XI, Subsection IWE	A.2.2.29, B.2.3.29	Existing	Consistent with exception and enhancements	XI.S1 ASME Section XI, Subsection IWE	3.0.3.2.20
ASME XI, Subsection IWF	A.2.2.30, B.2.3.30	Existing	Consistent with enhancements	XI.S3 ASME Section XI, Subsection IWF	3.0.3.2.21
10 CFR Part 50, Appendix J	A.2.2.31, B.2.3.31	Existing	Consistent	XI.S4 10 CFR Part 50, Appendix J	3.0.3.1.13
Masonry Walls	A.2.2.32, B.2.3.32	Existing	Consistent with enhancements	XI.S5 Masonry Walls	3.0.3.2.22
Structures Monitoring	A.2.2.33, B.2.3.33	Existing	Consistent with exception and enhancements	XI.S6 Structures Monitoring	3.0.3.2.23
Inspection of Water-Control Structures Associated with Nuclear Power Plants	A.2.2.34, B.2.3.34	Existing	Consistent with enhancements	XI.S7 Inspection of Water-Control Structures Associated with Nuclear Power Plants	3.0.3.2.24
Protective Coating Monitoring and Maintenance	A.2.2.35, B.2.3.35	Existing	Consistent with enhancement	XI.S8 Protective Coating Monitoring and Maintenance as modified by SLR-ISG-2021-03-STRUCTURES	3.0.3.2.25
Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	A.2.2.36, B.2.3.36	Existing	Consistent with enhancements	XI.E1 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.2.26
Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements used in Instrumentation Circuits	A.2.2.37, B.2.3.37	Existing	Consistent with enhancements	XI.E2 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	3.0.3.2.27

Monticello Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-2191 GALL-SLR Report	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in This Safety Evaluation
Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	A.2.2.38, B.2.3.38	Existing	Consistent with enhancements	XI.E3A Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.2.28
Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	A.2.2.39, B.2.3.39	New	Consistent	XI.E3B Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.1.14
Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	A.2.2.40, B.2.3.40	New	Consistent	XI.E3C Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.1.15
Metal Enclosed Bus	A.2.2.41, B.2.3.41	Existing	Consistent with enhancements	XI.E4 Metal Enclosed Bus	3.0.3.2.29
Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	A.2.2.42, B.2.3.42	Existing	Consistent with enhancements	XI.E6 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.2.30

3.0.3.1 Aging Management Programs Consistent with the GALL-SLR Report

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

- Neutron Fluence Monitoring
- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- BWR Vessel ID [Inner Diameter] Attachment Welds
- BWR Stress Corrosion Cracking
- BWR Penetrations

- Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)
- Outdoor and Large Atmospheric Metallic Storage Tanks
- One-Time Inspection
- ASME Code Class 1 Small-Bore Piping
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components
- Monitoring of Neutron-Absorbing Materials Other Than Boraflex
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks
- 10 CFR Part 50, Appendix J
- Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

In the following sections, the staff discusses the results of the evaluation for these AMPs. The discussion includes 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 USAR supplement summary of the program.

3.0.3.1.1 Neutron Fluence Monitoring

SLRA Section B.2.2.2 describes the existing Neutron Fluence Monitoring Aging Management program (AMP) at MNGP Unit 1, as consistent with GALL-SLR Report AMP X.M2, "Neutron Fluence Monitoring Program," as modified by SLR-ISG-2021-02-MECHANICAL.

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

Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP X.M2, as modified by SLR-ISG-2021-02-MECHANICAL.

Operating Experience. SLRA Section B.2.2.2 summarizes OE related to the Neutron Fluence Monitoring program. The staff reviewed OE information in the application and during the audit.

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 Neutron Fluence Monitoring program was evaluated.

USAR Supplement. SLRA Section A.2.1.2 provides the USAR supplement for the Neutron Fluence Monitoring program.

The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in the GALL-SLR Report.

The staff also noted that the applicant committed (Commitment 2) to ongoing implementation of the existing Neutron Fluence Monitoring program for managing the effects of aging for applicable components during the subsequent period of operation. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Neutron Fluence Monitoring program, the staff concludes that those program elements for which the applicant claimed consistency with GALL-SLR Report AMP X.M2, as modified by SLR-ISG-2021-02-MECHANICAL, are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation (SPEO), as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

SLRA Section B.2.3.1 describes the American Society of Mechanical Engineers (ASME) Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program as an existing program that is consistent with GALL-SLR AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD."

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the applicant's program to the corresponding program elements of GALL-SLR AMP XI.M1.

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

Operating Experience. SLRA Section B.2.3.1 summarizes OE related to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent 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.

USAR Supplement. SLRA Section A.2.2.1, of provides the USAR supplement for AMP B.2.3.1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD." The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Table XI-01. The staff 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 subsequent period of extended operation. The staff finds that the information in the USAR 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-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 BWR Vessel ID Attachment Welds

SLRA Section B.2.3.4 describes the existing BWR Vessel ID Attachment Welds program as consistent with GALL-SLR Report AMP XI.M4, "BWR Vessel ID Attachment Welds." The applicant amended this SLRA section by letter dated June 26, 2023 (ML23177A218).

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M4.

As supplemented by letter dated June 26, 2023 (ML23177A218), based on the staff's audit, SLRA Section B.2.3.4 clarifies that the existing program for inspection of the reactor vessel inner diameter (ID) attachment welds incorporates a relief request granted in accordance with 10 CFR 50.55a, "Codes and standards," only during the fifth inservice inspection (ISI) inspection interval (ML16208A462). However, for inspections in the seventh and eighth intervals (i.e., during the subsequent period of extended operation), the applicant explained that its ASME ISI program, in accordance with 10 CFR 50.55a(g)(4), will be updated each successive 120-month inspection interval to comply with the requirements of the latest edition of the ASME Code specified 18 months before the start of the inspection interval and that any deviation from these requirements (including those documented in a Boiling Water Reactor Vessel Internals Project (BWRVIP)) will be approved by the NRC prior to its use.

Thus, the staff noted that unless the applicant seeks an alternative to the required ISI inspections for the attachment welds in accordance with 10 CFR 50.55a, the applicant's BWR Vessel ID Attachment Welds program will monitor the effects of cracking due to cyclic loading, stress corrosion cracking (SCC), and intergranular stress corrosion cracking (IGSCC). The program will require inspections of the reactor vessel interior attachment welds as part of the

ASME Section XI, Subsections IWB, IWC, and IWD Inservice Inspection program and BWRVIP 48-A, “Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines,” issued in 2004 (nonpublic), consistent with GALL-SLR Report AMP XI.M4.

Review of License Renewal Applicant Action Items

In the staff SE for Topical Report 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. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP-48 report to manage the effects of aging on the functionality of the bracket attachments during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled.

(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 final safety analysis report (FSAR) supplement.

(3) Those applicants for license renewal referencing the BWRVIP-48 report for the bracket attachments shall ensure that the inspection strategy described in the BWRVIP-48 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its application for license renewal.

The staff reviewed the applicant’s response, as documented in Appendix C to the SLRA, to the above license renewal applicant action items on BWRVIP-48-A. Based on its review and the applicant’s responses, the staff finds that the applicant has adequately addressed the above action items because the applicant verified that its AMP is bounded by BWRVIP-48-A, and that there are no deviations from the inspection and evaluation guidelines contained in this report. The applicant confirmed that no changes to the technical specifications were needed to meet the guidelines of the NRC-approved BWRVIP-48-A report and included a USAR supplement in SLRA Section A.2.2.4 to describe programs and activities for managing the effects of aging according to BWRVIP-48-A.

Based on a review of the SLRA, as supplemented by letter dated June 26, 2023 (ML23177A218), 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.M4.

Operating Experience. SLRA Section B.2.3.4 summarizes OE related to the BWR Vessel ID Attachment Welds program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent 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 Vessel ID Attachment Welds program was evaluated.

USAR Supplement. SLRA Section A.2.2.4 provides the USAR supplement for the BWR Vessel ID Attachment Welds program.

The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01.

Although SLRA Section A.2.2.4 indicates that its existing BWR Vessel ID Attachment Welds program is implemented consistent with an approved relief request (i.e., ML16208A462), which the staff noted is applicable only for the fifth ISI interval, the applicant explicitly indicated that this program is part of the ASME Section XI Inspection program and is updated periodically in accordance with 10 CFR 50.55a.

The staff also noted that the applicant committed (i.e., Commitment 7) to ongoing implementation of the existing BWR Vessel ID Attachment Welds program for managing the effects of aging for applicable components during the subsequent period of extended operation.

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

Conclusion. Based on its review of the applicant’s BWR Vessel ID Attachment Welds program, as supplemented by letter dated June 26, 2023 (ML23177A218), the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 BWR Stress Corrosion Cracking

SLRA Section B.2.3.5 describes the existing BWR Stress Corrosion Cracking program as consistent with GALL-SLR Report AMP XI.M7, “BWR Stress Corrosion Cracking.”

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the applicant’s program to the corresponding program elements of GALL-SLR Report AMP XI.M7.

Based on its review of the SLRA, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M7.

Operating Experience. SLRA Section B.2.3.5 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 (ML23214A232), 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, 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 subsequent 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.

USAR Supplement. SLRA Section A.2.2.5 provides the USAR supplement for the BWR Stress Corrosion Cracking program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to the ongoing implementation of the existing BWR Stress Corrosion Cracking program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the USAR 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-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 Penetrations

SLRA Section B.2.3.6 states that the BWR Penetrations program is an existing program consistent with the program elements in GALL-SLR Report AMP XI.M8, "BWR Penetrations."

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M8.

Based on its audit, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M8. The staff finds that the AMP is adequate to manage the applicable aging effects. SE Sections 3.0.3.2.3 and 3.0.3.1.2 provide the staff's review of the Water Chemistry and ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD programs, respectively.

Operating Experience. SLRA Section B.2.3.6 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 (ML23214A232), 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 subsequent 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 Penetrations program was evaluated.

<u>USAR Supplement</u>. SLRA Section A.2.2.6 provides the USAR supplement for the BWR Penetrations program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing BWR Penetrations program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

<u>Conclusion</u>. 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-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)

SLRA Section B.2.3.8 describes the new Thermal Aging Embrittlement of CASS program as consistent with GALL-SLR Report AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)," as modified by SLR-ISG-2021-02-MECHANICAL.

<u>Staff Evaluation</u>. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M12 as modified by SLR-ISG-2021-02-MECHANICAL. The staff noted that Monticello does not have ASME Code Class 1 CASS piping or fittings but has Class 1 CASS reactor recirculation pump casings and covers susceptible to thermal aging embrittlement. For the "detection of aging effects," the applicant has chosen to use qualified inspection, such as enhanced visual examination or ultrasonic testing, among the approaches described in the GALL-SLR Report.

Based on its audit, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M12. The staff finds that the AMP is adequate to manage the applicable aging effects.

<u>Operating Experience</u>. SLRA Section B.2.3.8 summarizes OE related to the Thermal Aging Embrittlement of CASS program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Thermal Aging Embrittlement of CASS program was evaluated.

USAR Supplement. SLRA Section A.2.2.8 provides the USAR supplement for the Thermal Aging Embrittlement of CASS program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the new Thermal Aging Embrittlement of CASS for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Thermal Aging Embrittlement of CASS program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 Outdoor and Large Atmospheric Metallic Storage Tanks

SLRA Section B.2.3.17 states that the Outdoor and Large Atmospheric Metallic Storage Tanks program is a new program that will be consistent with the program elements in the GALL-SLR Report AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks."

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M29.

Operating Experience. SLRA Section B.2.3.17 summarizes operating experience related to the Outdoor and Large Atmospheric Metallic Storage Tanks program. The staff reviewed operating experience information in the application and during the audit. As discussed in the audit report (ML23214A232), the staff reviewed search results of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent period of extended operation.

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

USAR Supplement. SLRA Appendix A, Section A.2.2.17 provides the USAR supplement for the Outdoor and Large Atmospheric Metallic Storage Tanks program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to implement the new Outdoor and Large Atmospheric Metallic Storage Tanks program 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

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

3.0.3.1.8 One-Time Inspection

SLRA Section B.2.3.20 describes the new One-Time Inspection program as consistent with GALL-SLR Report AMP XI.M32, "One-Time Inspection." The applicant amended this SLRA section by letter dated June 26, 2023 (ML23177A218).

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M32.

Based on a review of the SLRA 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 are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M32.

Operating Experience. SLRA Section B.2.3.20 summarizes OE related to the One-Time Inspection program. As discussed in the audit report (ML23214A232), 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 subsequent 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.

USAR Supplement. SLRA Section A.2.2.20 provides the USAR supplement for the One-Time Inspection program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to implementing the new One-Time Inspection program and starting the one-time inspections no earlier than 10 years prior to the subsequent period of extended operation and no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation, for managing the effects of aging for applicable components. The staff finds that the information in the USAR 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-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 ASME Code Class 1 Small-Bore Piping

SLRA Section B.2.3.22 describes its ASME Code Class 1 Small-Bore Piping program as a new condition monitoring program that is consistent with GALL-SLR AMP XI.M35, "ASME Code Class 1 Small-Bore Piping."

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the applicant's program to the corresponding program elements of GALL-SLR AMP XI.M35.

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

Operating Experience. SLRA Section B.2.3.22 summarizes OE related to the ASME Code Class 1 Small-Bore Piping program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent 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 Code Class 1 Small-Bore Piping program was evaluated.

USAR Supplement. SLRA Section A.2.2.22 provides the USAR supplement for AMP B.2.3.22, "ASME Code Class 1 Small-Bore Piping." The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Table XI-01. The staff noted that the applicant committed to implementation of the ASME Code Class 1 Small-Bore Piping program for managing the effects of aging for all applicable components during the subsequent period of extended operation. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

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

3.0.3.1.10 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

SLRA Section B.2.3.24 describes the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program as consistent with GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components."

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M38. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M38.

Operating Experience. SLRA Section B.2.3.24 summarizes OE related to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), the staff reviewed plant OE information provided by the applicant to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent 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.

USAR Supplement. SLRA Section A.2.2.24 provides the USAR supplement for the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to implementing the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff also noted that the applicant committed to perform baseline inspections before the period of extended operation no earlier than 10 years prior to the subsequent period of extended operation. The staff finds that the information in the USAR 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-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 Monitoring of Neutron-Absorbing Materials Other Than Boraflex

SLRA Section B.2.3.26 states that the Monitoring of Neutron-Absorbing Materials Other Than Boraflex program is an existing program that is consistent with the program elements in GALL-SLR Report AMP XI.M40, "Monitoring of Neutron-Absorbing Materials Other Than Boraflex."

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M40. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M40.

Operating Experience. SLRA Section B2.3.26 summarizes OE related to the Monitoring of Neutron-Absorbing Materials Other Than Boraflex program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), the staff reviewed plant OE information provided by the applicant to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent 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.

USAR Supplement. SLRA Section A.2.2.26 provides the USAR supplement for the Monitoring of Neutron-Absorbing Materials Other Than Boraflex program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing Monitoring of Neutron-Absorbing Materials Other Than Boraflex program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the USAR 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-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks

SLRA Section B.2.3.28 describes the new Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program as consistent with GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," as modified by SLR-ISG-2021-02-MECHANICAL.

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M42, as modified by SLR-ISG-2021-02-MECHANICAL.

Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M42.

Operating Experience. SLRA Section B.2.3.28 summarizes OE related to the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), the staff reviewed search results of the plant OE information provided by the applicant (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 subsequent period of extended operation.

The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program was evaluated.

USAR Supplement. SLRA Section A.2.2.28 provides the USAR supplement for the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to implementing the new Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program no later than 6 months prior to the subsequent period of extended operation or no later than the last refueling outage prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff also noted that the applicant committed to performing the inspections before the subsequent period of extended operation no earlier than 10 years prior to the subsequent period of extended operation. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 10 CFR Part 50, Appendix J

SLRA Section B.2.3.31 describes the existing 10 CFR Part 50, Appendix J ["Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors"] program as consistent with GALL-SLR Report AMP XI.S4, "10 CFR Part 50, Appendix J."

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.S4.

Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.S4

Operating Experience. SLRA Section B.2.3.31 summarizes OE related to the 10 CFR Part 50, Appendix J program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), the staff conducted a search of the plant OE information (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 subsequent 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.

USAR Supplement. SLRA Section A.2.2.31 provides the USAR supplement for the 10 CFR Part 50, Appendix J program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff noted that the applicant committed to ongoing implementation of the existing 10 CFR Part 50, Appendix J program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed (Commitment 34) to implementing the program by no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the USAR 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-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

SLRA Section B.2.3.39 describes the new Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 ["Environmental qualification of electric equipment important to safety for nuclear power plants"] Environmental Qualification Requirements program as consistent with GALL-SLR Report AMP XI.E3B, "Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR50.49 Environmental Qualification Requirements," as modified by SLR-ISG-2021-04-ELECTRICAL.

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report, as modified by SLR-ISG-2021-04-ELECTRICAL. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.E3B, as modified by SLR-ISG-2021-04-ELECTRICAL.

Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E3B, as modified by SLR-ISG-2021-04-ELECTRICAL.

Operating Experience. SLRA Section B.2.3.39 summarizes OE related to the Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program was evaluated.

USAR Supplement. SLRA Section A.2.2.39 provides the USAR supplement for the Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01.

The staff also noted that the applicant committed to implementing the new Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirement AMP no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation, for managing the effects of aging for applicable components. The new program will manage the effects of reduced insulation resistance of nonenvironmentally qualified, in-scope, inaccessible instrument and control cables that are potentially exposed to significant moisture.

The staff finds that the information in the USAR supplement, as amended by letter dated July 18, 2023 (ML23199A154) (Supplement 4), is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report, as modified by SLR-ISG-2021-04-ELECTRICAL, are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

SLRA Section B.2.3.40 describes the new Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program as consistent with GALL-SLR Report AMP XI.E3C, "Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," as modified by SLR-ISG-2021-04-ELECTRICAL. The applicant amended this SLRA section by letter dated July 18, 2023 (ML23199A154) (Supplement 4).

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report as modified by SLR-ISG-2021-04-ELECTRICAL. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.E3C, as modified by SLR-ISG-2021-04-ELECTRICAL. Based on a review of the SLRA, as modified by 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-SLR Report AMP XI.E3C, as modified by SLR-ISG-2021-04-ELECTRICAL.

Operating Experience. SLRA Section B.2.3.40, as modified by Supplement 4, summarizes OE related to the Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Electrical Insulation for Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program was evaluated.

USAR Supplement. SLRA Section A.2.2.40, as modified by Supplement 4, provides the USAR supplement for the Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01.

The staff also noted that the applicant committed to implementing the new Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation. The new program will manage the effects of reduced insulation resistance of nonenvironmentally qualified, in-scope, inaccessible low-voltage cables that are potentially exposed to significant moisture.

The staff finds that the information in the USAR supplement, as amended by letter dated July 18, 2023 (ML23199A154) (Supplement 4), is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report, as modified by SLR-ISG-2021-04-ELECTRICAL, are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

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

- Fatigue Monitoring
- Environmental Qualification of Electric Equipment

- Water Chemistry
- Reactor Head Closure Stud Bolting
- BWR Vessel Internals
- Flow-Accelerated Corrosion
- Bolting Integrity
- Open-Cycle Cooling Water System
- Closed Treated Water Systems
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems
- Compressed Air Monitoring
- Fire Protection
- Fire Water System
- Fuel Oil Chemistry
- Reactor Vessel Material Surveillance
- Selective Leaching
- External Surfaces Monitoring of Mechanical Components
- Lubricating Oil Analysis
- Buried and Underground Piping and Tanks
- ASME Section XI, Subsection IWE
- ASME Section XI, Subsection IWF
- Masonry Walls
- Structures Monitoring
- Inspection of Water-Control Structures Associated with Nuclear Power Plants
- Protective Coating Monitoring and Maintenance
- Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits
- Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- Metal Enclosed Bus
- Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

For AMPs that the applicant claimed are consistent with the GALL-SLR Report with exception(s), enhancement(s), or both, the NRC staff performed an audit and review to confirm that those attributes or features of the program for which the applicant claimed consistency with the GALL-SLR Report are indeed consistent. The staff reviewed the exceptions to the

GALL-SLR Report to determine whether they are acceptable and adequate. The staff also reviewed the enhancements to determine whether they will make the AMP consistent with the GALL-SLR Report AMP to which it is compared. The results of the staff's audits and reviews are documented in the following sections.

3.0.3.2.1 Fatigue Monitoring

SLRA Section B.2.2.1 states that the Fatigue Monitoring AMP is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP X.M1, "Fatigue Monitoring." The applicant amended this SLRA section by letters dated June 26, 2023 and July 18, 2023 (ML23177A218 and ML23199A154).

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP X.M1. For the portions of the program elements not associated with program enhancements, the staff found that these program elements of the SLRA are consistent with the corresponding program elements of GALL-SLR Report AMP X.M1.

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

Enhancement 1. SLRA Section B.2.2.1 includes an enhancement to the "parameters monitored or inspected" program element. The enhancement relates to updating the program procedures to require periodic validation of chemistry parameters that are used as inputs to determine environmental fatigue correction factors (F_{en}). The F_{en} values are used in the environmental cumulative usage factor (CUF_{en}) calculations. The water chemistry parameters are controlled and tracked in accordance with the Water Chemistry AMP (SLRA Section B.2.3.2).

The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.M1. The staff finds the enhancement acceptable because, when implemented, it will ensure that the F_{en} and CUF_{en} calculations use the water chemistry parameters (e.g., dissolved oxygen) as monitored in the Water Chemistry AMP. The staff's safety evaluation of the Water Chemistry AMP is documented in SE Section 3.0.3.2.3.

Enhancement 2. SLRA Section B.2.2.1 includes an enhancement to the "parameters monitored or inspected" program element. The enhancement relates to updating the program procedure to identify and require monitoring of the 80-year plant design cycles or projected cycles that are used as inputs to the CUF_{en} calculations.

The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.M1. The staff finds the enhancement acceptable because, when implemented, it will ensure that (1) the program identifies the 80-year design cycles or projected cycles that are assumed in the CUF_{en} calculations, (2) the program monitors actual transient cycles against the 80-year design cycles or projected cycles that are used in the CUF_{en} calculations, as applicable, and (3) the program performs corrective actions as needed such that the CUF_{en} does not exceed the fatigue design limit (1.0). The potential corrective actions include the refinement of CUF_{en} values and repair and replacement activities for affected components.

Enhancement 3. SLRA Section B.2.2.1 includes an enhancement to the "monitoring and trending" program element. The enhancement relates to updating the program procedure to identify the corrective action options to take if the values assumed for fatigue parameters are approached, transient severities exceed the design or assumed severities, transient counts exceed the design or assumed quantities, transient definitions have changed, unanticipated new fatigue loading events are discovered, or the geometries of components are modified.

The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.M1. The staff finds the enhancement acceptable because, when implemented, it will ensure that (1) corrective actions are performed, as needed, in response to the changes in transient severities, transient cycles, transient definitions, component geometries, and fatigue parameters such as cumulative usage factor (CUF) and CUF_{en} and (2) the CUF and CUF_{en} values do not exceed the fatigue design limit of 1.0 through fatigue monitoring and corrective actions.

Enhancement 4. SLRA Section B.2.2.1 includes an enhancement to the "monitoring and trending" element. The enhancement relates to updating the program procedure to require that trending be performed to ensure that the fatigue parameter limits will not be exceeded during the subsequent period of extended operation.

In its response (ML23227A175) to RAI B.2.2.1-1, the applicant also explained that the transients related to the flexible power operation do not need to be monitored because of the following: (1) MNGP is primarily operated as a baseload unit at 100 percent power, (2) MNGP may involve the flexible power operation that includes reducing power to 80 percent to allow windmills to operate when wind generation is predicted to be greater than demand, and (3) the flexible power operation and the associated load-following changes in reactor power have minor impact on the temperature of the reactor coolant system such that the effect of the flexible power operation on fatigue is negligible.

The staff finds the RAI response acceptable because the applicant clarified the following: (1) the flexible power operation includes the power reduction to 80 percent power, (2) the maximum pressure change associated with the flexible power operation is approximately 30 pounds per square inch gauge (psig), which is insignificant in comparison with the maximum pressure of 1,010 psig, (3) the pressure change corresponds to the temperature change up to 3.6 degrees Fahrenheit (°F) (i.e., 544°F to 547.6°F), (4) these bounding pressure and temperature changes result in cyclic stresses that are below the fatigue endurance limit for the reactor coolant pressure boundary components and piping, and (5) the impact of the pressure and temperature changes on fatigue is negligible so that monitoring of the transients associated with the flexible power operation is not needed.

The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.M1. The staff finds the enhancement acceptable because, when implemented, it will ensure that (1) the program monitors the transient cycles, which are used in the CUF and CUF_{en} calculations, and (2) the CUF and CUF_{en} values do not exceed the fatigue design limit (1.0) through the monitoring and trending of the transient cycles.

Enhancement 5. SLRA Section B.2.2.1 includes an enhancement to the "corrective actions" program element. The enhancement relates to updating the program procedure to specify that acceptable corrective actions include repair of the component, replacement of the component, and a more rigorous analysis of the component to demonstrate that the fatigue design limit will not be exceeded during the subsequent period of extended operation. For the corrective actions related to CUF_{en} analyses, the enhancement also includes the scope expansion that considers other environmentally assisted fatigue locations with the highest expected CUF_{en} values.

The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.M1. The staff finds the enhancement acceptable because, when implemented, it will ensure that (1) the program performs adequate corrective actions such that the fatigue design limit (0.1) for CUF and CUF_{en} is not exceeded and (2) the corrective actions of the program are consistent with those described in GALL-SLR Report AMP X.M1.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA supplements 2, 4 and the applicant's response to RAI B.2.2.1-1, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements, for which the applicant claimed consistency with the GALL-SLR Report, are consistent with the corresponding program elements of GALL-SLR Report AMP X.M1. In addition, the staff reviewed the enhancements associated with the "parameters monitored or inspected," "monitoring and trending," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.2.1 summarizes OE related to the Fatigue Monitoring AMP. The staff also reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), the staff reviewed search results of the plant OE information (1) to 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 subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program.

USAR Supplement. SLRA Section A.2.1.1 provides the USAR supplement of the Fatigue Monitoring AMP. The staff also noted that the applicant committed to implementing the program enhancements no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation, as described in SLRA Table A-3. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

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

3.0.3.2.2 Environmental Qualification of Electric Equipment

SLRA Section B.2.2.3 notes that the Environmental Qualification of Electric Equipment program is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP X.E1, “Environmental Qualification of Electric Equipment.”

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA to the corresponding elements of GALL-SLR Report AMP X.E1.

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

Enhancement 1. SLRA Section B.2.2.3 includes an enhancement to the “detection of aging effects” program element. The enhancement relates to the addition of visual inspections of accessible, passive EQ equipment for adverse localized environments (ALEs) that could impact qualified life at least once every 10 years with the first periodic visual inspection being performed prior to the subsequent period of extended operation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.E1 and finds it acceptable because, when implemented, it will be consistent with AMP X.E1 and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of environmentally qualified electric components within the scope of the AMP will be maintained consistent with the CLB.

Enhancement 2. SLRA Section B.2.2.3 includes an enhancement to the “acceptance criteria” program element. The enhancement relates to the addition of documentation of the visual inspections showing that accessible passive EQ equipment is free from unacceptable surface abnormalities that may indicate age degradation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.E1 and finds it acceptable because, when implemented, it will be consistent with AMP X.E1 and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of environmentally qualified electric components within the scope of the AMP will be maintained consistent with the CLB.

Enhancement 3. SLRA Section B.2.2.3 includes an enhancement to the “corrective actions” program element. The enhancement relates to the addition of evaluation and taking appropriate corrective actions, which may include changes to qualified life, when an unexpected ALE or condition is identified during operational or maintenance activities that affect the qualification of electrical equipment. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.E1 and finds it acceptable because, when implemented, it will be consistent with AMP X.E1 and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of environmentally qualified electric components within the scope of the AMP will be maintained consistent with the CLB.

Based on a review of the SLRA, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP X.E1. In addition, the staff reviewed the enhancements associated with the “detection of aging effects,” “acceptance criteria,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.2.3 summarizes OE related to the Environmental Qualification of Electric Equipment program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Environmental Qualification of Electric Equipment program was evaluated.

USAR Supplement. SLRA Section A.2.1.3 provides the USAR supplement for the Environmental Qualification of Electric Equipment program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table X-01.

The staff also noted that the applicant committed (Commitment 3) to enhancing the existing Environmental Qualification of Electric Equipment AMP no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation.

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

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

3.0.3.2.3 Water Chemistry

SLRA Section B.2.3.2 states that the Water Chemistry program is an existing program that will be consistent with the program elements in GALL-SLR Report AMP XI.M2, “Water Chemistry,” as modified by SLR-ISG-2021-02-MECHANICAL, other than the exception identified in the SLRA.

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M2, as modified by SLR-ISG-2021 02-MECHANICAL.

The staff also reviewed the portions of the "parameters monitored or inspected" 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 1. SLRA Section B.2.3.2 includes an exception to the "parameters monitored or inspected" program element related to not measuring hydrogen peroxide levels as part of measuring electrochemical potential. The staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP XI.M2, as modified by SLR-ISG-2021-02-MECHANICAL, and finds it acceptable because the GALL-SLR Report states that water quality is maintained in accordance with the Electric Power Research Institute (EPRI) BWRVIP-190, Revision 1, "BWR Vessel and Internals Project, Volume 1: BWR Water Chemistry Guidelines - Mandatory, Needed, and Good Practice Guidance and Volume 2: BWR Water Chemistry Guidelines - Technical Basis." issued in 2014 (nonpublic). These guidelines include an alternative to measuring hydrogen peroxide. Therefore, the exception does not affect the applicant's commitment to maintaining water quality in accordance with the EPRI Water Chemistry Guidelines.

Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M2, as modified by SLR-ISG-2021-02-MECHANICAL. The staff also reviewed the exception associated with the "parameters monitored or inspected" program element and its justification and finds that the AMP, with the exception, is adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.2 summarizes OE related to the Water Chemistry program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), the staff reviewed search results of the plant OE information (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 subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Water Chemistry program was evaluated.

USAR Supplement. SLRA Section A.2.2.2 provides the USAR supplement for the Water Chemistry program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to implementing the existing Water Chemistry program no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the USAR 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-SLR Report are consistent. The staff also reviewed the exception and finds that, when the exception is implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.4 Reactor Head Closure Stud Bolting

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

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M3.

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

Exceptions 1 and 2. SLRA Section B.2.3.3 includes exceptions to the "preventive actions" and "corrective actions" program elements. These exceptions relate to the suggestion to limit the yield strength of the reactor head closure studs to less than 150 kilo-pounds per square inch (ksi) and ultimate tensile strength to less than 170 ksi. GALL-SLR Report AMP XI.M3 places limits on the yield and tensile strength values of the reactor head closure studs to reduce susceptibility of the studs to SCC or IGSCC, which is more likely to occur as material strength increases beyond the limited values. The applicant stated that most existing reactor head closure studs at MNGP have ultimate tensile strengths over 170 ksi. The applicant is therefore taking exception to the recommendation in the GALL Report AMP XI.M3 that specifies an upper limit value on the ultimate tensile strength of the existing reactor head closure studs. The staff reviewed these exceptions against the corresponding program elements in GALL-SLR Report AMP XI.M3 and finds them acceptable for the following reasons: (1) ISI identified no relevant indications for the reactor head closure stud bolting components, (2) the closure studs are volumetrically examined according to 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-SLR Report AMP XI.M3 regarding not using metal-plated studs, using acceptable stud surface treatments, and using stable lubricants are met, and (4) implementation of the enhancements (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-SLR Report AMP XI.M3.

Enhancements 1 and 2. SLRA Section B.2.3.3 includes an enhancement to the "preventive actions" and "corrective actions" program elements, which relates to the procurement of new reactor head closure studs to limit yield strength to less than 150 ksi (1,034 MPa). The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M3 and finds it acceptable because, when implemented, it will bring the “preventive actions” and “corrective actions” program elements in line with the suggested material properties to reduce the potential for SCC of the reactor head closure studs.

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

Operating Experience. SLRA Section B.2.3.3 summarizes OE related to the Reactor Head Closure Stud Bolting AMP. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent period of extended operation. The applicant’s search of the plant OE was conducted to identify examples of age-related degradation, as documented in the applicant’s corrective action program database. The staff’s review of this search provides a basis for the staff’s conclusions on the ability of the applicant’s proposed AMP to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any OE that indicated 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.

USAR Supplement. SLRA Section A.2.2.3 provides the USAR supplement for the Reactor Head Closure Stud Bolting AMP. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing Reactor Head Closure Stud Bolting AMP with enhancements (Commitment 6) for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the USAR 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-SLR Report are consistent. The staff also reviewed the exceptions and the enhancements and finds that, when the exceptions and enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 Internals

SLRA Section B.2.3.7 states that the BWR Vessel Internals AMP is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.M.9, “BWR Vessel Internals,” other than the exception identified in the SLRA. The applicant amended this SLRA section by letters dated June 26, 2023, and July 18, 2023.

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M9.

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

Exception 1. SLRA Section B.2.3.7 includes an exception to the “detection of aging effects” program element related to the Long-Term Steam Dryer Inspection Plan for the applicant’s replacement steam dryer. The staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP XI.M9 and finds it acceptable because it is based on (1) design-specific considerations not addressed by GALL-SLR Report AMP XI.M9 and (2) an NRC-approved inspection plan that includes future periodic examinations (ML20202A230).

Enhancement 1. SLRA Section B.2.3.7 includes an enhancement to the “scope of program” program element, which as indicated in BWRVIP-315, “Reactor Internals Aging Management Evaluation for Extended Operations,” relates to implementation of the Topical Reports BWRVIP-26, “BWR Top Guide Inspection and Flaw Evaluation Guidelines”; BWRVIP-41, “BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines”; BWRVIP-47; and BWRVIP-183 "BWR Vessel and Internals Project, Top Guide Grid Beam Inspection and Flaw Evaluation Guidelines". The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M9 and finds it acceptable because, when implemented, it will ensure that recommended updates to the existing BWRVIP aging management guidance will be accounted for in the applicant’s BWR Vessel Internals AMP.

Enhancement 2. SLRA Section B.2.3.7 includes an enhancement to the “scope of program” program element, which relates to implementation of Topical Report BWRVIP-315-A, once published. The staff reviewed this enhancement, as modified in the supplement dated June 26, 2023 (ML23177A218), against the corresponding program elements in GALL-SLR Report AMP XI.M9 and finds it acceptable because, when implemented, it will ensure that the applicant’s BWR Vessel Internals AMP will implement BWRVIP-315-A (i.e., the NRC-approved version of BWRVIP-315), which will account for NRC conditions on the use of this topical report in the applicant’s BWR Vessel Internals AMP.

Based on a review of the SLRA and amendments, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M9. The staff also reviewed the exception between the applicant's program and GALL-SLR Report XI.M9 associated with the "detection of aging effects" program elements and its justification and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the "scope of program" program element and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Review of License Renewal Applicant Action Items

In past staff SEs for the topical reports listed in Appendix C to the applicant's SLRA, the staff issued license renewal applicant action items on the reports. The applicant described these action items in Tables C-1 to C-3 of the SLRA, as amended by the supplement dated July 18, 2023. The staff confirmed that the applicant responded appropriately to the applicant action items issued for the following BWRVIP topical reports:

- BWRVIP-18, Revision 2-A, "BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines"
- BWRVIP-25, Revision 1-A, "BWR Core Plate Inspection and Flaw Evaluation Guidelines"
- BWRVIP-26-A, "BWR Top Guide Inspection and Flaw Evaluation Guidelines"
- BWRVIP-27-A, "BWR Standby Liquid Control System/Core Plate ΔP Inspection and Flaw Evaluation Guidelines"
- BWRVIP-38, "BWR Shroud Support Inspection and Flaw Evaluation Guidelines"
- BWRVIP-41, Revision 4-A, "BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines"
- BWRVIP-47-A, "BWR Lower Plenum Inspection and Flaw Evaluation Guidelines"
- BWRVIP-48-A, "Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines"
- BWRVIP-49-A, "Instrument Penetration Inspection and Flaw Evaluation Guidelines"
- BWRVIP-76, Revision 1-A, "BWR Core Shroud Inspection and Flaw Evaluation Guidelines"
- BWRVIP-139, Revision 1-A, "Steam Dryer Inspection and Flaw Evaluation Guidelines"

In addition, the applicant referenced Topical Report BWRVIP-315, which contains an evaluation of existing BWRVIP topical reports for operations beyond 60 years. The applicant referenced a number of applicant action items related to BWRVIP-315 in Table C-3 of the SLRA.

The staff confirmed that the applicant addressed the relevant action items. This includes the applicant's responses to the following types of action items that have been issued concerning the specific BWRVIP report methodologies:

- information supporting the implementation of BWRVIP-defined inspections or evaluations of reactor vessel internal component-specific locations
- evaluations of reactor vessel internal component-specific TLAAs
- needed USAR supplement information for describing programmatic bases used to implement specific BWRVIP guideline methodologies

For these action items, the staff finds the responses to be acceptable because the applicant—

- included the applicable USAR supplement describing the applicable inspection or evaluation used to manage aging effects of applicable components addressed in the applicant action item
- identified, included, and evaluated the applicable TLAAs for the component in the SLRA
- implemented appropriate procedural controls to ensure that updated NRC-approved BWRVIP reports are incorporated into the AMP
- evaluated design-specific considerations (e.g., whether the core shroud had been modified to include tie rod repairs)
- addressed specific technical issues related to operations beyond 60 years, as identified by BWRVIP-315

Operating Experience. SLRA Section B.2.3.7 summarizes OE related to the BWR Vessel Internals AMP. The staff reviewed OE information in the application during the audit. As discussed in the audit report (ML23214A232), the staff reviewed the applicant's methodology and 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 subsequent 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 Vessel Internals AMP was evaluated.

USAR Supplement. SLRA Section A.2.2.7 provides the USAR supplement for the BWR Vessel Internals AMP. As a result of discussions during the audit (ML23214A232), the licensee modified the USAR description by supplement dated June 26, 2023 (ML23177A218). The staff reviewed it and found that it is consistent with the corresponding program description in GALL-SLR Report Table XI-01 and that it includes appropriate details identified by the staff during the audit. Therefore, the staff finds that the information in the USAR supplement, as amended by the supplement dated June 26, 2023 (ML23177A218), is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's BWR Vessel Internals AMP, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the exception and the enhancements and finds that, when the exception and the enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the updated USAR 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 Flow-Accelerated Corrosion

SLRA Section B.2.3.9 states that the Flow-Accelerated Corrosion program is an existing program with enhancements that will be consistent with the program elements in GALL-SLR

Report AMP XI.M17, “Flow-Accelerated Corrosion.” The applicant amended this SLRA section by letter dated June 26, 2023 (ML23177A218).

Staff Evaluation. As documented in the audit report (ML23214A232), the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M17.

The staff also reviewed the portions of the “scope of program,” “detection of aging effects,” “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. Because the program’s enhancements are not enumerated in the SLRA, the enhancement numbering below reflects their appearance in the associated enhancement table in the SLRA. The staff’s evaluation of the three program enhancements follows.

Enhancement 1. SLRA Section B.2.3.9 includes an enhancement to the “scope of program” and “detection of aging effects” program elements. The enhancement relates to reassessing systems that have been excluded from wall thickness monitoring, based on limited operating time, to ensure that the exclusion remains valid. The staff reviewed this enhancement against the corresponding program elements in the associated AMP and finds it acceptable because validating prior system exclusions, which were based on limited operating time, is consistent with the guidance in GALL-SLR Report AMP XI.M17 and will ensure that the effects of aging are being adequately managed.

Enhancement 2. SLRA Section B.2.3.9 includes an enhancement to the “monitoring and trending” program element. The enhancement relates to evaluating inspection results to determine if assumptions in extent-of-condition reviews remain valid. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because validating assumptions made in extent-of-condition reviews is consistent with the guidance in GALL-SLR Report AMP XI.M17, and it will ensure that the effects of aging are being adequately managed.

Enhancement 3. SLRA Section B.2.3.9, as modified in a letter dated June 26, 2023 (ML23177A218), includes an enhancement to the “acceptance criteria” program element. The enhancement relates to the use of an industry-recommended safety factor of 2.0 for calculating remaining service life of components with wall thinning due to erosion mechanisms. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because addressing the use of the industry recommended safety factor can ensure that intended functions of components will be maintained in accordance with the CLB and that the effects of aging are being adequately managed.

Based on its review of the SLRA and amendments, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M17. The staff also reviewed the enhancements associated with the “scope of program,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements and finds that, when the enhancements are implemented, the AMP can adequately manage applicable aging effects.

Operating Experience. SLRA Section B.2.3.9 summarizes OE related to the Flow-Accelerated Corrosion program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report, the staff reviewed search results of the plant OE information to (1) identify examples of plant-specific age-related degradation 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 subsequent 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 Flow-Accelerated Corrosion program was evaluated.

USAR Supplement. SLRA Section A.2.2.9, as modified by letter dated June 26, 2023 (ML23177A218), provides the USAR supplement for the Flow-Accelerated Corrosion program. The staff reviewed this USAR supplement description of the program and noted that it was consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to enhancing the existing Flow-Accelerated Corrosion program, as noted in Table A-3, Commitment 12, no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the USAR supplement, as modified, 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-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when the enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 Bolting Integrity

SLRA Section B 2.3.10 states that the Bolting Integrity program is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.M18, "Bolting Integrity."

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M18.

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

Enhancement 1. SLRA Section B.2.3.10 includes an enhancement to the "preventive actions" and "corrective actions" program elements, which relates to referencing EPRI Reports 1015336 "Nuclear Maintenance Application Center: Bolted Joint Fundamentals," and 1015337 "Nuclear

Maintenance Applications Center: Assembling Gasketed, Flanged Bolted Joints," and incorporating the guidance. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-SLR Report recommendations to ensure that the selection of bolting material and the use of lubricant are in accordance with the referenced industry guidelines to prevent or mitigate SCC.

Enhancement 2. SLRA Section B.2.3.10 includes an enhancement to the "preventive actions" program element, which relates to prohibiting lubricants containing molybdenum disulfide (disulfide or polysulfide) or other lubricants containing sulfur from being used on pressure-retaining bolted joints. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-SLR Report recommendations to ensure that lubricants known to be a potential contributor to SCC are not used.

Enhancement 3. SLRA Section B.2.3.10 includes an enhancement to the "preventive actions," and "parameters monitored or inspected" program elements, which relates to ensuring that the maximum yield strength of replacement or newly procured pressure-retaining bolting material will be limited to an actual yield strength less than 150 ksi (1,034 MPa). The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-SLR Report recommendations to include preventive measures for not using high-strength closure bolting (actual yield strength greater than or equal to 150 ksi (1,034 MPa)) known to be more susceptible to SCC.

Enhancement 4. SLRA Section B.2.3.10 includes an enhancement to the "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements, which relates to developing a new procedure to perform alternative means of testing and inspection for closure bolting where leakage is difficult to detect. The acceptance criteria for the alternative means of testing will be no indication of leakage from the bolted connections. Required inspections will be performed to ensure that a representative sample of the population of bolt heads and threads (i.e., 20 percent of the population, up to a maximum of 25 items) is accessed and inspected over each 10-year period of the subsequent period of extended operation. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-SLR Report recommendations to ensure that (1) closure bolting in locations that preclude detection of joint leakage are inspected or monitored for degradations as described in GALL-SLR Report AMP XI.M18, (2) the selected sample is sufficient to provide adequate representative inspection results, and (3) appropriate acceptance criteria are clearly defined and established.

Enhancement 5. SLRA Section B.2.3.10 includes an enhancement to the "detection of aging effects" program element, which relates to ensuring that bolted joints that are not readily visible during plant operations and refueling outages will be inspected when they are made accessible. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M18 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to ensure that the aging effects in bolted joints that are not readily visible for inspection are being monitored when they are made accessible and at such intervals that would provide reasonable assurance that the components' intended functions are maintained.

Enhancement 6. SLRA Section B.2.3.10 includes an enhancement to the "detection of aging effects" program element. The enhancement relates to ensuring that volumetric examination will be required in accordance with the ASME Code for closure bolting greater than 5.08 cm (2 inches) in diameter with actual yield strength greater than or equal to 150 ksi (1,034 MPa) and for which yield strength is unknown. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M18 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to perform volumetric examination in accordance with the ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1 (e.g., acceptance standards, extent and frequency of examination).

Enhancement 7. SLRA Section B.2.3.10 includes an enhancement to the "monitoring and trending" program element. The enhancement relates to projecting identified degradations until the next scheduled inspection and evaluating the results against the acceptance criteria to confirm that the timing of the subsequent inspection will maintain the component's intended functions based on the projected rate of degradation. The enhancement also includes evaluating the results from sampling-based inspections against the acceptance criteria to confirm that the sampling bases will maintain the component's intended function and to increase the inspection frequency or sample size when the evaluation determines this to be necessary. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M18 and finds it acceptable because, when implemented, it will make the program consistent with the GALL-SLR Report recommendation to (1) ensure that identified degradation is projected and results evaluated to confirm that the selected inspection frequency will maintain the components' intended functions throughout the subsequent period of extended operation and (2) evaluate the results from sampling-based inspections against the acceptance criteria to confirm that the components' intended functions will be maintained throughout the subsequent period of extended operation.

Enhancement 8. SLRA Section B.2.3.10 includes an enhancement to the "corrective actions" program element, which relates to including guidance for leak monitoring, sample expansion, and additional inspections as described in the corresponding program element of GALL-SLR Report AMP XI.M18. The staff reviewed this enhancement and finds it acceptable because, when implemented, it will make the program element consistent with the GALL-SLR Report recommendations for adequately addressing results that do not meet the acceptance criteria.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent, or consistent with enhancements, with the corresponding program elements of GALL-SLR Report AMP XI.M18. In addition, the staff reviewed the enhancements associated with the "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, the enhancements will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.10 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 (ML23214A232), 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 subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Bolting Integrity program was evaluated.

USAR Supplement. SLRA Section A.2.2.10 provides the USAR supplement for the Bolting Integrity program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff noted that the applicant committed (Commitment 13) to implementing the program enhancements by no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation. The staff also noted that the applicant committed to ongoing implementation of the existing Bolting Integrity program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

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

3.0.3.2.8 Open-Cycle Cooling Water System

SLRA Section B.2.3.11 states that the Open-Cycle Cooling Water System program is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.M20, "Open-Cycle Cooling Water System." The applicant amended this SLRA section by letter dated June 26, 2023 (ML23177A218).

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M20. The staff also reviewed the portions of the "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "corrective actions" program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these six enhancements follows.

Enhancement 1. SLRA Section B.2.3.11 includes an enhancement to the "parameters monitored or inspected" program element, which relates to updating the procedure for the program under Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment, dated July 18, 1989, and related piping inspection procedures to monitor for internal cracking. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M20 and finds it acceptable because, when implemented, it will be consistent with NUREG-2191.

Enhancement 2. SLRA Section B.2.3.11 includes an enhancement to the “detection of aging effects” program element, which relates to ensuring that non-ASME Code tests and inspections follow site procedures that include requirements for items such as lighting, distance, offset, surface coverage, presence of protective coatings, and cleaning processes. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M20 and finds it acceptable because, when implemented, it will be consistent with NUREG-2191.

Enhancement 3. SLRA Section B.2.3.11 includes an enhancement to the “monitoring and trending” program element, which relates to clarifying in the heat exchanger testing and inspection procedures that inspection results are trended to evaluate the adequacy of surveillance frequencies so that proper function is maintained between surveillances. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M20 and finds it acceptable because, when implemented, it will be consistent with NUREG-2191.

Enhancement 4. SLRA Section B.2.3.11 includes an enhancement to the “monitoring and trending” program element, which relates to ensuring that the primary program procedures and relevant inspection procedures prompt an evaluation of the heat transfer capability of the safety-related raw water supplied heat exchangers when fouling is identified. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M20 and finds it acceptable because, when implemented, it will be consistent with NUREG-2191.

Enhancement 5. SLRA Section B.2.3.11 includes an enhancement to the “monitoring and trending” program element, which relates to ensuring that the primary program procedures and relevant inspection procedures include trending of wall thickness measurements at locations susceptible to ongoing degradation, due to specific aging mechanisms (e.g., microbiologically induced corrosion), and the monitoring frequency and number of inspection locations will be adjusted based on the trending. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M20 and finds it acceptable because, when implemented, it will be consistent with NUREG-2191.

Enhancement 6. SLRA Section B.2.3.11 includes an enhancement to the “corrective actions” program element. The enhancement relates to updating the primary program procedures and relevant inspection testing procedures to clarify that if fouling is identified, the overall effect is evaluated for reduction of heat transfer, flow blockage, loss of material, and chemical treatment effectiveness. The number of inspections will be increased in accordance with the corrective action program; however, no fewer than five additional inspections are conducted for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging effect combination is inspected, whichever is less. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M20 and finds it acceptable because, when implemented, it will be consistent with NUREG-2191.

Based on a review of the SLRA, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M20. In addition, the staff reviewed the enhancements associated with the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.11 summarizes OE related to the Open-Cycle Cooling Water System program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Open-Cycle Cooling Water System program was evaluated.

USAR Supplement. SLRA Section A.2.2.11 provides the USAR supplement for the Open-Cycle Cooling Water System program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to implementing the existing program no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the USAR 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-SLR Report are consistent. The staff also reviewed the enhancements and finds that, with the enhancements implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.9 Closed Treated Water Systems

SLRA Section B.2.3.12 states that the Closed Treated Water Systems program is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.M21A, “Closed Treated Water Systems,” as modified by SLR-ISG-2021-02-MECHANICAL.

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M21A.

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

Enhancement 1. SLRA Section B.2.3.12 includes an enhancement to the "scope of program," "preventive actions," "parameters monitored or inspected," "monitoring and trending," and "acceptance criteria" program elements. The enhancement relates to revising procedures to include the heating and ventilation cooling system as a closed treated water system, subject to the same requirements as other closed treated water systems. The staff reviewed this enhancement, against the corresponding program elements in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when implemented, it will be consistent with the recommendations in GALL-SLR Report AMP XI.M21A, as modified by SLR-ISG-2021-02-MECHANICAL.

Enhancement 2. SLRA Section B.2.3.12 includes an enhancement to the "parameters monitored or inspected" program element. The enhancement relates to revising or creating procedures to evaluate surfaces for loss of material, surface discontinuities indicative of cracking, and surface cleanliness to determine heat transfer capability. Functional testing may be used to verify heat removal rates. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when implemented, it will be consistent with the recommendations in GALL-SLR Report AMP XI.M21A, as modified by SLR-ISG-2021-02-MECHANICAL.

Enhancement 3. SLRA Section B.2.3.12 includes an enhancement to the "detection of aging effects" program element. The enhancement relates to revising procedures to include visual inspection of surfaces whenever the system boundary is opened. In each 10-year period during the subsequent period of operation, a representative sample (20 percent minimum, up to a maximum of 25 components) of the population will be inspected using techniques capable of detecting loss of material, cracking, and fouling, as appropriate. The 20 percent minimum refers to surface area inspected unless the component is measured in linear feet, such as piping. In that case, any combination of 1-foot length sections and components can be used to meet the recommended extent of 25 inspections. Inspections will be conducted in accordance with applicable ASME Code requirements. If there are no ASME code requirements, inspections will be conducted in accordance with site procedures, which will include requirements for items such as lighting, distance, offset, surface coverage, presence of protective coatings, and cleaning processes. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when implemented, it will be consistent with the recommendations in GALL-SLR Report AMP XI.M21A, as modified by SLR-ISG-2021-02-MECHANICAL.

Enhancement 4. SLRA Section B.2.3.12 includes an enhancement to the "acceptance criteria" program element. The enhancement relates to revising or creating new procedures to include acceptance criteria for the results of visual inspections of surfaces exposed to the closed treated water environment. Any detectable loss of material, cracking, or fouling of heat transfer surfaces will be evaluated in the corrective action program. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when implemented, it will be consistent with the recommendations in GALL-SLR Report AMP XI.M21A, as modified by SLR-ISG-2021-02-MECHANICAL.

Enhancement 5. SLRA Section B.2.3.12 includes an enhancement to the “corrective actions” program element. The enhancement relates to revising or creating new procedures to include corrective actions if the results of visual inspections of surfaces exposed to the closed treated water environment do not meet acceptance criteria. If fouling of heat transfer surfaces is identified, the overall effect will be evaluated for reduction of heat transfer, flow blockage, and loss of material. Additional inspections are conducted if one of the inspections does not meet acceptance criteria. The number of increased inspections will be determined in accordance with the corrective action program; however, there will be no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging affect inspected, whichever is less. If subsequent inspections do not meet acceptance criteria, an extent-of-condition and extent-of-cause analysis will be conducted to determine the further extent of condition. Additional samples will be inspected for any recurring degradation to ensure that corrective actions appropriately address the associated causes. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when implemented, it will be consistent with the recommendations in GALL-SLR Report AMP XI.M21A, as modified by SLR-ISG-2021-02-MECHANICAL.

Based on a review of the SLRA, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M21A. In addition, the staff reviewed the enhancements associated with the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.12 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 (ML23214A232), 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 subsequent 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 Closed Treated Water Systems program was evaluated.

USAR Supplement. SLRA Section A.2.2.12 provides the USAR supplement for the Closed Treated Water Systems program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI.M21A. The staff also noted that the applicant committed to implementing the existing Closed Treated Water Systems program no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the USAR 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-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when the enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

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

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M23.

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

Enhancement 1. SLRA Section B.2.3.13 includes an enhancement to the "detection of aging effects" program element, which relates to updating the MNGP Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP governing procedure and crane inspection procedures to include the following:

- to perform visual inspection by a designated person and documented before being placed with frequencies in service in accordance with the requirements listed in paragraph 2-2.1.3, "Periodic Inspections," of ASME B30.2, "Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)," 2005 Edition, or other appropriate standards of the ASME B30 series
- to replace references to NP-5067 and EPRI TR-104213 with references to EPRI Reports 1015336 and 1015337
- to perform the visual inspections of the load handling system by personnel qualified in accordance with plant-specific procedures and processes
- to inspect the trolley and bridge runway rail web and flange for damage or cracks

The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M23 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation for performing visual inspection by personnel qualified in accordance with plant-specific procedures and processes in accordance with the requirements listed in paragraph 2-2.1.3, of ASME B30.2, 2005 Edition, or other appropriate standards of the ASME B30 series, referencing EPRI Reports 1015336 and 1015337, and inspecting the trolley and bridge runway rail web and flange for damage or cracks.

Enhancement 2. SLRA Section B.2.3.13 includes an enhancement to the "monitoring and trending" program element. The enhancement relates to identifying deficiencies that are documented using plant-specific processes and procedures, where the cattle chute lifting strongback inspection procedure will be updated to generate a corrective action program action request if any nonconforming conditions are found to perform evaluation with consideration for age-related degradation. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M23 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation by updating the cattle chute lifting strongback inspection procedure to generate a corrective action program action request if any nonconforming conditions are found to perform evaluation(s) on the age-related degradation(s).

Enhancement 3. SLRA Section B.2.3.13 includes an enhancement to the "acceptance criteria" program element. The enhancement relates to performing visual inspections for indications of loss of material due to corrosion and wear and evaluating any visual indication of loss of material due to corrosion or wear and any visual signs of loss of bolting preload in accordance with ASME/ B30.2 or ASME B30.16 "Overhead Underhung and Stationary Hoists." The staff reviewed this enhancement against the corresponding program elements in the GALL-SLR Report AMP XI.M23 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report AMP XI.M23 recommendation of ASME/ANSI B30.2, 2005 Edition, or ASME B30 series standards in their inspection procedures.

Enhancement 4. SLRA Section B.2.3.13 includes an enhancement to the "corrective action" program element. The enhancement relates to revising inspection procedures to state that repairs made to load handling systems covered by NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants: Resolution of Generic Technical Activity A-36," issued July 1980, are performed as specified in the 2005 version of ASME B30.2 or other applicable industry standard in the ASME B30 series. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M23 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report AMP XI.M23 recommendation to perform corrective action according to ASME/ANSI B30.2, 2005 Edition, or ASME B30 series standards in their inspection procedures.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," and "parameters monitored or inspected" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M23. In addition, the staff reviewed the enhancements associated with the "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, the AMP will be adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.13 summarizes OE related to the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent 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 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP was evaluated.

USAR Supplement. SLRA Appendix A, Section A.2.2.3.1, provides the USAR supplement for the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implementing the enhancements no later than 6 months or the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when the enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.11 Compressed Air Monitoring

SLRA Section B2.3.14 states that the Compressed Air Monitoring program is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.M24, "Compressed Air Monitoring."

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M24.

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

Enhancement 1. SLRA Section B.2.3.14 includes an enhancement to the "preventive actions" and the "detection of aging effects" program elements, which updates the air quality sampling or governing procedure to incorporate the air quality provisions in the guidance of EPRI TR-108147 "Compressor and Instrument Air System Maintenance Guide," issued 1998, and the related guidance in ASME OM-2012, Division 2, Part 28 "Operation and Maintenance of Nuclear Power Plants." The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M24 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

<u>Enhancement 2</u>. SLRA Section B2.3.14 includes an enhancement to the "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements, which relates to performing opportunistic visual inspections of accessible internal surfaces for signs of corrosion and abnormal corrosion products that might indicate a loss of material within the system. Acceptance criteria for visual inspection of internal surfaces will include no signs of corrosion (general, pitting, and crevice) that could indicate the potential loss of function of the component. Qualified personnel will perform the inspections and tests. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M24 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

<u>Enhancement 3</u>. SLRA Section B2.3.14 includes an enhancement to the "detection of aging" and "monitoring and trending" program elements, which updates procedures to trend the dewpoint temperature measurements. The staff reviewed this enhancement, against the corresponding program elements in GALL-SLR Report AMP XI.M24 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

<u>Enhancement 4</u>. SLRA Section B2.3.14 includes an enhancement to the "monitoring and trending" program element to include monitoring and trending guidance for ASME OM-2012, Division 2, Part 28, as applicable. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M24 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

<u>Enhancement 5</u>. SLRA Section B2.3.14 includes an enhancement to the "corrective actions" program element, which requires procedures to take appropriate corrective actions when corrosion is discovered on internal system surfaces. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M24 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the amended SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M24. In addition, the staff reviewed the enhancements associated with the "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

<u>Operating Experience</u>. SLRA Section B2.3.14 summarizes OE related to the Compressed Air Monitoring program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent period of extended operation.

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

USAR Supplement. SLRA Appendix A, Section A2.14, provides the USAR for the Compressed Air Monitoring program. The staff reviewed this USAR description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing Compressed Air Monitoring program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the USAR 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-SLR Report are consistent. The staff also reviewed the enhancements and exceptions and finds that, when the enhancements and exceptions are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.12 Fire Protection

SLRA Section B.2.3.15 states that the Fire Protection AMP is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.M26, "Fire Protection," as modified by SLR-ISG-2021-02-MECHANICAL. The applicant amended this SLRA section by letters dated June 26, 2023 (ML23177A218), and September 5, 2023 (ML23248A474).

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M26, as modified by SLR-ISG-2021-02-MECHANICAL.

For the "monitoring and trending" and "acceptance criteria" program elements, the staff needed additional information on trending of the halon fire suppression system inspection and periodic test results, crack width limits for fire barriers, the AMPs that will manage the effects of aging for fire-rated doors, and how grout associated with fire barriers is addressed in the SLRA. The staff's requests and the applicant's responses to RAIs B.2.3.15-1 and B.2.3.15-2 and Requests for Confirmation of Information (RCIs) 3.5.2-A and 3.5.2-B are documented in ADAMS (ML23248A474 and ML23199A154).

In its response to RAI B.2.3.15-1, the applicant revised Commitment 18.b in Table A-3 and the enhancement to the “monitoring and trending” program element in Section B.2.3.15 to include trending of the halon fire suppression system inspection and periodic test results. The staff finds the response acceptable because trending the inspection and periodic test results of the halon fire suppression system is consistent with GALL-SLR Report AMP XI.M26. For additional detail, see the discussion in Enhancement 2 below.

In its response to RAI B.2.3.15-2, the applicant revised Commitment 18.e in Table A-3 and the enhancement to the “acceptance criteria” program element in Section B.2.3.15 to remove inspection procedure acceptance criteria for cracks greater than 0.25 inches in fire barrier materials, other than thermal mastic. The staff finds the response acceptable because the applicant will not adopt a crack width limit that applies only to thermal mastic materials for other fire barriers. For additional detail, see the discussion in Enhancement 3 below.

In its response to RCI 3.5.2-A, the applicant confirmed that fire-rated doors with intended functions in addition to the fire barrier intended function will be managed by both the Fire Protection AMP and the Structures Monitoring AMP. The staff finds the response acceptable because managing the effects of aging with both AMPs will ensure that all intended functions are maintained during the subsequent period of extended operation.

In its response to RCI 3.5.2-B, the applicant confirmed that grout is included as part of the cementitious fire barrier commodity types in the SLRA, and that grout will be inspected as part of the fire barrier according to Procedure 0275-02 during the subsequent period of extended operation. The staff finds the response acceptable because grout will be inspected during the subsequent period of extended operation, and cracking, change in material properties, delamination, loss of material, and separation will be managed for grout by the Fire Protection AMP, which is consistent with the aging effects for cementitious coatings in SLR-ISG-2021-02-MECHANICAL.

The staff also reviewed the portions of the “parameters monitored or inspected,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements associated with the enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. Because the program’s enhancements are grouped according to program element in the SLRA, the enhancement numbering below reflects the enhancement’s appearance in the associated table in the SLRA. The associated commitment numbers are provided after each enhancement discussion because parts of some enhancements were combined into various commitments, making it difficult to ensure that enhancements were translated into commitments. The staff’s evaluations of these enhancements follow.

Enhancement 1. SLRA Section B.2.3.15 includes an enhancement to the “parameters monitored or inspected” program element that relates to revising fire damper inspection procedures to inspect for corrosion and cracking. The staff reviewed this enhancement against the corresponding program elements in the associated AMP and finds it acceptable because, when implemented, inspection procedures for fire damper assemblies will address aging effects consistent with GALL-SLR Report AMP XI.M26.

Enhancement 2. As supplemented by letter dated September 5, 2023 (ML23248A474), SLRA Section B.2.3.15 includes an enhancement to the “monitoring and trending” program element that relates to trending of inspection and periodic test results, evaluating the results against acceptance criteria to confirm the bases for sampling-based inspections, and assessing the need to conduct additional inspections if current or projected results do not meet acceptance criteria. The staff reviewed this enhancement against the corresponding program elements in the associated AMP and finds it acceptable because, when the enhancement is implemented, the program will be consistent with GALL-SLR Report AMP XI.M26.

Enhancement 3. As supplemented by letter dated September 5, 2023 (ML23248A474), SLRA Section B.2.3.15 includes an enhancement to the “acceptance criteria” program element. The enhancement relates to including additional indications of age-related degradation in the inspection procedure acceptance criteria for fire damper assemblies and fire barrier penetration seals and limiting the applicability of the crack width acceptance criterion to only thermal mastic materials in fire barrier penetration seals. The staff reviewed this enhancement against the corresponding program elements in the associated AMP and finds it acceptable because, when the enhancement is implemented, the program will be consistent with GALL-SLR Report AMP XI.M26 by ensuring timely identification of aging.

Enhancement 4. SLRA Section B.2.3.15 includes an enhancement to the “corrective actions” program element that relates to revising fire barrier penetration seal inspection procedures to expand the inspection scope if degradation is detected. The staff reviewed this enhancement against the corresponding program elements in the associated AMP and finds it acceptable because, when the enhancement is implemented, the program will be consistent with GALL-SLR Report AMP XI.M26 by ensuring that additional samples are inspected if degradation is identified.

The staff conducted an audit to verify the applicant’s claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, amendments, and the applicant’s responses to RAIs B.2.3.15-1 and B.2.3.15-2 and RCIs 3.5.2-A and 3.5.2-B, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M26, as modified by SLR-ISG-2021-02-MECHANICAL. In addition, the staff reviewed the enhancements associated with the “parameters monitored or inspected,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.15 summarizes OE related to the Fire Protection AMP. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent 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 Fire Protection AMP was evaluated.

USAR Supplement. SLRA Section A.2.2.15 provides the USAR supplement for the Fire Protection AMP. The staff reviewed the USAR supplement descriptions of the program and noted that they are consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that in SLRA Table A-3, the applicant committed to continuing the existing Fire Protection AMP including implementation of Enhancements 1 through 4, stated above, no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

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

3.0.3.2.13 Fire Water System

SLRA Section B.2.3.16 states that the Fire Water System program is an existing program with enhancements that, excluding one exception identified in the SLRA, will be consistent with the program elements in GALL-SLR Report AMP XI.M27, "Fire Water System." The applicant amended this SLRA section by letters dated June 26, 2023 (ML23177A218), and September 22, 2023 (ML23265A158).

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M27.

For the "detection of aging effects" program element, the staff had questions about the enhancement related to wet pipe sprinklers and issued RAI B.2.3.16-3. The staff's request and the applicant's response are documented in ML23265A158. The staff finds the applicant's response acceptable because consistent with footnote 7 to Table XI.M27-1 in GALL-SLR Report AMP XI.M27, the applicant revised the SLRA to state that the wet pipe sprinklers are not exposed to harsh environments.

The staff also reviewed the portions of the "detection of aging effects" program element associated with the exception and the portions of the "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements associated with the enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. Because the program's enhancements are not numbered, the enhancement numbering below reflects their order of appearance in the associated SLRA enhancement table. The staff's evaluations of the exception and the enhancements to the program follow.

Exception. As amended by letter dated June 26, 2023 (ML23177A218), Section B.2.3.16 includes an exception to the "detection of aging effects" program element related to main drain tests according to Section 13.2.5 of NFPA 25. The staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because main drain tests will be performed on 20 percent of the standpipes and risers each refueling cycle, which is sufficient to establish a trend if potential flow blockage is occurring. The

20 percent sample will be performed at different standpipes and risers each refueling cycle so that all standpipes and risers will be main-drain tested within a 10-year period. The staff also 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., GALL Report AMP XI.M38, “Internal Surfaces in Miscellaneous Piping and Ducting Components”).

Enhancement 1. SLRA Section B.2.3.16 includes an enhancement to the “parameters monitored or inspected” program element related to the visual inspection technique used to detect loss of material. The technique must be capable of detecting surface irregularities, and when surface irregularities are detected, follow-up volumetric wall thickness examinations must be performed. The staff reviewed this enhancement against the corresponding program elements in the associated AMP and finds it acceptable because, when implemented, it will address the visual inspection technique consistent with GALL-SLR Report AMP XI.M27.

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

Enhancement 3. SLRA Section B.2.3.16 includes an enhancement to the “detection of aging effects” program element. The enhancement relates to updating and developing procedures to incorporate surveillance requirements from the corresponding program element and Table XI.M27-1 of GALL-SLR Report AMP XI.M27, and testing or replacing fast-response and traditional sprinklers. SLRA Section B.2.3.16 also includes a table with additional detail on the required enhancements based on Table XI.M27-1 in GALL-SLR Report AMP XI.M27 (see RAI B.2.3.16-2, discussed below). The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when implemented, it will address testing and visual inspections, and testing and replacement of sprinklers consistent with GALL-SLR Report AMP XI.M27. (See Commitment 19.c.)

Enhancement 4. As amended by letter dated June 26, 2023 (ML23177A218), SLRA Section B.2.3.16 includes an enhancement to the “monitoring and trending” program element. The enhancement relates to monitoring and trending inspection results, evaluating results against acceptance criteria, projecting degradation, confirming the bases for sampling-based inspections, and evaluating degradation in the corrective action program. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report AMP XI.M27. (See Commitment 19.d.)

Enhancement 5. As amended by letter dated June 26, 2023 (ML23177A218), SLRA Section B.2.3.16 includes an enhancement to the “monitoring and trending” program element. The enhancement relates to documenting and trending deposits (i.e., scale and foreign material) of spray and sprinkler system flushes, acceptance criteria including no loose fouling products that could cause flow blockage in sprinklers and deluge nozzles, and entering negative trends (i.e., increasing deposits) 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 implemented, it will address spray and sprinkler system flushes consistent with GALL-SLR Report AMP XI.M27. (See Commitment 19.e.)

Enhancement 6. As amended by letter dated June 26, 2023 (ML23177A218), SLRA Section B.2.3.16 includes an enhancement to the “acceptance criteria” program element related to entering wall loss greater than the manufacturer’s tolerance and any negative trend for inspection or testing 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 implemented, it will be consistent with the recommendations in GALL-SLR AMP XI.M27 associated with maintaining the minimum wall thickness of fire water system components and the required system pressure and flow rates. (See Commitment 19.f.)

Enhancement 7. SLRA Section B.2.3.16 includes an enhancement to the “corrective actions” program element. The enhancement relates to removing obstructions and entering inspection results into the corrective action program, evaluating whether deposits should be removed to determine if loss of material has occurred, performing a flush consistent with Annex D.5 of NFPA 25 when loose fouling products that could cause sprinkler flow blockage are detected, and adjusting inspection frequencies if projected inspection results will not meet acceptance criteria prior to the next inspection. The staff reviewed this enhancement against the corresponding program elements in the associated AMP and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report AMP XI.M27.

Enhancement 8. SLRA Section B.2.3.16 includes an enhancement to the “corrective actions” program element related to updating flow testing and flushing procedures to include additional tests when acceptance criteria are not met. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because it will be consistent with the GALL-SLR Report AMP XI.M27 recommendations associated with (1) conducting additional tests if flow tests or main-drain tests do not meet acceptance criteria due to current or projected degradation, (2) performing no fewer than two additional tests for each test not meeting acceptance criteria, (3) completing additional inspections within the same interval as the original test, and (4) performing extent-of-condition and extent-of-cause analyses to determine the extent of further tests if subsequent tests do not meet acceptance criteria.

Enhancement 9. As amended by letter dated June 26, 2023 (ML23177A218), SLRA Section B.2.3.16 includes an enhancement to the “corrective actions” program element related to how recurring internal corrosion will be managed during the subsequent period of extended operation. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when the enhancement is implemented, recurring internal corrosion will be managed for the fire water system in a manner that will be consistent with the GALL-SLR Report AMP XI.M27 recommendations associated with (1) performing additional inspections at least every 24 months when the acceptance criteria are not met, until the rate of recurring internal corrosion occurrences no longer meets the criteria in the SRP-SLR, (2) periodically reviewing inspection locations to validate their relevance and usefulness and adjusting them as necessary, and (3) including corrosion rate determination, minimum allowable design wall thickness comparison, and reinspection interval determinations during inspection result evaluations.

The staff conducted an audit to verify the applicant’s claim of consistency with GALL-SLR Report AMP XI.M27. Based on a review of the SLRA, amendments, and the applicant’s responses to RAI B.2.3.16-3, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with GALL-SLR Report AMP XI.M27 are consistent with the corresponding program elements of AMP XI.M27. The staff also reviewed the exception associated with the "detection of aging effects" program element and its justification and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.16 summarizes OE related to the Fire Water System program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A241), 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 subsequent 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 Fire Water System program was evaluated.

USAR Supplement. As amended by letter dated June 26, 2023 (ML23177A218), Section A.2.2.16 of SLRA Appendix A provides the USAR supplement for the Fire Water System program. The staff reviewed the USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. However, the staff noted that the implementation schedule included in SLRA Appendix A, Table A-3, is inconsistent with the implementation schedule in GALL-SLR Report Table XI-01. In addition, the associated commitment to enhance the program by incorporating the surveillance requirements in AMP XI.M27, element 4, and Table XI.M27-1 lacked sufficient detail to ensure that the program changes would be consistent with the enhancement details in the SLRA. Based on the above, the staff issued RAIs B.2.3.16-1 and B.2.3.16-2. The staff's requests and the applicant's responses to these RAIs are documented in a letter dated September 22, 2023 (ML23265A158). The staff finds the applicant's responses to these RAIs acceptable because (1) the applicant clarified that the Fire Water System program implementation schedule, including enhancements, will begin within the 5-year period before the subsequent period of extended operation, and inspections or tests required to be completed before the subsequent period of extended operation will be completed 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation, and (2) the applicant revised Commitment 19 in SLRA Table A-3 to state that the program will be enhanced as stated in SLRA Section B.2.3.16, which provides sufficient details to ensure that the changes to the program will be consistent with the enhancements in the SLRA. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Fire Water System program, the staff concludes that those program elements for which the applicant claimed consistency with GALL-SLR Report AMP XI.M27 are consistent. The staff also reviewed the exception and enhancements and finds that, when the exception and the enhancements are implemented prior to the subsequent period of extended operation, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.14 Fuel Oil Chemistry

SLRA Section B2.3.18 states that the Fuel Oil Chemistry program is an existing program with an exception and enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.M30, “Fuel Oil Chemistry.”

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M30.

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

Exception 1. SLRA Section B.2.3.18 includes an exception to the “detection of aging effects” program element. The exception is related to the size and the design of the diesel fire pump day tank and emergency diesel generator base tanks, which make it difficult to perform the required draining, cleaning, internal inspections, or volumetric inspection of the bottom thickness of the day tanks. Accordingly, the applicant will take an exception to the cleaning and inspection requirements specified in element 4 of the GALL-SLR Report AMP, XI.M30. The staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP XI.M30 and finds it acceptable because as an alternative to the GALL-SLR Element 4 requirements, the applicant will drain and clean the diesel fire pump day tank and emergency diesel generator base tanks to the extent practical, visually inspect accessible locations of the day tank internals, and perform volumetric (ultrasonic testing) inspection of accessible portions of the day tank.

Enhancement 1. SLRA Section B2.3.18 includes an enhancement to the “preventive actions” program element, which relates to enhancing procedures to include periodic checks for and removal of water accumulation in the diesel fire pump day tank. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 2. SLRA Section B2.3.18 includes an enhancement to the “parameters monitored or inspected” and “monitoring and trending” program elements, which relates to enhancing procedures for including sampling of the day tanks and base tanks, in addition to the samples taken from the diesel oil storage tanks, subject to the same standards. The enhancement ensures that the sampling of all diesel oil storage tanks specifically monitors the following parameters for trending purposes: water, content, sediment, content, biological activity, and total particulate concentration. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 3. SLRA Section B2.3.18 includes an enhancement to the “monitoring and trending” program element. The enhancement relates to improving procedures such as those for visual and volumetric inspection, which encompasses identification of degradation projected until the next scheduled inspection, where practical. Also, this enhancement will evaluate the results against acceptance criteria to confirm that the timing of subsequent inspections will maintain the components’ intended functions throughout the subsequent period of extended operation based on the projected rate of degradation. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 4. SLRA Section B2.3.18 includes an enhancement to the “acceptance criteria” program element, which relates to creating and updating visual and volumetric inspection procedures. Corrective actions will be taken if; microbiological activity is detected; if any degradation of tank internal surfaces is reported and evaluated using the corrective action program; or if the thickness measurements of the diesel oil storage tank bottoms are evaluated against the design thickness and corrosion allowance. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 5. SLRA Section B2.3.18 includes an enhancement to the “corrective actions” program element, which updates implementing procedures to include the addition of biocide to the fuel oil when the presence of biological activity is confirmed, or if there is evidence of microbiologically induced corrosion. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

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

Operating Experience. SLRA Section B2.3.18 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 (ML23214A232), 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 subsequent period of extended operation.

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

USAR Supplement. SLRA Appendix A, Section A2.2.18, provides the USAR supplement for the Fuel Oil Chemistry program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing Fuel Oil Chemistry program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the USAR 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-SLR Report are consistent. The staff also reviewed the enhancements and exception and finds that, when the enhancements and exception are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.15 Reactor Vessel Material Surveillance

SLRA Section B.2.3.19 states that the Reactor Vessel Material Surveillance program is an existing program, with an enhancement that will be consistent with the program elements in GALL-SLR Report AMP XI.M31, "Reactor Vessel Material Surveillance." The applicant amended this SLRA section by letter dated June 26, 2023 (ML23177A218).

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M31. During its audit, the staff identified a discrepancy, which resulted in the applicant submitting Supplement 2 (ML23177A218), to provide additional detail on the applicant-identified enhancement, which the staff evaluated as discussed below.

The staff also reviewed the portions of the "scope of program," "parameters monitored or inspected," "detection of aging effects," and "monitoring and trending" program elements, as supplemented by letter dated June 26, 2023 (ML23177A218), associated with an enhancement to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of the enhancement follows.

Enhancement. SLRA Section B.2.3.19, as supplemented by letter dated June 26, 2023 (ML23177A218), includes an enhancement to the "scope of program," "parameters monitored or inspected," "detection of aging effects," and "monitoring and trending" program elements. The enhancement relates to the applicant's implementation of BWRVIP-321-A, "Boiling Water Reactor Vessel and Internals Project, Plan for Extension of the BWR Integrated Surveillance program (ISP) Through the Second License Renewal (SLR)," issued December 2018.

During its audit, the staff noted that the applicant's enhancement in SLRA Section B.2.3.19 was inconsistent with the enhancement in SLRA Section A.2.2.19 and Commitment 22 in SLRA Table A-3. Specifically, SLRA Section B.2.3.19 did not indicate that the SLRA AMP would be enhanced to implement subsequent NRC-approved revisions of BWRVIP-321-A. The staff noted that this enhancement ensures the applicant's implementation of NRC-approved BWRVIP-321-A and, if applicable, subsequent NRC-approved revisions of BWRVIP-321-A. The staff noted that a subsequent revision to BWRVIP-321-A was reviewed and approved by the staff following the submittal of the applicant's SLRA. Specifically, the applicant provided Revision 1-A, which also contains the staff's SE of the report, by letter dated May 23, 2023 (ML23143A347). The staff finds that this enhancement is appropriate to ensure that any subsequent revisions of BWRVIP-321-A that are reviewed and approved in accordance with Section III.C of Appendix H, "Reactor Vessel Material Surveillance Program Requirements," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," are addressed in a timely manner during the subsequent period of extended operation.

The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M31 and finds it acceptable because, when the enhancement is implemented, the applicant will participate in an NRC-approved integrated surveillance program. The surveillance program is an appropriate method for the applicant to maintain compliance with 10 CFR Part 50, Appendix H, to monitor changes in the fracture toughness properties of reactor pressure vessel materials due to irradiation and provide adequate information for required integrity evaluations of the reactor pressure vessel during the subsequent period of extended operation.

Based on a review of the SLRA and amendments, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M31. In addition, the staff reviewed the enhancement associated with the "scope of program," "parameters monitored or inspected," "detection of aging effects," and "monitoring and trending" program elements and finds that, when the enhancements are implemented, the AMP will be adequate to manage reduction of fracture toughness of reactor vessel beltline materials due to neutron irradiation embrittlement and monitor the reactor vessel operating condition during the subsequent period of extended operation.

Operating Experience. SLRA Section B.2.3.19 summarizes OE related to the Reactor Vessel Material Surveillance program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program beyond that incorporated during the development of and staff review of the SLRA.

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 Material Surveillance program was evaluated.

USAR Supplement. SLRA Section A.2.2.19 provides the USAR supplement for the Reactor Vessel Material Surveillance program.

The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff noted that the applicant committed (Commitment 22) to enhancing its existing Reactor Vessel Material Surveillance AMP to implement BWRVIP-321-A and subsequent NRC-approved revisions upon obtaining NRC approval for MNGP to use BWRVIP-321-A to maintain compliance with 10 CFR Part 50, Appendix H. This commitment, as described in SLRA Table A-3, will be implemented no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation.

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

Conclusion. Based on its review of the applicant's Reactor Vessel Material Surveillance program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancement and finds that, when the enhancement is implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 Selective Leaching

SLRA Section B.2.3.21 states that the Selective Leaching program is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.M33, "Selective Leaching." The applicant amended this SLRA section by letter dated June 26, 2023 (ML23177A218).

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M33.

For the "detection of aging effects" program element, the staff determined the need for additional information to demonstrate that the extent of inspections in GALL-SLR AMP XI.M33 (i.e., 3 percent with a maximum of 10 components) is appropriate for gray cast iron piping exposed to soil, resulting in the issuance of RAI B.2.3.21-1 (ML23248A474). During its review, the staff noted the following:

- GALL-SLR Report Table XI.M41-2, "Inspection of Buried and Underground Piping and Tanks," references American Water Works Association (AWWA) C105, "Polyethylene Encasement for Ductile-Iron Pipe Systems," Table A.1, "Soil-Test Evaluation," with respect to determining soil corrosivity.

- Gray cast iron and ductile iron exhibit similar corrosion rate behavior in a soil environment (i.e., the staff considers AWWA C105, Table A.1, applicable to gray cast iron, in addition to ductile iron).
- AWWA C105, Table A.1, uses the soil parameters of soil resistivity, pH, redox potential, sulfides, and moisture to determine the overall soil corrosivity index.
- AWWA C105, Table A.1, indicates that soil is considered corrosive when the soil corrosivity index is 10 points or greater.
- As confirmed by the applicant through RCI B.2.3.21-1 (ML23276B433), five soil corrosivity samples taken around the site in 2014 showed that (1) saturated soil resistivity ranged from 8,400 to 36,400 ohm-centimeters, (2) pH ranged from 7.5 to 8.1, (3) redox potential was either N/A or -34 millivolts, (4) sulfates ranged from 0.7 to 0.9 milligrams per kilogram, and (5) soil moisture ranged from 3.9 to 5.8 percent.

The response to RAI B.2.3.21-1 is acceptable for the following reasons: (1) the staff's review of OE during its audit did not identify instances of selective leaching in buried components, (2) excavation of a section of fire protection loop piping in 2017 found that external coatings were undamaged with no evidence of selective leaching, and (3) soil corrosivity testing conducted in 2014 demonstrated noncorrosive soil conditions per GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," guidance (i.e., the soil corrosivity index for all samples was less than 10 points per AWWA C105, Table A.1).

The staff also reviewed the portions of the "scope of program," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements associated with the enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these 12 enhancements follows.

Enhancement 1. SLRA Section B.2.3.21 includes an enhancement to the "scope of program" program element, which relates to updating procedures to include inspection of susceptible components exposed to treated water, closed-cycle cooling water, waste water, or soil. The staff reviewed this enhancement and finds it acceptable because, when the enhancement is implemented, the scope of program will be consistent with GALL-SLR Report AMP XI.M33 recommendations.

Enhancement 2. SLRA Section B.2.3.21 includes an enhancement to the "detection of aging effects" program element, which relates to updating procedures to perform one-time inspections of a representative sample of each population for components exposed to closed-cycle cooling water or treated water. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancements 3 and 4 are implemented, the "detection of aging effects" program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M33.

Enhancement 3. SLRA Section B.2.3.21 includes an enhancement to the "detection of aging effects" program element, which relates to updating procedures to perform periodic inspections for components exposed to raw water, waste water, or soil. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancements 2 and 4 are implemented, the "detection of aging effects" program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M33.

Enhancement 4. SLRA Section B.2.3.21 includes an enhancement to the “detection of aging effects” program element, which relates to updating procedures to include guidance on inspection parameters such as lighting, distance, offset, surface coverage, presence of protective coatings, and cleaning processes. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancements 2 and 3 are implemented, the “detection of aging effects” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M33.

Enhancement 5. SLRA Section B.2.3.21 includes an enhancement to the “monitoring and trending” program element, which relates to updating procedures to clarify that, where practical, identified degradation is projected until the next scheduled inspection. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancement 6 are implemented, the “monitoring and trending” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M33.

Enhancement 6. SLRA Section B.2.3.21 includes an enhancement to the “monitoring and trending” program element, which relates to updating procedures to clarify that inspection results are evaluated against acceptance criteria to confirm that the sampling bases will maintain the components’ intended functions throughout the subsequent period of extended operation based on the projected rate and extent of degradation. The staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancement 5 are implemented, the “monitoring and trending” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M33.

Enhancement 7. SLRA Section B.2.3.21 includes an enhancement to the “acceptance criteria” program element, which relates to updating procedures to include no noticeable change in color from the normal yellow color to the reddish copper color or green copper oxide as an acceptance criterion for copper-based alloys. The staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 8, 9, and 10 are implemented, the “acceptance criteria” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M33.

Enhancement 8. SLRA Section B.2.3.21 includes an enhancement to the “acceptance criteria” program element, which relates to updating procedures to include the absence of a surface layer that can be easily removed by chipping or scraping or identified in the destructive examinations as an acceptance criterion for gray cast iron and ductile iron. The staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 7, 9, and 10 are implemented, the “acceptance criteria” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M33.

Enhancement 9. SLRA Section B.2.3.21 includes an enhancement to the “acceptance criteria” program element, which relates to updating procedures to include the presence of no more than a superficial layer of dealloying as an acceptance criterion. The staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 7, 8, and 10 are implemented, the “acceptance criteria” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M33.

Enhancement 10. SLRA Section B.2.3.21 includes an enhancement to the “acceptance criteria” program element, which relates to updating procedures to include meeting system design requirements such as minimum wall thickness, when extended to the end of the subsequent period of extended operation, as an acceptance criterion. The staff reviewed this enhancement and finds it acceptable because when the subject enhancement and Enhancements 7, 8, and 9 are implemented, the “acceptance criteria” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M33.

Enhancement 11. SLRA Section B.2.3.21 includes an enhancement to the “corrective actions” program element. The enhancement relates to updating procedures to clarify that when acceptance criteria are not met such that it is determined that the affected component should be replaced prior to the end of the subsequent period of extended operation, additional inspections are performed if the cause of the aging effect for each applicable material and environment is not corrected by repair or replacement for all components constructed of the same material and exposed to the same environment. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancement 12 are implemented, the “corrective actions” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M33.

Enhancement 12. SLRA Section B.2.3.21 includes an enhancement to the “corrective actions” program element. The enhancement relates to updating procedures to require the removal of interferences to access or to remove components that have difficult-to-access surfaces and are most susceptible to selective leaching if unacceptable inspection findings occur within the same material and environment population. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancement 11 are implemented, the “corrective actions” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M33.

Based on a review of the SLRA and the applicant’s responses to RAI B.2.3.21-1 and RCI B.2.3.21-1, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M33. In addition, the staff reviewed the enhancements associated with the “scope of program,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.21 summarizes OE related to the Selective Leaching program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), the staff reviewed plant OE information provided by the applicant to (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (2) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the subsequent period of extended operation.

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

USAR Supplement. As amended by letter dated June 26, 2023, SLRA Section A.2.2.21 provides the USAR supplement for the Selective Leaching program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to implementing the Selective Leaching program enhancements no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff also noted that the applicant committed to performing the one-time inspections no earlier than 10 years prior to the subsequent period of extended operation and no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the USAR 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-SLR Report are consistent. The staff also reviewed the enhancements and finds that, with the enhancements implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 External Surfaces Monitoring of Mechanical Components

SLRA Section B.2.3.23 states that the External Surfaces Monitoring of Mechanical Components program is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components." The applicant amended this SLRA section by letter dated January 11, 2024 (ML24012A051).

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M36.

The staff also reviewed the portions of the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements associated with 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 17 enhancements follows.

Enhancement 1. SLRA Section B.2.3.23 includes an enhancement to the "scope of program" program element, which relates to revising procedures to inspect heat exchanger surfaces exposed to air for reduction of heat transfer due to fouling. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because, when the enhancement is implemented, the "scope of program" program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M36.

Enhancement 2. SLRA Section B.2.3.23 includes an enhancement to the "scope of program" program element, which relates to revising procedures to ensure the inspection of areas that are frequently wetted. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because, when the enhancement is implemented, the "scope of program" program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M36.

Enhancement 3. SLRA Section B.2.3.23 includes an enhancement to the "scope of program" program element. The enhancement relates to specifying in procedures that when the external surface condition is representative of the internal surface condition, external inspections of components may be credited for managing loss of material and cracking of internal surfaces for metallic and polymeric components and hardening or loss of strength of internal surfaces for elastomeric components. When credited, the program provides the basis to establish that the external and internal surface condition and environment are sufficiently similar. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because, when the enhancement is implemented, the "scope of program" program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M36.

Enhancement 4. SLRA Section B.2.3.23, as modified by letter dated January 11, 2024 (ML24012A051), includes an enhancement to the "scope of program" program element relating to the addition of the off-gas system in the system engineering walkdown inspection procedures. The staff reviewed this enhancement against the corresponding element in GALL-SLR Report AMP XI.M36 and finds it acceptable because aging of the components being managed by this program will now be included in existing system engineering walkdown procedures.

Enhancement 5. SLRA Section B.2.3.23 includes an enhancement to the "parameters monitored or inspected" program element. The enhancement relates to revising procedures to add corrosion stains on thermal insulation, blistering of protective coating, and accumulation of debris on both heat exchanger tube surfaces and air-side heat exchanger surfaces as inspection parameters for metallic components. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because, when the enhancement is implemented, the "parameters monitored or inspected" program element will be consistent with the corresponding program element in GALL Report AMP XI.M36.

Enhancement 6. SLRA Section B.2.3.23 includes an enhancement to the "parameters monitored or inspected" program element. The enhancement relates to revising procedures to include inspection for elastomeric and polymeric components and the methodology, which includes a combination of visual inspection and manual or physical manipulation of 100 percent of the accessible component surfaces of the material. The sample size for manipulation is at least 10 percent of available surface area. The inspection parameters for elastomers and polymers shall include surface cracking, crazing, scuffing, dimensional change, loss of thickness, exposure of internal reinforcement, and hardening. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because, when the enhancement is implemented, the "parameters monitored or inspected" program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M36.

Enhancement 7. SLRA Section B.2.3.23 includes an enhancement to the "detection of aging effects" program element. The enhancement relates to specifying in procedures that inspections are to be performed by personnel qualified in site procedures and programs for the specified task, and when required by the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), inspections are conducted in accordance with the applicable Code requirements. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because, when the enhancement is implemented, the “detection of aging effects” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M36.

Enhancement 8. SLRA Section B.2.3.23 includes an enhancement to the “detection of aging effects” program element related to revising procedures to ensure that non-ASME Code inspections and tests include inspection parameters for items such as lighting, distance offset, surface coverage, and presence of protective coatings. The enhancement includes opportunistic inspections of surfaces not readily visible during plant operations and refueling outages and at such intervals that ensure the components’ intended functions are maintained. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because, when the enhancement is implemented, the “detection of aging effects” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M36.

Enhancement 9. SLRA Section B.2.3.23 includes an enhancement to the “detection of aging effects” program element that relates to specifying in procedures that cracking inspections are either surface examinations conducted in accordance with plant-specific procedures or ASME Code Section XI Visual Examination (VT)-1 inspections (including inspections on non-ASME Code components). At least 20 percent of the surface area of the component is inspected, unless the component is measured in linear feet; in that case, any combination of 1-foot sections can be used to meet the 20 percent requirement. A maximum of 25 inspections is required in each population. Component inspections in a more severe environment may be credited as an inspection for the same specified environment, material, and aging effect in a less severe environment. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because, when the enhancement is implemented, the “detection of aging effects” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M36.

Enhancement 10. SLRA Section B.2.3.23 includes an enhancement to the “detection of aging effects” program element. The enhancement relates to specifying in procedures that alternative methods for detecting moisture inside piping insulation (such as thermography, neutron backscatter devices, and moisture meters) can be used for inspecting piping jacketing that is not installed in accordance with plant-specific procedures (such as no minimum overlap, wrong location of seams, etc.). The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because these alternate moisture detection methods are capable of detecting moisture inside piping insulation, which is consistent with the purpose of the “detection of aging effects” program element in GALL-SLR Report AMP XI.M36.

Enhancement 11. SLRA Section B.2.3.23 includes an enhancement to the “detection of aging effects” program element. The enhancement relates to specifying in procedures that insulated component surfaces that are exposed to condensation because the component is operated below the dewpoint and insulated outdoor components are periodically inspected every 10 years. These inspections are conducted for each material type and environment where condensation or moisture on the component surfaces could occur routinely or seasonally. At least 20 percent of the in-scope piping length, or 20 percent of the surface area, is inspected after the insulation is removed. Alternatively, any combination of a minimum of 25 1-foot axial length sections and components for each material type is inspected. Inspection locations should focus on the components most susceptible to aging because of time in service, severity of operating conditions, and lowest design margin. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because, when the enhancement is implemented, the “detection of aging effects” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M36.

<u>Enhancement 12</u>. SLRA Section B.2.3.23 includes an enhancement to the “detection of aging effects” program element that relates to specifying in procedures that visual inspections will use direct indicators of loss of material due to wear and indirect indicators of hardening or loss of strength for elastomers and flexible polymers. Visual inspections will cover 100 percent of accessible component surfaces. Manual manipulation can be used to augment visual inspection to confirm the absence of hardening or loss of strength for elastomers and flexible polymeric materials where appropriate, and the sample size for manipulation is at least 10 percent of available surface area. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because, when the enhancement is implemented, the “detection of aging effects” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M36.

<u>Enhancement 13</u>. SLRA Section B.2.3.23, as modified by letter dated January 11, 2024 (ML24012A051), includes an enhancement to the “detection of aging effects” program element relating to inspections of below-grade piping segments located in the seismic gap between the reactor and turbine buildings. This enhancement resulted from operating experience discussed in response to RAI B.2.3.27-3 (ML23265A158), which related to a leak in the control rod drive piping, and the inclusion of comparable below-grade, restricted access piping segments within the scope of the routine system engineering walkdowns. The staff finds this enhancement acceptable because inspecting a representative sample of piping in this unique external environment will provide reasonable assurance that the effects of aging in comparable piping segments will be identified prior to a loss of intended function.

<u>Enhancement 14</u>. SLRA Section B.2.3.23 includes an enhancement to the “monitoring and trending” program element that relates to revising procedures to formalize sampling-based inspections. The results of sampling-based inspections will be evaluated against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the intended functions of the components based on the projected rate and extent of degradation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because, when the enhancement is implemented, the “monitoring and trending” program element will be consistent with the corresponding program element in GALL_SLR Report AMP XI.M36.

<u>Enhancement 15</u>. SLRA Section B.2.3.23 includes an enhancement to the “acceptance criteria” program element that relates to revising procedures to add an evaluation to project the degree of observed degradation to the end of the subsequent period of operation or the next scheduled inspection, whichever is shorter. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because, when the enhancement is implemented, the “acceptance criteria” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M36.

<u>Enhancement 16</u>. SLRA Section B.2.3.23 includes an enhancement to the “acceptance criteria” program element that relates to specifying in procedures that, where practical, acceptance criteria are quantitative. For quantitative analyses, the required minimum wall thickness to meet applicable design standards will be used. Where qualitative acceptance criteria are used, the criteria are clear enough to reasonably ensure that a singular decision is derived based on the

observed condition of the SSCs. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because, when the enhancement is implemented, the “acceptance criteria” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M36.

Enhancement 17. SLRA Section B.2.3.23 includes an enhancement to the “corrective actions” program element that relates to specifying in procedures that if any projected inspection results will not meet acceptance criteria prior to the next scheduled inspection, inspection frequencies are adjusted as determined by the corrective action program. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because, when the enhancement is implemented, the “corrective actions” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M36.

Based on a review of the SLRA, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M36. In addition, the staff reviewed the enhancements associated with the “scope of program,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.23 summarizes OE related to the External Surfaces Monitoring of Mechanical Components program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent period of extended operation. Other than the enhancement associated with inspections of below-grade piping segments located in the seismic gap between the reactor and turbine buildings, discussed above, the staff did not identify any OE indicating that the applicant should modify its proposed program.

USAR Supplement. SLRA Section A.2.2.23 provides the USAR supplement for the External Surfaces Monitoring of Mechanical Components program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that (except for enhancement No. 13 discussed above) the applicant committed to implementing the enhancements to the External Surfaces Monitoring of Mechanical Components program by six months prior to the start of the subsequent period of extended operation (the SPEO starts September 8, 2030), or no later than the last refueling outage prior to the subsequent period of extended operation, for managing the effects of aging for applicable components. For enhancement No. 13, the applicant committed to perform the associated inspections no later than 2033. The staff finds that the information in the USAR 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-SLR Report are consistent. The staff also reviewed the enhancements and finds that, with implementation of the enhancements, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 Lubricating Oil Analysis

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

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M39.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. The staff also reviewed the portions of the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for consistency with the corresponding program elements of GALL-SLR Report AMP XI.M39.

The staff also reviewed the portions of the "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 this enhancement follows.

Enhancement 1. SLRA Section B.2.3.25 includes an enhancement to the "acceptance criteria" and "corrective actions" program elements that revises procedure(s), Preventive Maintenance, or both to clarify that phase-separated water in any amount is not acceptable for any component within the scope of the SLRA. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M39 and finds it acceptable because, when implemented, it will be consistent with the recommendations of the GALL-SLR Report.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the amended SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M39. In addition, the staff reviewed the enhancements associated with the "acceptance criteria" and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.25 summarizes OE related to the Lubricating Oil Analysis program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 Lubricating Oil Analysis program was evaluated.

USAR Supplement. SLRA Appendix A, Section A2.2.25, provides the USAR supplement for the Lubricating Oil Analysis program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI.M39. The staff also noted that the applicant committed to ongoing implementation of the existing Lubricating Oil Analysis program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the USAR 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-SLR Report are consistent. Also, the staff reviewed the enhancement and concluded that its implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.19 Buried and Underground Piping and Tanks

SLRA Section B.2.3.27 states that the Buried and Underground Piping and Tanks program is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," other than the exceptions identified in the SLRA. The applicant amended this SLRA section by letters dated June 26, 2023 (ML23177A218); July 18, 2023 (ML23199A154); September 5, 2023 (ML23248A474); September 22, 2023 (ML23265A158); and January 11, 2024 (ML24012A051).

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M41.

For the "detection of aging effects" program element, the staff issued two RAIs. The response to RAI B.2.3.27-1 (ML23248A474) is acceptable because consistent with recommendations outlined in GALL-SLR Report Table XI.M41-2, "Inspection of Buried and Underground Piping and Tanks," the applicant revised the SLRA to clarify that Preventive Action Category C will be used for buried steel piping unless a reevaluation of cathodic protection system performance determines that another Preventive Action Category is more applicable. In addition, the response to RAI B.2.3.27-2 (ML23248A474), is acceptable because based on plant-specific operating experience noted by the staff in RAI B.2.3.27-2, the applicant revised the SLRA (specifically Enhancement No. 10 below) to clarify that cathodic protection overprotection (i.e., polarized potentials more negative than -1,200 mV) history will be used as an input for determining piping inspection locations.

The staff also reviewed the portions of the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements associated with the exceptions and enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of the 2 exceptions and 22 enhancements follows.

Exception 1. As amended by letter dated June 26, 2023, SLRA Section B.2.3.27 includes an exception to the “preventive actions” program element related to existing backfill for buried components not being in accordance with GALL-SLR Report AMP XI.M41 recommendations. The staff reviewed this exception and finds it acceptable for the following reasons: (a) existing backfill was installed using design specifications that did not allow the use of materials containing brush, roots, peat, sod, or other organic, perishable or deleterious matter, snow, ice, or frozen soil, thereby minimizing the potential for coating damage or corrosion of buried piping due to non-conforming backfill; (b) the staff did not identify any instances of non-conforming backfill resulting in coating damage or corrosion of buried piping during its review of operating experience documentation provided by the applicant during its audit; and (c) as noted in Enhancement No. 1 below, new and replacement backfill quality will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Exception 2. As amended by letters dated September 22, 2023, and January 11, 2024, SLRA Section B.2.3.27 includes an exception to the “preventive actions” program element related to not providing external coatings for underground components. The staff’s evaluation with respect to not providing external coatings for underground components is documented in the *Operating Experience* discussion of this SE section (below).

Enhancement 1. SLRA Section B.2.3.27 includes an enhancement to the “preventive actions” program element which relates to revising procedures to state that new and replacement backfill shall meet the requirements of NACE SP0169-2007, “Control of External Corrosion on Underground or Submerged Metallic Piping Systems,” Section 5.2.3 or NACE RP0285-2002, “Corrosion Control of Underground Storage Tank Systems by Cathodic Protection,” Section 3.6. The staff reviewed this enhancement and finds it acceptable because when it is implemented new and replacement backfill quality will be consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 2. As amended by letter dated June 26, 2023, SLRA Section B.2.3.27 includes an enhancement to the “preventive actions” program element. The enhancement relates to refurbishing the cathodic protection system at least five years prior to the subsequent period of extended operation and including a limiting critical potential of -1,200 mV to prevent overprotection. The staff reviewed this enhancement and finds it acceptable because the timing for cathodic protection system refurbishment and the use of the cited limiting critical potential are consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 3. As amended by letter dated September 22, 2023, SLRA Section B.2.3.27 includes an enhancement to the “preventive actions” program element which relates specifying that new and replacement underground components shall meet the requirements of Table 1 of NACE SP0169-2007 or Section 3.4 of NACE RP0285-2002 for coatings. The staff reviewed this enhancement and finds it acceptable because providing coatings for underground components in accordance with these NACE standards is consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 4. SLRA Section B.2.3.27 includes an enhancement to the “parameters monitored or inspected” program element which relates to revising procedures to clarify when volumetric examinations should be performed and when pit depth gages or calipers may be used for measuring wall thickness. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 5 and 6 are implemented, the “parameters monitored or inspected” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 5. SLRA Section B.2.3.27 includes an enhancement to the “parameters monitored or inspected” program element which relates to revising procedures to perform visual inspection of external surfaces of controlled low strength material backfill, where such material is used, to detect potential cracks that could admit groundwater to the surface of the component. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 4 and 6 are implemented, the “parameters monitored or inspected” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 6. SLRA Section B.2.3.27 includes an enhancement to the “parameters monitored or inspected” program element which relates to revising procedures to clarify that inspections for cracking due to stress corrosion cracking for stainless steel and steel utilize a method that has been determined to be capable of detecting cracking. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 4 and 5 are implemented, the “parameters monitored or inspected” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 7. As amended by letter dated September 5, 2023, SLRA Section B.2.3.27 includes an enhancement to the “detection of aging effects” program element which relates to revising procedures to clarify that inspections will be conducted in accordance with GALL-SLR Report Table XI.M41-2, Preventive Action Category C for buried steel and stainless steel piping, unless a reevaluation of cathodic protection performance, future operating experience, or soil conditions determines that another Preventive Action Category is more applicable. During its review, the staff noted Preventive Action Category C is not applicable to stainless steel piping; however, SLRA Section B.2.3.27 specifies one inspection will be conducted for buried stainless steel piping in each 10-year inspection period, consistent will GALL-SLR Report AMP XI.M41 recommendations. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 8, 9, and 10 are implemented, the “detection of aging effects” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 8. SLRA Section B.2.3.27 includes an enhancement to the “detection of aging effects” program element which relates to revising procedures to clarify that visual inspections will be supplemented with surface and/or volumetric nondestructive testing if evidence of wall loss beyond minor surface scale is observed. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 7, 9, and 10 are implemented, the “detection of aging effects” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 9. As amended by letter dated July 18, 2023, SLRA Section B.2.3.27 includes an enhancement to the “detection of aging effects” program element which clarifies that if alternatives to visual inspections are performed, they will be performed in accordance with GALL-SLR Report AMP XI.M41, Subsection 4.e. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 7, 8, and 10 are implemented, the “detection of aging effects” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 10. As amended by letter dated September 5, 2023, SLRA Section B.2.3.27 includes an enhancement to the “detection of aging effects” program element which relates to revising procedures to clarify the guidance for selection of piping inspection locations. The applicant revised this enhancement based on plant-specific operating experience noted by the staff in RAI B.2.3.27-2 to clarify that cathodic protection overprotection history will be as an input for determining piping inspection locations. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 7, 8, and 9 are implemented, the “detection of aging effects” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 11. As amended by letter dated January 11, 2024, SLRA Section B.2.3.27 includes an enhancement to the “detection of aging effects” program element which relates to revising procedures to clarify that in-scope underground stainless steel piping located in the seismic gap space between the reactor and turbine buildings will have inspections performed on a sample of the piping in the most susceptible penetration to corrosion at least once every 6 years (or three refueling outage period). The staff’s evaluation with respect to the inspection frequency for underground stainless steel piping is documented in the *Operating Experience* discussion of this SE section (below).

Enhancement 12. SLRA Section B.2.3.27 includes an enhancement to the “monitoring and trending” program element which relates to revising procedures to specify that degradation (e.g., coating condition, wall thinning) is projected, where practical, until the next scheduled inspection. The staff reviewed this enhancement and finds it acceptable because when it is implemented, the “monitoring and trending” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 13. SLRA Section B.2.3.27 includes an enhancement to the “acceptance criteria” program element which relates to revising procedures to clarify that for coated piping or tanks, there is either no evidence of coating degradation, or the type and extent of coating degradation is evaluated as insignificant by a qualified individual. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 14, 15, 16, 17, 18, and 19 are implemented, the “acceptance criteria” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 14. SLRA Section B.2.3.27 includes an enhancement to the “acceptance criteria” program element which relates to revising procedures to specify that degradation is projected until the next scheduled inspection and that results are evaluated against acceptance criteria to confirm that the sampling bases will maintain the components’ intended functions throughout the subsequent period of extended operation based on the projected rate and extent of degradation. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 13, 15, 16, 17, 18, and 19 are implemented, the “acceptance criteria” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 15. SLRA Section B.2.3.27 includes an enhancement to the “acceptance criteria” program element which relates to revising procedures to specify that indications of cracking in metallic pipe are managed in accordance with the Corrective Action Program. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 13, 14, 16, 17, 18, and 19 are implemented, the “acceptance criteria” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 16. SLRA Section B.2.3.27 includes an enhancement to the “acceptance criteria” program element which relates to revising procedures to clarify that backfill is acceptable if the inspections do not reveal evidence that the backfill caused damage to the component’s coatings or the surface of the component (if not coated). The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 13, 14, 15, 17, 18, and 19 are implemented, the “acceptance criteria” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 17. SLRA Section B.2.3.27 includes an enhancement to the “acceptance criteria” program element which relates to revising procedures to specify that acceptance criteria for pressure tests are that there are no visible indications of leakage, and no drop in pressure within the isolated portion of the piping that is not accounted for by a temperature change in the test media or by quantified leakage across test boundary valves. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 13, 14, 15, 16, 18, and 19 are implemented, the “acceptance criteria” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 18. SLRA Section B.2.3.27 includes an enhancement to the “acceptance criteria” program element which relates to revising procedures to specify that cracks in cementitious backfill that could admit groundwater to the surface of the component are not acceptable. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 13, 14, 15, 16, 17, and 19 are implemented, the “acceptance criteria” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 19. As amended by letter dated June 26, 2023, SLRA Section B.2.3.27 includes an enhancement to the “acceptance criteria” program element. The enhancement relates to revising procedures to specify a cathodic protection acceptance criterion of -850 mV relative to a copper/copper sulfate reference electrode (instant-off), or acceptance criteria alternatives outlined in GALL-SLR Report AMP XI.M41. The staff reviewed this enhancement and finds it acceptable because the cathodic protection acceptance criteria referenced in this enhancement are consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 20. SLRA Section B.2.3.27 includes an enhancement to the “corrective actions” program element which relates to revising procedures to conduct an extent of condition evaluation when damage to a coating has been evaluated as significant (and the damage was caused by nonconforming backfill) to determine the extent of degraded backfill in the vicinity of the observed damage. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 21 and 22 are implemented, the “corrective actions” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 21. SLRA Section B.2.3.27 includes an enhancement to the "corrective actions" program element which relates to revising procedures to evaluate coated and uncoated metallic piping and tanks that show evidence of corrosion to ensure that the minimum wall thickness is maintained throughout the subsequent period of extended operation. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 20 and 22 are implemented, the "corrective actions" program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Enhancement 22. SLRA Section B.2.3.27 includes an enhancement to the "corrective actions" program element which relates to revising procedures to clarify (a) where coatings, backfill or the condition of exposed piping does not meet acceptance criteria, the degraded condition is repaired, or the affected component is replaced; and (b) an expansion of sample size is conducted 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 subsequent period of extended operation. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 20 and 21 are implemented, the "corrective actions" program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M41.

Based on a review of the SLRA and the applicant's responses to RAIs B.2.3.27-1 and B.2.3.27-2, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M41. The staff also reviewed the exceptions between the applicant's program and GALL-SLR Report AMP XI.M41 associated with the "preventive actions" 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 "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.27 summarizes operating experience related to the Buried and Underground Piping and Tanks program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ML23214A232), the staff reviewed plant operating experience information provided by the applicant to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent period of extended operation.

The staff identified operating experience related to an underground carbon steel control rod drive (CRD) system pipe between the reactor and turbine buildings for which it determined the need for additional information, which resulted in the issuance of RAIs and an additional audit (ML23332A165). The "operating experience" program element, as modified by responses to RAIs B.2.3.27-3 (ML23265A158) and B.2.3.27-3a (ML23313A158), and Supplement 8 (ML24012A051) is acceptable as follows. The applicant clarified that (a) failure of the underground carbon steel CRD system pipe, which was subsequently replaced with stainless steel, was due to general external surface corrosion; and (b) the penetration containing the underground CRD piping was modified to allow for periodic visual inspections on the external surfaces of the piping. Therefore, the staff finds that the Buried and Underground Piping and Tanks program is the appropriate AMP to manage this aging mechanism.

In addition, based on the applicant's extent of condition evaluation to identify other in-scope underground piping, the staff has reasonable assurance that the effects of aging for other in-scope underground piping (i.e., off-gas system piping and radwaste solid and liquid (RAD) system piping) will be adequately managed using the Buried and Underground Piping and Tanks program during the subsequent period of extended operation. Furthermore, as documented in RAIs B.2.3.27-3 and B.2.3.27-3a, the staff requested additional information with respect to why the inspection quantities and frequencies in GALL-SLR Report Table XI.M41-2 are appropriate for underground piping given the (a) subject plant-specific operating experience; (b) potential exposure of underground piping to elevated levels of chlorides from groundwater exposure; and (c) absence of external coatings for underground piping, which is associated with Exception No. 2 above (GALL-SLR Report AMP XI.M41 recommends external coatings for underground steel piping and stainless steel piping in chloride containing environments). The staff's disposition of this issue for underground stainless steel piping and underground steel piping is documented as follows:

<u>*Underground Stainless Steel Piping (CRD and RAD Systems)*</u>. In Supplement 8, the applicant committed to performing increased inspections beyond what is recommended in GALL-SLR Report AMP XI.M41 for underground stainless steel piping. The applicant committed to perform two inspections every 6 years (see Enhancement No. 11 above) in lieu of GALL-SLR Report Table XI.M41-2 guidance, which recommends one inspection every 10 years. The staff finds that performing two inspections every 6 years provides reasonable assurance that degradation on the external surfaces of the subject piping will be detected prior to a loss of intended function.

<u>*Underground Steel Piping (Off-Gas System)*</u>. In Supplement 8, the applicant clarified that inspections of underground steel piping will be conducted in accordance with GALL-SLR Report Table XI.M41-2. The staff finds the applicant's response acceptable for the following reasons: (a) the subject piping is only 1 foot below grade and resides in a vault that is only partially underground, minimizing the potential for exposure of the piping to groundwater; (b) the vault contains piping that operates at elevated temperatures, increasing the temperature in the vault and reducing the potential for condensation to develop on the external surfaces of the piping; (c) based on the location of the piping with respect to grade level and elevated temperatures in the vault, the staff noted that the subject piping is exposed to a less aggressive environment when compared to the underground environment described in GALL-SLR Report Table IX.D, "Use of Terms for Environments"; and (d) plant-specific operating experience has not identified instances of corrosion of the subject piping or evidence of groundwater intrusion into the vault.

Based on its audits, review of the application, review of the applicant's responses to RAIs B.2.3.27-3 and B.2.3.27-3a, and review of Supplement 8, the staff finds that other than the underground piping operating experience dispositioned above and plant-specific operating experience related to cathodic overprotection (dispositioned in the staff's evaluation of RAI B.2.3.27-2), the conditions and operating experience at the plant are bounded by those for which the Buried and Underground Piping and Tanks program was evaluated.

<u>USAR Supplement</u>. As amended by letters dated June 26, 2023, and January 11, 2024, SLRA Section A.2.2.27 provides the USAR supplement for the Buried and Underground Piping and Tanks program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The

staff also noted the applicant committed to implement the Buried and Underground Piping and Tanks program enhancements no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation for managing the effects of aging for applicable components. In addition, the staff also noted that the applicant committed to (a) start 10-year interval inspections no earlier than 10 years prior to the subsequent period of extended operation; (b) refurbish the cathodic protection system 5 years prior to the subsequent period of extended operation; and (c) start 6-year interval (or three refueling outage period) inspections for underground stainless steel piping no earlier than 6 years prior to the subsequent period of extended operation and no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the USAR 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-SLR Report are consistent. The staff also reviewed the exceptions and enhancements, and finds that with the exceptions and enhancements implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.20 ASME XI, Subsection IWE

SLRA Section B.2.3.29 states that the ASME Section XI, Subsection IWE AMP is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.S1, "ASME Section XI, Subsection IWE," other than the exceptions identified in the SLRA. The applicant amended this SLRA section in Supplement 2 by letter dated June 26, 2023 (ML23177A218).

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.S1.

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

Exceptions 1 and 2. SLRA Section B.2.3.29, as amended by Supplement 2, includes an exception related to each of the "parameters monitored or inspected" and "detection of aging effects" program elements. The exceptions involve not using supplemental surface examination methods to monitor for cracking for the drywell shell, non-high-temperature and non-piping Class MC drywell penetrations (temperature less than or equal to 140°F), and penetration sleeves subject to cyclic loading with no CLB fatigue analysis. As justification for the exception, SLRA Sections B.2.3.29 and 3.5.2.2.1.5, as amended by Supplement 2 and the response to RAI 3.5.2.2.1.5-1 (ML23227A175), state that the primary containment was designed as described in ASME Section III, Subsection B, 1965 Edition with 1965 Winter Addenda, and that no fatigue evaluation was required by this code year or the original construction specifications.

The SLRA further states, however, that for SLR, the applicant performed a fatigue waiver analysis demonstrating that the six criteria stipulated in Subsection NE-3222.4(d), “Vessels Not Requiring Analysis for Cyclic Operation,” of the ASME Code Section III, Division 1, 1974 Edition, are satisfied for the drywell shell and Class MC drywell penetrations (except high-temperature mechanical penetrations) and penetration sleeves. The six conditions evaluated fatigue cycles through the end of the subsequent period of extended operation due to the following: (1) atmospheric-to-operating pressure cycle, (2) normal operation pressure fluctuation, (3) temperature difference—startup and shutdown, (4) temperature difference—normal operation, (5) temperature difference—dissimilar materials, and (6) mechanical loads. SLRA Section 3.5.2.2.1.5, as amended by SLRA Supplement 2 and the response to RAI 3.5.2.2.1.5-1 (ML23227A175), documents the bounding number of cycles for 80 years used in the evaluation and demonstrates how the six conditions stipulated in NE-3222.4(d) of the ASME Code were satisfied.

Based on this code fatigue waiver assessment, the applicant concluded that the stated drywell components are, by design evaluation, subject to an acceptable amount of fatigue for the subsequent period of extended operation, and therefore no supplemental surface examinations need be performed to detect cracking due to cyclic loading. The applicant further noted that this exception does not address the high-temperature mechanical penetrations, subject to cyclic loading with no CLB fatigue analysis, and the accessible portions of the penetrations will be inspected for cracking.

The staff reviewed the exceptions, as modified by Supplement 2, against the corresponding program elements in GALL-SLR Report AMP XI.S1 and finds them acceptable as follows. As also discussed in SE Section 3.5.2.2.1.5, the applicant has demonstrated analytically, by evaluation satisfying the six fatigue waiver conditions stipulated in paragraph NE-3222.4(d), “Vessel Not Requiring Analysis for Cyclic Operation,” of the ASME Code, Section III, Division 1, 1974 Edition, that the stated drywell components (i.e., drywell shell, non-high-temperature and non-piping Class MC drywell penetrations, and penetration sleeves) are capable of withstanding the fatigue cycles expected through the end of the subsequent period of extended operation without any further fatigue evaluation for cyclic operation. Therefore, the aging effect does not require management; no supplemental surface examinations, recommended in GALL-SLR AMP XI.S1 for components without CLB fatigue analysis, are required for managing the aging effect of cracking due to cyclic loading for these components.

Enhancement 1. SLRA Section B.2.3.29 includes an enhancement to the “preventive actions” program element that relates to preventive actions for American Society for Testing and Materials (ASTM) A325 and ASTM A490 or equivalent structural bolting. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S1 and finds it acceptable because, when it is implemented, plant procedures will specify preventive actions for storage, lubricants, and SCC potential of ASTM A325 and ASTM A490 or equivalent twist-off structural bolting in accordance with Section 2 of the Research Council for Structural Connections publication, “Specification for Structural Joints Using ASTM A325 or A490 Bolts,” which is consistent with the recommendations in the GALL-SLR Report AMP.

Enhancement 2. SLRA Section B.2.3.29, as amended by Supplement 2, includes an enhancement to the “parameters monitored or inspected” program element related to revising procedures to specify that accessible noncoated surfaces (including those of the torus vent system) are monitored for arc strikes. The staff reviewed this enhancement, as modified by Supplement 2, against the corresponding program element in GALL-SLR Report AMP XI.S1 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation in the “parameters monitored or inspected” element to monitor noncoated surfaces for arc strikes.

Enhancement 3. SLRA Section B.2.3.29, as amended by Supplement 2, includes an enhancement to the “parameters monitored or inspected,” “detection of aging effects,” and “acceptance criteria” program elements. The exception relates to performing periodic supplemental surface examinations or enhanced visual examinations (EVT-1) at intervals no greater than 10 years to detect cracking due to cyclic loading for accessible portions of high-temperature (above 140°F) penetrations that have no CLB fatigue analysis and are not subject to local leak rate testing. The staff reviewed this enhancement, as modified by Supplement 2, against the corresponding program elements in GALL-SLR Report AMP XI.S1 and finds it acceptable because, when the enhancement is implemented, (1) the AMP will perform periodic supplemental surface examinations or EVT-1 examinations in addition to visual examinations, once in a 10-year interval, to detect cracking for high-temperature penetrations that have no CLB fatigue analysis and are not subject to Type B local leak rate testing capable of detecting cracking, (2) the inspection methods that will be used are consistent with the recommendations of the GALL-SLR Report to detect and manage cracking in pressure-retaining components subject to cyclic loading, (3) the frequency of examination of once in a 10-year interval is reasonable because there has been no identified plant-specific OE of cracking in these components, (4) the first of these periodic supplemental examinations will begin no earlier than 5 years prior to entering the subsequent period of extended operation, and (5) if cracking is detected, it will be corrected by repair or replacement or accepted by engineering evaluation consistent with the GALL-SLR recommendation.

Enhancements 4 and 6. SLRA Section B.2.3.29, as amended by Supplement 2, includes two enhancements to the “detection of aging effects” and “corrective action” program elements, respectively. The enhancements relate to conducting supplemental one-time surface examinations or enhanced visual examinations (e.g., EVT-1) to confirm the absence of cracking due to SCC in susceptible containment high-temperature (above 140°F) penetration components of stainless steel (SS) or dissimilar metal welds. This one-time inspection, performed by qualified personnel, will examine a representative sample of 5 of 24 (i.e., 20 percent sample size) of the high-temperature SS penetrations or EVT-1 associated with high-temperature (above 140°F) SS piping systems in frequent use. If cracking is detected from the supplemental one-time inspections, additional inspections will be conducted in accordance with the site’s corrective action process; this will include incrementing the sample by one additional penetration at a time (i.e., each time cracking is detected) from the uninspected population until cracking is no longer detected. Periodic inspection of these components for cracking will be added to the Subsection IWE AMP, if necessary, based on the inspection results.

The staff reviewed these enhancements, as modified by Supplement 2, against the corresponding program elements in GALL-SLR Report AMP XI.S1 and finds them acceptable because, when they are implemented, (1) a one-time supplemental examination, within the 5 years prior to the subsequent period of extended operation, will be conducted for a representative sample of SS or dissimilar metal welds of susceptible containment high-temperature penetrations to confirm the presence or absence of cracking due to SCC, (2) if cracking is detected, additional inspections will be performed as specified in the site’s corrective action process, (3) if absence of the aging effects cannot be confirmed based on evaluation of examination results, periodic supplemental examination will be added to the AMP, (4) the examination methods that will be used (surface or EVT-1 examination methods) for one-time (and periodic if necessary) inspection and sampling size for the one-time inspection are consistent with the recommendation in the GALL-SLR Report (AMP XI.M32) for detecting cracking due to SCC of pressure-retaining components, and (5) the one-time inspection approach is acceptable since thus far there is no plant-specific OE showing cracking in these components.

Enhancement 5. SLRA Section B.2.3.29, as amended by Supplement 2, includes an enhancement to the “detection of aging effects” program element. The enhancement relates to conducting a one-time volumetric examination of the primary containment metallic shell surfaces if triggered by plant-specific OE of corrosion initiated on the inaccessible side of the metallic shell. From a review of plant-specific OE and a related statement in the amended SLRA, the staff noted that the triggering OE has not occurred to date at MNGP. The staff reviewed this enhancement, as modified by Supplement 2, against the corresponding program element in GALL-SLR Report AMP XI.S1 and finds it acceptable because, when implemented, (1) it will include, consistent with the GALL-SLR recommendations, actions, sampling criteria (random and focused areas), and statistically based acceptance criteria consistent with GALL-SLR Report AMP XI.S1 recommendations to conduct a one-time supplemental volumetric examination of the containment metallic shell surfaces inaccessible from one side, if triggered by plant-specific OE showing corrosion initiated on the inaccessible side since the issuance of the first renewed license through the end of the subsequent period of extended operation, and (2) if the triggering OE occurs, the one-time volumetric examination will be conducted on a schedule established by the MNGP corrective action program in a manner that ensures that the intended function of the containment metallic shell is maintained.

Based on a review of the SLRA and its amendments, the staff finds that the “scope of program,” “preventive actions,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent, or with enhancements will be consistent, with the corresponding program elements of GALL-SLR Report AMP XI.S1. The staff also reviewed the exceptions between the applicant’s program and GALL-SLR Report XI.S1 associated with the “parameters monitored or inspected” and “detection of aging effects” program elements and their justifications and finds that the AMP, with the exceptions, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “acceptance criteria,” and “corrective actions” program elements and finds that, when implemented, the AMP will be adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.29, as amended by Supplement 2, summarizes OE related to the ASME Section XI, Subsection IWE AMP. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent 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 AMP was evaluated.

USAR Supplement. SLRA Section A.2.2.29, with SLRA Table A-3 (item 32), as amended by Supplement 2, provides the USAR supplement for the ASME Section XI, Subsection IWE AMP. The staff reviewed this USAR supplement description of the program and finds that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also notes that the applicant committed to ongoing implementation of the existing ASME Section XI, Subsection IWE AMP for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also notes that the applicant committed to implementing the enhancements no later than 6 months or the last refueling outage prior to the subsequent period of extended operation and to starting supplemental inspections no earlier than 5 years prior to the subsequent period of extended operation. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's ASME Section XI, Subsection IWE AMP, as amended by Supplement 2, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the exceptions and the enhancements and finds that, when the exceptions and the enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.21 ASME XI, Subsection IWF

SLRA Section B.2.3.30 states that the ASME Section XI, Subsection IWF AMP is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.S3, "ASME Section XI, Subsection IWF." The applicant amended this SLRA section in Supplement 2 by letter dated June 26, 2023 (ML23177A218) and Supplement 5 by letter dated August 28, 2023 (ML23240A695).

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.S3.

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

Enhancement 1. SLRA Section B.2.3.30, as amended by Supplement 2, includes an enhancement to the "scope of program" program element related to evaluating the acceptability of inaccessible areas of Class 1, 2, 3, and MC component supports based on conditions found in accessible areas. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, the program will evaluate the acceptability of inaccessible areas of component supports when conditions in accessible areas indicate the presence of, or result in, degradation to such inaccessible areas. This is consistent with the recommendation in the GALL-SLR Report AMP XI.S3 for aging management of inaccessible areas of component supports.

Enhancement 2. SLRA Section B.2.3.30 includes an enhancement to the “preventive actions” program element related to revising procedures to clarify that, in addition to molybdenum disulfide (MoS2), the use of other lubricants containing sulfur on structural bolting is prohibited. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, the enhancement would also prohibit the use of other lubricants containing sulfur in addition to MoS2 to ensure bolting integrity consistent with recommendations in GALL-SLR Report AMP XI.S3.

Enhancement 3. SLRA Section B.2.3.30 includes an enhancement to the “preventive actions” program element related to specifying actions in accordance with Section 2 of Research Council for Structural Connections specification for storage, lubricants, and SCC for ASTM A325, ASTM A490, and equivalent structural bolting. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report recommendations for ASTM A325, A490, and their respective twist-off bolting regarding preventive actions for storage, lubricants, and SCC in accordance with the recommended industry standard.

Enhancement 4. SLRA Section B.2.3.30 includes an enhancement to the “parameters monitored or inspected” program element related to monitoring elastomeric or polymeric vibration isolation elements for cracking, loss of material, and hardening. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will include cracking, loss of material, and hardening as parameters monitored for vibration isolation elements, which is consistent with the recommendation in GALL-SLR Report AMP XI.S3.

Enhancement 5. SLRA Section B.2.3.30, as amended by Supplement 2, includes an enhancement to the “parameters monitored or inspected” program element related to monitoring accessible sliding surfaces for accumulation of debris or dirt and excessive loss of material due to wear. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will include monitoring of applicable parameters for accessible sliding surfaces to ensure intended sliding function of the support, which is consistent with the recommendation in GALL-SLR Report AMP XI.S3.

Enhancement 6. SLRA Section B.2.3.30, as amended by Supplement 2, includes an enhancement to the “detection of aging effects” program element related to a one-time inspection of an additional 5 percent sample of the code sample populations for Class 1, 2, and 3 and Class MC component supports within 5 years prior to the subsequent period of extended operation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will provide inspections of an additional sample of susceptible component supports not previously inspected by the program to ensure that the routinely inspected sample is representative of the aging of the remaining population of supports, consistent with recommendations in GALL-SLR Report AMP XI.S3.

Enhancement 7. SLRA Section B.2.3.30, as amended by Supplement 2, includes an enhancement to the “detection of aging effects” program element related to including tactile inspection (feeling, prodding) of elastomeric or polymeric vibration isolation elements to detect hardening. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will include a tactile inspection method capable of detecting hardening for vibration isolation elements if the vibration isolation function is suspect, which is consistent with the recommendation in GALL-SLR Report AMP XI.S3.

Enhancement 8. SLRA Section B.2.3.30, as amended by Supplement 2, includes an enhancement to the “detection of aging effects” program element. The enhancement relates to performing volumetric examination comparable to Table IWB-2500-1 (Examination Category B-G-1) to detect cracking due to SCC in high-strength (HS) bolting greater than 1 inch in diameter in ASME Class 1, 2, 3, and MC component supports. The enhancement also states that the subject population of HS bolting (if used) will be identified, and a representative sample will be inspected by volumetric examination prior to entering the subsequent period of extended operation and on a 10-year interval during the subsequent period of extended operation. The sample will consist of 20 percent of the HS bolting population (for a material/environment combination), up to a maximum of 25 bolts. The staff noted from SLRA Table 3.5-1, item 3.5.1-068, as modified by Supplement 2, that as of the time of SLRA submittal, there was no HS steel structural bolting used in MNGP component supports; however, HS bolting may be used in the future. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will ensure that, if used, a representative sample of susceptible HS bolting (actual measured yield strength greater than or equal to 150 ksi) from the identified population is volumetrically examined for cracking due to SCC prior to entering the subsequent period of extended operation and once in every 10-year interval during the subsequent period of extended operation. The volumetric examination method and sample size are consistent with GALL Report recommendations in AMPs XI.S3 and XI.M18 and provide reasonable assurance that SCC is not occurring for the entire population of susceptible HS bolts, if used, during the subsequent period of extended operation.

Enhancement 9. SLRA Section B.2.3.30, as amended by Supplement 2, includes an enhancement to the “monitoring and trending” program element related to increasing or modifying the component support ISI sample, when a component support within the inspection sample is repaired to as-new condition. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will ensure that the program inspects a sample that is representative of the aging effects of the remaining population of component supports, consistent with recommendations in GALL-SLR Report AMP XI.S3.

Enhancement 10. SLRA Section B.2.3.30 includes an enhancement to the “acceptance criteria” program element related to specifying additional other unacceptable conditions (i.e., loss of material due to corrosion or wear; debris, dirt, or excessive wear of sliding surfaces; cracked or sheared bolts and anchors; loss of material; cracking and hardening of elastomeric or polymeric vibration isolation elements that could affect vibration isolation; and cracks). The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when implemented, it will include other unacceptable conditions in addition to those specified in Subsection IWF of the ASME Code Section XI, consistent with recommendations in GALL-SLR Report AMP XI.S3.

Enhancement 11. SLRA Section B.2.3.30, as amended by Supplement 5, includes an enhancement to the “scope of program” and “parameters monitored or inspected” program elements related to revising procedures to include monitoring for irradiation embrittlement during existing IWF inspections of the reactor vessel support steel. The staff reviewed this enhancement and finds it acceptable because, when implemented, the program will be adequate to manage irradiation aging effects by (1) explicitly including loss of fracture toughness (cracking) as an aging effect managed within the program scope and (2) incorporating into implementing procedures the use of existing IWF VT-3 visual examinations of the reactor vessel support steel to confirm the absence of or monitor for visual symptoms (cracking) of loss of fracture toughness due to irradiation embrittlement for which the ASME Section XI, Subsection IWF program is credited in SLRA Section 3.5.2.2.2.6, as amended by Supplement 5.

Based on a review of the SLRA and its amendments, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are, or with enhancements will be, consistent with the corresponding program elements of GALL-SLR Report AMP XI.S3. In addition, the staff reviewed the enhancements associated with the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements and finds that, when implemented, the AMP will be adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.30 summarizes OE related to the ASME Section XI, Subsection IWF AMP. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 AMP to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program beyond that incorporated during the development of the SLRA.

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

USAR Supplement. SLRA Section A.2.2.30, as amended by Supplement 2, provides the USAR supplement for the ASME Section XI, Subsection IWF AMP. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing ASME Section XI, Subsection IWF AMP for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implementing the enhancements no later than 6 months or the last refueling outage prior to the subsequent period of extended operation and starting one-time inspections no earlier than 5 years prior to the subsequent period of extended operation. The staff finds that the information in the USAR supplement, as amended by Supplement 2, dated June 26, 2023, is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's ASME Section XI, Subsection IWF AMP, as amended, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when the enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP, as amended, 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 Masonry Walls

SLRA Section B.2.3.32 states that the Masonry Walls program is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.S5, “Masonry Walls.” The applicant amended this SLRA section in Supplement 2, dated June 26, 2023 (ML23177A218).

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.S5.

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

Enhancement 1. SLRA Section B.2.3.32, as amended by Supplement 2, includes an enhancement to the “scope of program” program element related to inspecting for masonry walls in the radwaste building. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S5 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to include in the scope all masonry walls identified as performing their intended functions in accordance with 10 CFR 54.4, “Scope.”

Enhancement 2. SLRA Section B.2.3.32 includes an enhancement to the “parameters monitored or inspected” program element related to monitoring and inspecting for gaps between the supports and masonry walls. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S5 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to monitor and inspect for gaps between the supports and masonry walls that could potentially impact the intended function or potentially invalidate its evaluation basis.

Enhancement 3. SLRA Section B.2.3.32 includes an enhancement to the “detection of aging effects” program element related to updating procedures for more frequent inspections in areas where significant loss of material, cracking, or other signs of degradation are projected or observed. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S5 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to ensure more frequent inspections in areas where significant signs of degradation are projected or observed to provide reasonable assurance that there is no loss of intended function between inspections.

Enhancement 4. SLRA Section B.2.3.32 includes an enhancement to the “monitoring and trending” program element related to including trending of widths and lengths of cracks and of gaps between supports and masonry walls. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S5 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to ensure that observed crack widths and lengths, and gaps between supports and masonry walls, that approach or exceed acceptance criteria are measured and assessed for trends, and the intended functions are maintained throughout the subsequent period of extended operation.

Enhancement 5. SLRA Section B.2.3.32 includes an enhancement to the “monitoring and trending” program element related to including projected degradation until the next scheduled inspection, when practical. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S5 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to ensure that identified degradation is projected until the next scheduled inspection, when practical, and results are evaluated against acceptance criteria to confirm that the timing of subsequent inspections will maintain the components’ intended functions throughout the subsequent period of extended operation based on the projected rate of degradation.

Enhancement 6. SLRA Section B.2.3.32, as amended by Supplement 2, includes an enhancement to the “monitoring and trending” program element related to including the comparison of inspection results with previous inspections to identify changes or trends in the condition of masonry walls. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S5 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to ensure that inspection results are compared to previous inspections to identify changes or trends and that degradation detected from monitoring is evaluated to ensure that the intended function of masonry wall is maintained.

Enhancement 7. SLRA Section B.2.3.32 includes an enhancement to the “acceptance criteria” program element related to ensuring that observed aging effects do not invalidate the evaluation basis of the wall or impact its intended function. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S5 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to ensure that observed degradation will be assessed to confirm that the degradation has not invalidated the original evaluation assumptions or impacted the capability to perform the intended functions.

Enhancement 8. SLRA Section B.2.3.32 includes an enhancement to the “corrective actions” program element related to ensuring that inspection frequencies are adjusted if any projected inspection results will not meet acceptance criteria prior to the next scheduled inspection. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S5 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to ensure that inspection frequencies will be adjusted as determined by the MNGP corrective action program if any projected inspection results will not meet the acceptance criteria prior to the next scheduled inspection. This provides reasonable assurance that there is no loss of intended function between inspections.

Enhancement 9. SLRA Section B.2.3.32, as amended by Supplement 2, includes an enhancement to the “corrective actions” program element related to including a corrective action option to develop a new analysis or evaluation basis for the degraded condition of the wall. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S5 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to ensure that a new analysis or evaluation basis that accounts for the degraded condition of the wall (i.e., acceptance by further evaluation) will be developed as a corrective action option to confirm that the degraded condition has not invalidated its evaluation basis of the wall or impacted its intended function.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA and amendments, the staff finds that the "scope of program," "preventive actions," "detection of aging effects," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.X5. In addition, the staff reviewed the enhancements associated with the "parameters monitored or inspected," "monitoring and trending," and "acceptance criteria" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.32 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 (ML23214A232), the staff reviewed the applicant's results from 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 subsequent 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.

USAR Supplement. SLRA Section 19.2.2.32 provides the USAR supplement for the Masonry Walls program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff noted that the applicant committed to ongoing implementation of the existing Masonry Walls program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implementing the enhancements by no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Masonry Walls program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when the enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 Structures Monitoring

SLRA Section B.2.3.33 states that the Structures Monitoring program is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.S6, “Structures Monitoring,” other than the exception identified in the SLRA. The applicant amended this SLRA section by letters dated June 26, 2023, August 28, 2023, and January 11, 2024.

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA AMP to the corresponding program elements of GALL-SLR 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,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements associated with the exception and enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of one exception and 14 enhancements follows.

Exception 1. During its review of SLRA Section B.2.3.33, the staff identified a difference in the “detection of aging effects” program element. In this difference, the staff noted that the inspection intervals for those normally inaccessible areas may exceed 5 years. During its audit (ML23214A232), the staff confirmed that these normally inaccessible areas are high-radiation areas such as the primary containment, condenser room steam chase, and air ejector room, and they are inspected at an interval of 6 years during refueling outages. The applicant claimed that the inspection intervals are consistent with GALL-SLR Report AMP XI.S6. The staff reviewed this difference, as modified by SLRA Supplement 2 (ML23177A218), against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because the AMP, with the exception, is adequate to manage the applicable aging effects of those normally inaccessible areas.

Enhancement 1. SLRA Section B.2.3.33 includes an enhancement to the “scope of program” program element related to revising the implementing procedure to explicitly include inspection of the components and commodities listed in SLRA Section B.2.3.33. The staff reviewed this enhancement, as modified by SLRA Supplement 2 (ML23177A218) and SLRA Supplement 5 (ML23240A695), against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when implemented, it will expand the scope of the program to include these additional components and commodities determined to be in scope for SLR.

Enhancement 2. SLRA Section B.2.3.33 includes an enhancement to the “scope of program” and “parameters monitored or inspected” program elements. The enhancement relates to revising implementing procedures to include monitoring for irradiation embrittlement during existing structures monitoring inspections of the biological shield wall structural steel. The staff reviewed this enhancement, as modified by SLRA Supplement 5 (ML23240A695), and finds it acceptable because, when the enhancement is implemented, the program will be adequate to manage irradiation aging effects of the biological shield wall structural steel by (1) including loss of fracture toughness as an aging effect managed within the scope of the program and (2) incorporating into implementing procedures the use of existing periodic visual examinations of the structural steel components of the biological shield wall to monitor for visual symptoms (e.g., cracking) of loss of fracture toughness due to irradiation embrittlement for which the Structures Monitoring program is credited in SLRA Section 3.5.2.2.2.6, as amended by Supplement 5.

Enhancement 3. SLRA Section B.2.3.33 includes an enhancement to the “preventive actions” program element related to revising the implementing procedure for proper selection of bolting and lubricants and appropriate installation torque or tension to prevent or minimize loss of bolting preload and cracking of HS bolting, for storage, lubricant selection, and bolting and coating material selection discussed in Section 2 of the Research Council for Structural Connections publication, “Specification for Structural Joints Using High-Strength Bolts,” for structural bolting consisting of ASTM A325, ASTM A490, ASTM F1852, or ASTM F2280 bolts. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to ensure that preventive actions are in accordance with applicable industry guidelines and to ensure that structural bolting integrity is maintained.

Enhancement 4. SLRA Section B.2.3.33 includes an enhancement to the “parameters monitored or inspected” program element related to revising the implementing procedure to include monitoring and trending of leakage volumes and chemistry for signs of concrete or steel reinforcement degradation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to monitor and trend leakage volumes and chemistry for signs of concrete or steel reinforcement degradation if active through-wall leakage or ground water infiltration is identified.

Enhancement 5. SLRA Section B.2.3.33 includes an enhancement to the “detection of aging effects” program element related to revising the implementing procedure to include provisions for more frequent inspections. The staff reviewed this enhancement, as modified by SLRA Supplement 2 (ML23177A218), against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to include provisions for more frequent inspections in areas where significant signs of degradation are projected or observed to provide reasonable assurance that there is no loss of intended function between inspections.

Enhancement 6. SLRA Section B.2.3.33 includes an enhancement to the “detection of aging effects” program element. The enhancement relates to revising the implementing procedure to include engineering evaluation, more frequent inspections, or destructive testing of affected concrete if evidence of water in-leakage is identified. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to include engineering evaluation, more frequent inspections, or destructive testing of affected concrete if evidence of water in-leakage is identified, and the program may include analysis of the leakage pH, along with mineral, chloride, sulfate, and iron content in the water when leakage volumes allow.

Enhancement 7. SLRA Section B.2.3.33 includes an enhancement to the “detection of aging effects” program element related to revising the implementing procedure to include tactile inspection in addition to visual inspection of elastomeric elements to detect hardening. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the

GALL-SLR Report recommendations to conduct visual inspection of elastomeric elements and tactile inspection to detect hardening if the intended function is suspect.

Enhancement 8. SLRA Section B.2.3.33 includes an enhancement to the “detection of aging effects” program element related to revising the implementing procedure to include qualification requirements for both inspection and evaluation personnel that are in accordance with American Concrete Institute (ACI) 349.3R “Evaluation of Existing Nuclear Safety-Related Concrete Structures.” The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to ensure that qualifications of inspection and evaluation personnel meet current ACI 349.3R code requirements.

Enhancement 9. SLRA Section B.2.3.33 includes an enhancement to the “detection of aging effects” program element. The enhancement relates to revising the implementing procedure to manage the aging effect of an increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible concrete areas. The staff reviewed this enhancement, as modified by SLRA Supplement 2 (ML23177A218), against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to ensure that the program can adequately manage this aging effect in the inaccessible concrete areas during the subsequent period of extended operation.

Enhancement 10. SLRA Section B.2.3.33 includes an enhancement to the “monitoring and trending” program element related to revising the implementing procedure to include trending of quantitative measurements and qualitative information for findings exceeding the acceptance criteria. The staff reviewed this enhancement, as modified by SLRA Supplement 2 (ML23177A218), against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to ensure that quantitative measurements and qualitative information are recorded and trended for findings that exceed the acceptance criteria for all applicable parameters monitored or trended.

Enhancement 11. SLRA Section B.2.3.33 includes an enhancement to the “acceptance criteria” program element related to revising the implementing procedure to include acceptance criteria for concrete surfaces based on the “second-tier” evaluation criteria in ACI 349.3R. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to ensure that acceptance criteria for concrete surfaces are based on the “second-tier” evaluation criteria in ACI 349.3R.

Enhancement 12. SLRA Section B.2.3.33 includes an enhancement to the “acceptance criteria” program element related to revising the implementing procedure to include enhanced acceptance criteria for detection of alkali-silica reactions in concrete. The staff reviewed this enhancement, as modified by SLRA Supplement 2 (ML23177A218), against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to detect visual indications of aggregate reactions and to ensure that the intended function of the concrete structure will be maintained during the subsequent period of extended operation.

Enhancement 13. SLRA Section B.2.3.33 includes an enhancement to the “acceptance criteria” program element related to revising the implementing procedure to include acceptance criteria for inspections of the components and commodities listed in SLRA Section B.2.3.33. The staff reviewed this enhancement, as modified by SLRA Supplement 2 (ML23177A218), against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when implemented, it will include acceptance criteria for inspections of these additional components and commodities determined to be in the scope of SLR.

<u>*Enhancement 14*</u>. SLRA Section B.2.3.33 includes an enhancement to the “corrective actions” program element related to revising the implementing procedure to adjust inspection frequencies as determined by the MNGP corrective action program. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to ensure that inspection frequencies are adjusted as determined by the MNGP corrective action program if any projected inspection results will not meet acceptance criteria prior to the next scheduled inspection.

<u>*Enhancement 15*</u>. SLRA Section B.2.3.33 includes enhancements to the “scope of program,” “parameters monitored or inspected,” and “acceptance criteria” program elements which relate to revising implementing procedures to include monitoring for irradiation embrittlement during existing structures monitoring inspections of the biological shield wall structural steel. The staff reviewed the enhancements, as modified by SLRA Supplement 5 (ML23240A695) and SLRA Supplement 8 (ML24012A051), against the corresponding program elements in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented the program will be adequate to manage irradiation aging effects of the biological shield wall structural steel by (1) including loss of fracture toughness (cracking) as an aging effect managed within the scope of the program and (2) incorporating into implementing procedures the use of existing periodic visual examinations of the biological shield wall structural steel components and corresponding acceptance criteria to monitor for cracking as a visual symptom of loss of fracture toughness due to irradiation embrittlement for which the Structures Monitoring program is credited in SLRA Section3.5.2.2.2.6, as modified by SLRA Supplements 5 and 8.

Based on a review of the SLRA, SLRA Supplement 2 (ML23177A218), SLRA Supplement 5 (ML23240A695), and SLRA Supplement 8 (ML24012A051) the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.S6 with the exception of staff-identified differences between the applicant’s program and GALL-SLR Report AMP XI.S6. The staff also reviewed the exception associated with the “detection of aging effects” program element and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements and finds that, when implemented, the enhancements will make the AMP adequate to manage the applicable aging effects.

<u>Operating Experience</u>. SLRA Section B.2.3.33, as modified by SLRA Supplement 2 (ML23177A218), summarizes OE related to the Structures Monitoring program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), the staff reviewed the plant OE search results to (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (2) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to

manage the effects of aging in the subsequent 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 Structures Monitoring program was evaluated.

USAR Supplement. SLRA Appendix A, Section A.2.2.33, provides the USAR supplement for the Structures Monitoring program. The staff reviewed this USAR supplement description of the program, as modified by SLRA Supplement 2 (ML23177A218) and SLRA Supplement 5 (ML23240A695), and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff noted that the applicant committed to ongoing implementation of the existing Structures Monitoring program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implementing AMP enhancements for SLR no later than 6 months prior to the subsequent period of extended operation or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the USAR supplement, as amended, is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Structures Monitoring program, as amended, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent, with the exception of the staff-identified difference (Exception 1) between the applicant's program and GALL-SLR Report AMP XI.S6. The staff also reviewed the exception and the enhancements and finds that, when the exception and the enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 Inspection of Water-Control Structures Associated with Nuclear Power Plants

SLRA Section B.2.3.34 states that the Inspection of Water-Control Structures Associated with Nuclear Power Plants program is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants." The applicant amended this SLRA section by letter dated June 26, 2023.

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA AMP to the corresponding program elements of GALL-SLR Report AMP XI.S7.

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

Enhancement 1. SLRA Section B.2.3.34 includes an enhancement to the "preventive actions" program element. The enhancement relates to revising the implementing procedure for proper selection of bolting and lubricants and appropriate installation torque or tension to prevent or minimize loss of bolting preload and cracking of HS bolting. It also addresses storage, lubricant selection, and bolting and coating material selection discussed in Section 2 of the Research Council for Structural Connections publication, "Specification for Structural Joints Using High-Strength Bolts," for structural bolting consisting of ASTM A325, ASTM A490, ASTM F1852, or ASTM F2280 bolts. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to ensure that preventive actions are in accordance with applicable industry guidelines and to ensure that structural bolting integrity is maintained.

Enhancement 2. SLRA Section B.2.3.34 includes an enhancement to the "parameters monitored or inspected" program element related to revising the implementing procedure to include monitoring and trending of leakage volumes and chemistry for signs of concrete or steel reinforcement degradation. The staff reviewed this enhancement, as modified by SLRA Supplement 2 (ML23177A218), against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to monitor and trend leakage volumes and chemistry for signs of concrete or steel reinforcement degradation if active through-wall leakage or ground water infiltration is identified.

Enhancement 3. SLRA Section B.2.3.34 includes an enhancement to the "parameters monitored or inspected" program element related to revising the implementing procedure to include provisions for more frequent inspections. The staff reviewed this enhancement, as modified by SLRA Supplement 2 (ML23177A218), against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to include provisions for more frequency inspections in areas where significant signs of degradation are projected or observed to provide reasonable assurance that there is no loss of intended function between inspections.

Enhancement 4. SLRA Section B.2.3.34 includes an enhancement to the "detection of aging effects" program element related to revising implementing procedures to include engineering evaluation, more frequent inspections, or destructive testing of affected concrete if evidence of water in-leakage is identified. The staff reviewed this enhancement, as modified by SLRA Supplement 2 (ML23177A218), against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to include engineering evaluation, more frequent inspections, or destructive testing of affected concrete if evidence of water in-leakage is identified, and the program may include analysis of the leakage pH, along with mineral, chloride, sulfate, and iron content in the water when leakage volumes allow.

Enhancement 5. SLRA Section B.2.3.34 includes an enhancement to the "detection of aging effects" program element related to enhancing the implementing procedure to perform visual inspections of inaccessible concrete for evidence of leaching of calcium hydroxide. The staff reviewed this enhancement, as modified by SLRA Supplement 2 (ML23177A218), against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to monitor the evidence of leaching of calcium hydroxide in inaccessible concrete if the area becomes accessible or if inspections in an accessible area identify a condition that would be a leading indicator for the inaccessible area.

Enhancement 6. SLRA Section B.2.3.34 includes an enhancement to the “detection of aging effects” program element related to enhancing the implementing procedure to include qualification requirements for both inspection and evaluation personnel. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to ensure that qualification requirements for both inspection and evaluation personnel are in accordance with ACI 349.3R.

Enhancement 7. SLRA Section B.2.3.34 includes an enhancement to the “monitoring of trending” program element related to enhancing the implementing procedure to include trending of quantitative measurements and qualitative information for findings exceeding the acceptance criteria. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to include trending of quantitative measurements and qualitative information for findings that exceed the acceptance criteria for all applicable parameters monitored or trended.

Enhancement 8. SLRA Section B.2.3.34 includes an enhancement to the “acceptance criteria” program element related to revising the implementing procedure to include acceptance criteria for concrete surfaces based on the “second-tier” evaluation criteria. The staff reviewed this enhancement, as modified by SLRA Supplement 2 (ML23177A218), against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to include acceptance criteria for concrete surfaces based on the “second-tier” evaluation criteria in ACI 349.3R-02.

Enhancement 9. SLRA Section B.2.3.34 includes an enhancement to the “corrective actions” program element related to revising the implementing procedure to adjust inspection frequencies as determined by the MNGP corrective action program. The staff reviewed this enhancement, as modified by SLRA Supplement 2 (ML23177A218), against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendations to ensure that inspection frequencies are adjusted as determined by the MNGP corrective action program if any projected inspection results will not meet acceptance criteria prior to the next scheduled inspection.

Based on a review of the SLRA and SLRA Supplement 2 (ML23177A218), the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.S7. In addition, the staff reviewed the enhancements associated with the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.34 summarizes OE related to the Inspection of Water-Control Structures Associated with Nuclear Power Plants program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), the staff reviewed the plant OE search results to (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and

(2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent 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 Water-Control Structures Associated with Nuclear Power Structures program was evaluated.

<u>USAR Supplement</u>. SLRA Appendix A, Section A.2.2.34, provides the USAR supplement for the Inspection of Water-Control Structures Associated with Nuclear Power Plants program. The staff reviewed this USAR supplement description of the program, as modified by SLRA Supplement 2 (ML23177A218), and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff noted that the applicant committed to ongoing implementation of the existing Inspection of Water-Control Structures Associated with Nuclear Power Plants program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implementing AMP enhancements for SLR no later than 6 months prior to the subsequent period of extended operation or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

<u>Conclusion</u>. Based on its review of the applicant's Inspection of Water-Control Structures Associated with Nuclear Power Plants program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when the enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.25 Protective Coating Monitoring and Maintenance

SLRA Section B2.3.35 states that the Protective Coating Monitoring and Maintenance program is an existing program that, with enhancements, will be consistent with GALL-SLR Report AMP XI.S8, "Protective Coating Monitoring and Maintenance," as modified by SLR-ISG-2021-03-STRUCTURES (ML20181A381).

<u>Staff Evaluation</u>. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.S8, as modified by SLR-ISG-2021-03-STRUCTURES.

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

<u>Enhancement 1</u>. SLRA Section B2.3.35 includes an enhancement to the “detection of aging effects” program element to revise procedures to specify that thorough visual inspections shall be carried out on previously designated areas and on areas noted as deficient during the walk through. Procedures will also be revised to state that, when the nuclear coatings specialist specifies follow-up inspections beyond visual inspections, they will be performed by individuals trained and certified in the applicable reference standards of ASTM Guide D5498 “Standard Guide for Developing a Training Program for Personnel Performing Coating and Lining Work Inspection for Nuclear Facilities,” issued November 2012, for the inspection designated by the nuclear coatings specialist. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S8 and finds it acceptable because, when implemented, it will be consistent with the recommendations in the GALL-SLR Report.

<u>Enhancement 2</u>. SLRA Section B2.3.35 includes an enhancement to the “monitoring and trending” program element to revise procedures to specify that any required coating repairs be prioritized between the current or future outages. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S8 and finds it acceptable because, when implemented, it will be consistent with the recommendations in the GALL-SLR Report.

<u>Enhancement 3</u>. SLRA Section B2.3.35 includes an enhancement to the “acceptance criteria” program element to revise procedures to specify that if coating areas cannot be inspected, the inspection documentation will note this with a reason why the inspection could not be conducted. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S8 and finds it acceptable because, when implemented, it will be consistent with the recommendations in the GALL-SLR Report.

<u>Enhancement 4</u>. SLRA Section B2.3.35 includes an enhancement to the “operating experience” program element to revise procedures to reference Regulatory Position C4 of Regulatory Guide 1.54, Revision 3, “Service Level I, II, III and In-Scope License Renewal Protective Coatings Applied to Nuclear Power Plants,” issued April 2017 (ML17031A288), for maintenance of Service Level I coatings. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S8 and finds it acceptable because, when implemented, it will be consistent with the recommendations in the GALL-SLR Report.

<u>Operating Experience</u>. SLRA Section B2.3.35 summarizes OE related to the Protective Coating Monitoring and Maintenance program. The staff evaluated OE information by reviewing the SLRA and conducting an audit (ML23214A232). During the audit, the staff reviewed search results of the plant OE information to determine whether any previously unknown or recurring aging effects were identified. 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

<u>USAR Supplement</u>. SLRA Section A2.2.35 provides the USAR supplement for the Protective Coating Monitoring and Maintenance program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing Protective Coating Monitoring and Maintenance program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the USAR 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-SLR Report are consistent. Also, the staff reviewed the enhancements and concluded that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

SLRA Section B.2.3.36 notes that the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.E1, "Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.E1.

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

Enhancement 1. SLRA Section B.2.3.36 includes an enhancement to the "parameters monitored or inspected" program element. The enhancement relates to revising implementing documents to identify the most limiting temperature, radiation, and moisture environments and their basis, to ensure that cable and connection inspections are performed for the most limiting insulation plant environments. The enhancement also calls for the review of plant-specific OE for previously identified and mitigated ALEs for cumulative aging effects that could potentially impact service life. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E1 and finds it acceptable because, when implemented, it will be consistent with AMP X1.E1.

Enhancement 2. SLRA Section B.2.3.36 includes an enhancement to the "detection of aging effects" program element related to revising implementing documents to require the following:

- Evaluation of plant-specific OE to identify in-scope cable and connection insulation previously subjected to ALE during the original period of extended operation. The evaluation should verify that the dispositioned corrective actions continue to support the intended functions of in-scope cable and connections during the subsequent period of extended operation.

- Engineering evaluation if there are unacceptable visual indications of cable jacket and connection insulation surface anomalies that could potentially lead to a loss of intended function. If visual inspections identify degraded or damaged conditions, then testing may be performed. Testing may include thermography and other proven condition monitoring test methods applicable to the cable and connection insulation. Testing as part of an existing maintenance, calibration, or surveillance program may be credited.
- Testing of a sample population of cables and connections that are identified as potentially degraded. When a large number of cables and connections are identified as potentially degraded, a sample population is tested. The sample would consist of 20 percent of each cable and connection type with a maximum sample size of 25. The following factors are considered in the development of the cable and connection insulation test sample: environment including identified ALEs (high temperature, high humidity, vibration, etc.), voltage level, circuit loading, connection type, location (high temperature, high humidity, vibration, etc.), and insulation material. The component sampling methodology will utilize a population that includes a representative sample of in-scope electrical cable and connection types regardless of whether the component was included in a previous aging management or maintenance program. The technical basis for the sample selection will be documented.

The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E1 and finds it acceptable because, when implemented, it will be consistent with AMP X1.E1.

Enhancement 3. SLRA Section B.2.3.36 includes an enhancement to the “acceptance criteria” program element related to revising governing procedures to identify that electrical cable and connection insulation material test results are to be within the acceptance criteria, as identified in MNGP procedures. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.E1 and finds it acceptable because, when implemented, it will be consistent with AMP X1.E1.

Based on a review of the SLRA, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E1. In addition, the staff reviewed the enhancements associated with the “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. SLRA Section B.2.3.36 summarizes OE related to the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed the OE information in the application and during the audit. As discussed in the audit report (ML23214A232), the 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 subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program.

Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program was evaluated.

USAR Supplement. SLRA Section A.2.2.36 provides the USAR supplement for the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed (Commitment 39) to enhancing the existing Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when the enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

SLRA Section B.2.3.37 notes that the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.E2, "Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits."

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.E2.

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

Enhancement 1. SLRA Section B.2.3.37 includes an enhancement to the "detection of aging effects" program element related to revising the implementing procedures to include documented periodic review of calibration test results for neutron monitors and radiation monitors within the scope of this program. The applicant will perform the first periodic review for second license renewal prior to the subsequent period of operation and at least every 10 years thereafter. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E2 and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report AMP X1.E2.

Based on a review of the SLRA, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E2. In addition, the staff reviewed the enhancement associated with the “detection of aging effects” program element and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.37 summarizes OE related to the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program. The staff reviewed the OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent period of extended operation.

The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program was evaluated.

USAR Supplement. SLRA Section A.2.2.37 provides the USAR supplement for the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed (Commitment 40) to enhancing the existing Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits AMP no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancement and finds that, when the enhancement is implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

SLRA Section B.2.3.38 notes that the Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.E3A, “Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements,” as modified by SLR-ISG-2021-04-ELECTRICAL. The applicant amended this SLRA section by letter dated July 18, 2023 (Supplement 4) (ML23199A154).

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report as modified by SLR-ISG-2021-04-ELECTRICAL. The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA to the corresponding elements of GALL-SLR Report AMP XI.E3A, as modified by SLR-ISG-2021-04-ELECTRICAL.

The staff also reviewed the portions of the “scope of program,” “preventive actions,” “detection of aging effects,” 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 six enhancements follows.

Enhancement 1. SLRA Section B.2.3.38, as modified by Supplement 4, includes an enhancement to the “scope of the program” element. The enhancement relates to the revision of implementing documents to ensure nonenvironmentally qualified, in-scope, inaccessible medium-voltage power cables that are energized less than 25 percent of the time (i.e., resulting in the inclusion of all nonenvironmentally qualified, in-scope, inaccessible medium-voltage power cables regardless of how frequently they are energized) and potentially exposed to significant moisture are within the scope of this program. The staff reviewed this enhancement, as modified by Supplement 4 (ML23199A154), against the corresponding program element in GALL-SLR Report AMP XI.E3A and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report AMP XI.E3A, as modified by SLR-ISG-2021-04-ELECTRICAL and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of the electrical insulation components within the scope of the AMP will be maintained consistent with the CLB.

Enhancement 2. SLRA Section B.2.3.38, as modified by Supplement 4, includes an enhancement to the “preventive actions” program element related to the revision of implementing documentation to ensure that manhole inspections occur at least once annually. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E3A and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report AMP XI.E3A as modified by SLR-ISG-2021-04-ELECTRICAL and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of the electrical insulation components within the scope of the AMP will be maintained consistent with the CLB.

Enhancement 3. SLRA Section B.2.3.38, as modified by Supplement 4, includes an enhancement to the “preventive actions” program element. The enhancement relates to the revision of implementing documents to include inspection of manholes for water accumulation after event-driven occurrences, such as heavy rain, rapid thawing of ice and snow, or flooding. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E3A and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report AMP XI.E3A, as modified by SLR-ISG-2021-04-ELECTRICAL and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of the electrical insulation components within the scope of the AMP will be maintained consistent with the CLB.

Enhancement 4. SLRA Section B.2.3.38, as modified by Supplement 4, includes an enhancement to the “preventive actions” program element. The enhancement relates to the revision of implementing documents to ensure that manhole inspections include direct indication that the cables are not wetted or submerged and that cable/splices and cable support structures are intact. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E3A and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report AMP XI.E3A, as modified by SLR-ISG-2021-04-ELECTRICAL, and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of the electrical insulation components within the scope of the AMP will be maintained consistent with the CLB.

Enhancement 5. SLRA Section B.2.3.38, as modified by Supplement 4, includes an enhancement to the “detection of aging effects” program element related to the revision of implementing documents to require testing of medium-voltage power cables within the scope of this program at least once every 6 years. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E3A and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report AMP XI.E3A, as modified by SLR-ISG-2021-04-ELECTRICAL, and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of electrical insulation components within the scope of the AMP will be maintained consistent with the CLB.

Enhancement 6. SLRA Section B.2.3.38, as modified by Supplement 4, includes an enhancement to the “acceptance criteria” program element related to the revision of implementing documents to ensure that manhole inspections include direct indication that cable support structures are intact. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E3A and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report AMP XI.E3A, as modified by SLR-ISG-2021-04-ELECTRICAL, and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of electrical insulation components within the scope of the AMP will be maintained consistent with the CLB.

Based on a review of the SLRA, as modified by 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 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E3A, as modified by SLR-ISG-2021-04-ELECTRICAL. In addition, the staff reviewed the enhancements associated with the “scope of program,” “preventive actions,” “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. SLRA Section B.2.3.38, as modified by Supplement 4, summarizes OE related to the Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program was evaluated.

USAR Supplement. SLRA Section A.2.2.38, as modified by Supplement 4, provides the USAR supplement for the Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed (Commitment 41) to enhancing the existing Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirement AMP no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation.

The staff finds that the information in the USAR supplement, as amended by letter dated July 18, 2023 (Supplement 4) (ML23199A154), is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Electrical Insulation for Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report, as modified by SLR-ISG-2021-04-ELECTRICAL, are consistent. The staff also reviewed the enhancements and finds that, when the enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.29 Metal Enclosed Bus

SLRA Section B.2.3.41 notes that the Metal Enclosed Bus (MEB) program is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.E4, "Metal Enclosed Bus."

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.E4.

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

Enhancement 1. SLRA Section B.2.3.41 includes an enhancement to the "parameters monitored or inspected," program element. The enhancement relates to revising procedures to (1) include inspection of accessible elastomers (e.g., gaskets, boots, and sealants) for degradation, including surface cracking, crazing, scuffing, dimensional change (e.g., "ballooning" and "necking"), shrinkage, discoloration, hardening or loss of strength, and (2) perform an engineering evaluation of MEB segments that are not accessible for inspection. (The evaluation can be based on results of accessible MEB inspections, tests, or other analysis.) The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E4 and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report AMP XI.E4.

Enhancement 2. SLRA Section B.2.3.41 includes an enhancement to the "detection of aging effects" program element. The enhancement relates to the (1) inclusion of inspection of accessible elastomers (e.g., gaskets, boots, and sealants) for degradation including surface cracking, crazing, scuffing, dimensional change (e.g., "ballooning" and "necking"), shrinkage, discoloration, hardening or loss of strength, (2) inspection of bolted connections not covered with heat shrink tape, sleeving, insulating boots, etc., for corrosion, loose connections, and hardware, including cracked or split washers, and (3) definition of a representative sample size as 20 percent of the accessible bolted connection population, with a maximum of 25. The enhancement also clarifies that, if visual inspections are used as an alternative to resistance measurements or thermography, inspections will be performed prior to the subsequent period of operation and every 5 years thereafter. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E4 and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report AMP XI.E4.

Enhancement 3. SLRA Section B.2.3.41 includes an enhancement to the "acceptance criteria," program element. The enhancement relates to the addition of (1) inspection of accessible elastomers (e.g., gaskets, boots, and sealants) for degradation including surface cracking, crazing, scuffing, dimensional change (e.g., "ballooning" and "necking"), shrinkage, discoloration, hardening or loss of strength, and (2) inspection of bolted connections not covered with heat shrink tape, sleeving, insulating boots, etc., for corrosion, loose connections, and hardware including cracked or split washers. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E4 and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report AMP XI.E4.

Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E4. 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. SLRA Section B.2.3.41 summarizes OE related to the MEB. The staff reviewed the OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent 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 MEB was evaluated.

USAR Supplement. SLRA Section A.2.2.41 provides the USAR supplement for the MEB. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed (Commitment 44) to enhancing the existing MEB AMP no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

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

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

SLRA Section B.2.3.42 notes that the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Staff Evaluation. During its audit (ML23214A232), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.E6.

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

Enhancement 1. SLRA Section B.2.3.42 includes an enhancement to the “parameters monitored or inspected” program element. The enhancement relates to revising implementing documents to identify that the SLR program will be implemented by the evaluation of one-time testing results for a representative sample of connections that are within the scope of SLR and not subject to the requirements of the EQ program. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E6 and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report AMP X1.E6.

Enhancement 2. SLRA Section B.2.3.42 includes an enhancement to the “detection of aging effects” program element related to revising implementing documents to specify the following:

- Perform a one-time test, the results of which are evaluated to determine if periodic testing of cable connections is warranted. This initial evaluation of test results from the basis of site-specific OE for age-related degradation and informs the need for subsequent testing on a 10-year periodic basis. The justification and technical basis for not performing subsequent periodic testing are documented.
- Define a representative sample size as 20 percent of the accessible connector type population, with a maximum sample of 25 per connection type.
- Include an alternative to measurement testing for accessible cable connections that are covered with heat shrink tape, sleeving, insulating boots, etc. The applicant may use a visual inspection of insulation material to detect surface anomalies such as embrittlement, cracking, chipping, melting, discoloration, swelling, or surface contamination. When this alternative visual inspection is used to check cable connections, the first inspection is completed prior to the subsequent period of extended operation and at least every 5 years thereafter.

The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E6 and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report AMP X1.E6.

Enhancement 3. SLRA Section B.2.3.42 includes an enhancement to the “acceptance criteria,” program element related to revising implementing documents to specify the following:

- Denote that cable connections should not indicate abnormal temperatures for the application when thermography is used. Alternatively, connections should exhibit a low resistance value appropriate for the application when resistance measurement is used.
- Denote that if the visual inspection of covered cable connections is used, the absence of embrittlement, cracking, chipping, melting, discoloration, swelling, or surface contamination indicates that the covered cable connection components are not loose.

The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E6 and finds it acceptable because, when implemented, it will be consistent with GALL-SLR Report AMP X1.E6.

Based on a review of the SLRA, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E6. 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. SLRA Section B.2.3.42 summarizes OE related to the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed the OE information in the application and during the audit. As discussed in the audit report (ML23214A232), 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 subsequent period of extended operation. The staff did not identify any OE indicating that the applicant should modify its proposed program.

Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program was evaluated.

USAR Supplement. SLRA Section A.2.2.42 provides the USAR supplement for the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program. The staff reviewed this USAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed (Commitment 45) to enhancing the existing Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program no later than 6 months prior to the subsequent period of extended operation, or no later than the last refueling outage prior to the subsequent period of extended operation.

The applicant also committed to implementing the AMP and starting the one-time and 10-year interval inspections no earlier than ten years prior to the subsequent period of extended operation. The staff finds that the information in the USAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of the applicant’s Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when the enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR 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 Quality Assurance Program Attributes Integral to Aging Management Programs

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

- Corrective Actions—Corrective actions, including root cause determination and prevention of recurrence, should be timely.
- Confirmation Process—The confirmation process should ensure that corrective actions have been completed and are effective.
- Administrative Controls—Administrative controls should provide a formal review and approval process.

SRP-SLR Appendix A.2, BTP IQMB-1, "Quality Assurance for Aging Management Programs," notes that AMP aspects that affect the quality of safety-related SSCs are subject to the QA requirements of 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." Additionally, the SRP-SLR states that, for non-safety-related SCs subject to an AMR, applicants may use the existing 10 CFR Part 50, Appendix B, QA program to address program element 7 ("corrective actions"), program element 8 ("confirmation process"), and program element 9 ("administrative controls"). BTP IQMB-1 provides the following guidance on the QA attributes of AMPs:

- Safety-related SCs are subject to 10 CFR Part 50 Appendix B requirements, which are adequate to address all quality-related aspects of an AMP consistent with the CLB of the facility for the subsequent period of extended operation.
- For nonsafety-related SCs that are subject to an AMR for SLR, an applicant has the option to expand the scope of its 10 CFR Part 50 Appendix B program to include these SCs to address [Program Element 7] corrective actions, [Program Element 8] confirmation process, and [Program Element 9] administrative controls for aging management during the subsequent period of extended operation. The reviewer verifies that the applicant has documented such a commitment in the Final Safely Analysis Report supplement in accordance with 10 CFR 54.21(d).
- If an applicant chooses an alternative means to address corrective actions, confirmation process, and administrative controls for managing aging of nonsafety-related SCs that are subject to an AMR for SLR, the applicant's proposal is reviewed on a case-by-case basis following the guidance in BTP RLSB-1.

3.0.4.1 Summary of Technical Information in Application

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

SLRA Appendix A, Section A.1.3, states, in part, the following:

> The MNGP QA Program implements the requirements of 10 CFR Part 50, Appendix B, and is consistent with the summary in Appendix A.2, "Quality Assurance for Aging Management Programs" (Branch Technical Position IQMB-1), of NUREG-2192. The NSPM QA Program includes the elements of corrective action, confirmation process, and administrative controls, and is

> applicable to the SR and NSR SSCs and commodity groups that are included within the scope of the AMPs.

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

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

3.0.4.2 Staff Evaluation

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

3.0.4.3 Conclusion

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

3.0.5 Operating Experience for Aging Management Programs

3.0.5.1 Summary of Technical Information in the Application

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

3.0.5.2 Staff Evaluation

3.0.5.2.1 Overview

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

3.0.5.2.2 Consideration of Future Operating Experience

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

3.0.5.2.3 Acceptability of Existing Programs

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

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

3.0.5.2.4 Areas of Further Review

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

SLRA Appendix A, Section A.1.4, and SLRA 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 SLRA also states that the ongoing evaluation of OE includes a review of corrective actions, which may result in program enhancements. The SLRA further states that trending reports, program health reports, assessments, and corrective actions program items were reviewed to determine whether aging effects have been identified on applicable components.

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

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

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

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

SLRA Appendix B, Section B.1.4, states that the sources of external OE include the INPO OE program, SLR 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-SLR Section A.4.2, the staff finds the OE program acceptable.

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

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

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

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

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

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

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

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

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

SLRA Appendix B, Section B.1.4, states that internal OE is found in condition reports, issue reports, OE reports, trending reports, program and system health reports, and program assessments. In addition, SLRA Appendix A, Section A.1.4, and SLRA Appendix B, Section B.1.4, state that either AMPs are enhanced or new AMPs developed, as appropriate, when it is determined through the evaluation of OE that the effects of aging may not be adequately managed. SLRA Appendix B, Section B1.4, states that the OE program also meets the requirements of NEI 14-12, "Aging Management Program Effectiveness," (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-SLR Section A.4.2; therefore, the staff finds the OE program acceptable.

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

SLRA Appendix A, Section A.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-SLR Section 4.2; therefore, the staff finds the OE program acceptable.

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

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

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

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

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

3.0.5.2.5 Conclusion

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

3.0.5.3 USAR Supplement

In accordance with 10 CFR 54.21(d), the USAR supplement must, in part, contain a summary description of the programs and activities for managing the effects of aging. SLRA Appendix A, Section A.1.4, provides the USAR 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 USAR supplement summary description acceptable.

3.0.5.4 Conclusion

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

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

3.1.2 Staff Evaluation

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

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

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1.1-001	Consistent with the GALL-SLR Report (see Safety Evaluation [SE] Section 3.1.2.2.1)
3.1.1-002	Not applicable to BWRs
3.1.1-003	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.1)
3.1.1-004	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.1)
3.1.1-005	Not applicable to BWRs
3.1.1-006	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.1)
3.1.1-007	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.1)
3.1.1-008	Not applicable to BWRs
3.1.1-009	Not applicable to BWRs
3.1.1-010	Not applicable to BWRs
3.1.1-011	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.1)
3.1.1-012	Not applicable to BWRs (see SE Section 3.1.2.2.2)
3.1.1-013	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.3, item 1)
3.1.1-014	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.3, item 2)
3.1.1-015	Not applicable to BWRs (see SE Section 3.1.2.2.3, item 3)
3.1.1-016	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.4, item 1)
3.1.1-017	Not applicable to MNGP (see SE Section 3.1.2.2.4, item 2)
3.1.1-018	Not applicable to BWRs (see SE Section 3.1.2.2.5)
3.1.1-019	Not applicable to BWRs (see SE Section 3.1.2.2.6, item 1)
3.1.1-020	Not applicable to BWRs (see SE Section 3.1.2.2.6, item 2)
3.1.1-021	Not applicable to MNGP (see SE Section 3.1.2.2.7)
3.1.1-022	Not applicable to BWRs (see SE Section 3.1.2.2.8)
3.1.1-023	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1-024	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1-025	Not applicable to BWRs (see SE Section 3.1.2.2.11)
3.1.1-026	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1-027	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1-028	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-029	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.12)
3.1.1-030	Consistent with the GALL-SLR Report
3.1.1-031	Not applicable to MNGP
3.1.1-032	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1-033	Not applicable to BWRs
3.1.1-034	Not applicable to BWRs
3.1.1-035	Not applicable to BWRs
3.1.1-036	Not applicable to BWRs
3.1.1-037	Not applicable to BWRs
3.1.1-038	Consistent with the GALL-SLR Report
3.1.1-039	Consistent with the GALL-SLR Report
3.1.1-040	Not applicable to BWRs
3.1.1-040a	Not applicable to BWRs
3.1.1-041	Not Used (addressed by 3.1.1-029) (see SE Section 3.1.2.2.12)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1.1-042	Not applicable to BWRs
3.1.1-043	Consistent with the GALL-SLR Report (see SE Section 3.1.2.1.2)
3.1.1-044	Not applicable to BWRs
3.1.1-045	Not applicable to BWRs
3.1.1-046	Not applicable to BWRs
3.1.1-047	Not applicable to BWRs
3.1.1-048	Not applicable to BWRs
3.1.1-049	Not applicable to BWRs
3.1.1-050	Consistent with the GALL-SLR Report
3.1.1-051a	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-051b	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-052a	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-052b	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-052c	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-053a	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-053b	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-053c	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-054	Not applicable to BWRs
3.1.1-055a	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-055b	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-055c	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-056a	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-056b	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-056c	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-057	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1-058a	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1-058b	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1, 059a	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1, 059b	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1, 059c	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1, 060	Consistent with the GALL-SLR Report
3.1.1, 061	Not applicable to BWRs
3.1.1, 062	Consistent with the GALL-SLR Report
3.1.1, 063	Consistent with the GALL-SLR Report
3.1.1, 064	Not applicable to BWRs
3.1.1, 065	Not applicable to BWRs
3.1.1, 066	Not applicable to BWRs
3.1.1, 067	Consistent with the GALL-SLR Report
3.1.1, 068	Not applicable to BWRs
3.1.1, 069	Not applicable to BWRs
3.1.1, 070	Not applicable to BWRs
3.1.1, 071	Not applicable to BWRs
3.1.1, 072	Not applicable to BWRs
3.1.1, 073	Not applicable to BWRs
3.1.1, 074	Not applicable to BWRs

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1.1, 075	Not applicable to BWRs
3.1.1, 076	Not applicable to BWRs
3.1.1, 077	Not applicable to BWRs
3.1.1, 078	Not applicable to BWRs
3.1.1, 079	Consistent with the GALL-SLR Report
3.1.1, 080	Not applicable to BWRs
3.1.1, 081	Not applicable to BWRs
3.1.1, 082	Not applicable to BWRs
3.1.1, 083	Not applicable to BWRs
3.1.1, 084	Consistent with the GALL-SLR Report
3.1.1, 085	Consistent with the GALL-SLR Report
3.1.1, 086	Not applicable to BWRs
3.1.1, 087	Not applicable to BWRs
3.1.1, 088	Not applicable to BWRs
3.1.1, 089	Not applicable to BWRs
3.1.1, 090	Not applicable to BWRs
3.1.1, 091	Consistent with the GALL-SLR Report (see SE Section 3.1.2.1.3)
3.1.1, 092	Not applicable to BWRs
3.1.1, 093	Not applicable to BWRs
3.1.1, 094	Consistent with the GALL-SLR Report
3.1.1, 095	Consistent with the GALL-SLR Report
3.1.1, 096	Not Used (addressed by 3.1.1-097)
3.1.1, 097	Consistent with the GALL-SLR Report
3.1.1, 098	Consistent with the GALL-SLR Report
3.1.1, 099	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.13)
3.1.1, 100	Consistent with the GALL-SLR Report
3.1.1, 101	Consistent with the GALL-SLR Report
3.1.1, 102	Consistent with the GALL-SLR Report
3.1.1, 103	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.12)
3.1.1, 104	Not Used (addressed by 3.1.1-103)
3.1.1, 105	Not applicable to MNGP (see SE Section 3.1.2.2.15)
3.1.1, 106	Not applicable to MNGP
3.1.1, 107	Consistent with the GALL-SLR Report (changed supp 5)
3.1.1, 108	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1, 109	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1, 110	Consistent with the GALL-SLR Report
3.1.1, 111	Not applicable to BWRs
3.1.1, 112	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1, 113	Consistent with the GALL-SLR Report
3.1.1, 114	Consistent with the GALL-SLR Report
3.1.1, 115	Not applicable to MNGP (see SE Section 3.1.2.2.15)
3.1.1, 116	Not applicable to BWRs (see SE Section 3.1.2.2.10 item 1)
3.1.1, 117	Not applicable to BWRs (see SE Section 3.1.2.2.10 item 2)
3.1.1, 118	Not applicable to BWRs (see SE Section 3.1.2.2.9)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1.1, 119	Not applicable to BWRs (see SE Section 3.1.2.2.9)
3.1.1, 120	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.14)
3.1.1, 121	Consistent with the GALL-SLR Report
3.1.1, 122	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1, 123	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1, 124	Consistent with the GALL-SLR Report
3.1.1, 125	Not applicable to BWRs
3.1.1, 126	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1, 127	Not applicable to BWRs
3.1.1, 128	Consistent with the GALL-SLR Report
3.1.1, 129	Consistent with the GALL-SLR Report
3.1.1, 130	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1, 131	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1, 132	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1, 133	Consistent with the GALL-SLR Report
3.1.1, 134	Not applicable to MNGP
3.1.1, 135	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1, 136	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.16)
3.1.1, 137	Not applicable to MNGP
3.1.1, 138	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.1.1, 139	Not applicable to BWRs (see SE Section 3.1.2.2.6, item 3)

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

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

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

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

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

The following subsections document the NRC staff's review of AMR results listed in SLRA Tables 3.1.2-1 through 3.1.2-3 that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat its review of the matters described in the GALL-SLR Report; however, the staff did verify that the material presented in the SLRA was applicable and that the applicant identified the appropriate GALL-SLR Report AMRs. For those AMR items that the staff found to be consistent with the GALL-SLR Report, and for which no additional evaluation or RAI applies, the staff's review and conclusions as documented in the GALL-SLR Report are considered to be the basis for acceptability of the AMR items. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SE Table 3.1-1, 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 Sections 3.1.2.1.2 and 3.1.2.1.3 below.

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

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

For SLRA Table 3.1-1 items 3.1.1- 017, 3.1.1- 021, 3.1.1- 031, 3.1.1- 105, 3.1.1- 106, 3.1.1-115, 3.1.1- 134 and 3.1.1- 137, the applicant claims that the corresponding AMR items in the GALL-SLR Report are neither used nor applicable to MNGP. The staff reviewed the SLRA and USAR and confirmed that the applicant's SLRA does not have any AMR results that are applicable for these items.

For SLRA Table 3.1-1 items 3.1.1-002, 3.1.1-005, 3.1.1-008, 3.1.1-009, 3.1.1-010, 3.1.1-012, 3.1.1-015, 3.1.1-018, 3.1.1-019, 3.1.1-020, 3.1.1-022, 3.1.1-025, 3.1.1-028, 3.1.1-033, 3.1.1-034, 3.1.1-035, 3.1.1-036, 3.1.1-037, 3.1.1-040, 3.1.1-040a, 3.1.1-042, 3.1.1-044, 3.1.1-045, 3.1.1-046, 3.1.1-047, 3.1.1-048, 3.1.1-049, 3.1.1-051a, 3.1.1-051b, 3.1.1-052a, 3.1.1-052b, 3.1.1-052c, 3.1.1-053a, 3.1.1-053b, 3.1.1-053c, 3.1.1-054, 3.1.1-055a, 3.1.1-055b, 3.1.1-055c, 3.1.1-056a, 3.1.1-056b, 3.1.1-056c, 3.1.1-058a, 3.1.1-058b, 3.1.1-059a, 3.1.1-059b, 3.1.1-059c, 3.1.1-061, 3.1.1-064, 3.1.1-065, 3.1.1-066, 3.1.1-068, 3.1.1-069, 3.1.1-070, 3.1.1-071, 3.1.1-072, 3.1.1-073, 3.1.1-074, 3.1.1-075, 3.1.1-076, 3.1.1-077, 3.1.1-078, 3.1.1-080, 3.1.1-081, 3.1.1-082, 3.1.1-083, 3.1.1-086, 3.1.1-087, 3.1.1-088, 3.1.1-089, 3.1.1-090, 3.1.1-092, 3.1.1-093, 3.1.1-111, 3.1.1-116, 3.1.1-117, 3.1.1-118, 3.1.1-119, 3.1.1-125, 3.1.1-127, and 3.1.1-139, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable because the associated items are only applicable to pressurized-water reactors (PWR). The staff reviewed the SRP-SLR Report, confirmed that these items only apply to BWRs, and finds that these items are not applicable to MNGP because it is a BWR.

For the following SLRA Table 3.1-1 items, the applicant claims that the corresponding items in the GALL-SLR Report are not used because they are addressed by other SLRA Table 1 items 3.1.1-041 (addressed by 3.1.1-029), 3.1.1-096 (addressed by 3.1.1-097), and 3.1.1-104 (addressed by 3.1.1-103). The staff reviewed the SLRA and confirmed that aging effects will be addressed by other SLRA Table 1 items. Therefore, the staff finds the applicant's proposal to use alternate items acceptable.

3.1.2.1.2 Loss of Material Due to Pitting, Crevice Corrosion.

SLRA Section 3.1.1 associated with SLRA Table 3.1-1, AMR item 3.1.1-043 addresses loss of material due to pitting and crevice corrosion for stainless steel and nickel alloy reactor vessel internal components exposed to the reactor coolant, which will be managed by the Water Chemistry program (B2.3.2) and the BWR Vessel Internals program (B.2.3.7). The applicant stated that the BWR Vessel Internals program (B.2.3.7) is used in lieu of the American Society of Mechanical Engineers (ASME) Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program (B.2.3.1) program.

The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.1. In its review of components associated with AMR item 3.1.1-043, the staff finds that the applicant has met the further evaluation criteria because the applicant uses the Water Chemistry program to mitigate potential loss of material due to pitting and crevice corrosion, and the BWR Vessel Internals program in lieu of the ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD program to monitor these components for potential loss of material due to pitting and crevice corrosion. The staff's evaluation of the BWR Vessel Internals program and the Water Chemistry program are documented in SE Sections 3.0.3.2.5 and 3.0.3.2.3, respectively.

For components associated with SLRA Section 3.1.1-043, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of subsequent extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.1.3 Cracking Due to Stress Corrosion Cracking (SCC); Loss of Material Due to General Pitting, Crevice Corrosion, Wear

SLRA Table 3.1-1, AMR item 3.1.1-091 addresses cracking and loss of material for steel reactor vessel closure flange assembly components exposed to uncontrolled indoor air. During its review of components associated with AMR item number 3.1.1-091 for which the applicant cited generic note B, the staff noted that the SLRA credits the XI.M3, Reactor Head Closure Stud Bolting to manage the aging effect for steel reactor vessel closure flange assembly components.

Based on its review of components associated with AMR item 3.1.1-091 for which the applicant cited generic note B, the staff finds the applicant's proposal to manage the effects of aging using the XI.M3, Reactor Head Closure Stud Bolting acceptable based on the following. The AMP is consistent with the GALL-SLR Report AMR item for the component, material, environment, and aging effects. The exception taken to the GALL-SLR Report AMP is to allow the use of reactor head studs with yield strengths greater than those recommended by the GALL-SLR Report AMP but to implement a program of matching GALL-SLR recommendations with future bolt acquisitions. This provides an acceptable level of safety as the bolts will be appropriately monitored for sulfide stress cracking throughout the subsequent period of extended operation.

3.1.2.2 Aging Management Review Results for which Further Evaluation Is Recommended by the GALL-SLR Report

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

3.1.2.2.1 Cumulative Fatigue Damage

SLRA Section 3.1.2.2.1 is associated with SLRA Table 3.1-1, Items 3.1.1-001, 3.1.1-003, 3.1.1-004, 3.1.1-006, 3.1.1-007 and 3.1.1-011. The SLRA section indicates that for time-limited aging analyses (TLAAs) on cumulative fatigue damage in RCS components, reactor pressure vessel components and reactor pressure vessel internals are evaluated in accordance with 10 CFR 54.21(c) and are addressed in SLRA Section 4.3. The staff finds that the applicant's AMR results for fatigue TLAAs are consistent with SRP-SLR Section 3.1.2.2.1 and are, therefore, acceptable. The staff's evaluation of fatigue TLAAs for the RCS components, reactor pressure vessel components, and reactor pressure vessel internals is documented in SE Section 4.3

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

Item 1. SLRA Section 3.1.2.2.2, item 1, associated with SLRA Table 3.1-1, AMR item 3.1.1-012, addresses loss of material due to general, pitting, and crevice corrosion in the steel PWR steam generator upper and lower shell and transition cone that are exposed to secondary feedwater and steam. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria of SRP-SLR Section 3.1.2.2.2.1 and finds the claim to be acceptable because the item is applicable only to PWR steam generators.

Item 2. SLRA Section 3.1.2.2.2, item 2, associated with SLRA Table 3.1-1, AMR item 3.1.1-012, addresses loss of material due to general, pitting, and crevice corrosion in the steel PWR steam generator shell assembly exposed to secondary feedwater and steam. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria of SRP-SLR Section 3.1.2.2.2.2 and finds the claim to be acceptable because the item is applicable only to PWR steam generators.

3.1.2.2.3 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement

Item 1. SLRA Section 3.1.2.2.3, item 1, associated with SLRA Table 3.1-1, item 3.1.1-013, states loss of fracture toughness due to neutron irradiation embrittlement is an aging effect and mechanism evaluated by a TLAA. The TLAA evaluation of neutron irradiation embrittlement is discussed in SLRA Section 4.2, *Reactor Vessel Neutron Embrittlement*.

The staff noted that SLRA Section 4.2 specifically addresses the ferritic materials that have a neutron fluence greater than 10^{17} n/cm^2 (E >1 MeV) at the end of the subsequent period of extended operation. Based on its review, the applicant's assessment of reactor pressure vessel (RPV) materials for loss of fracture toughness due to neutron irradiation embrittlement is consistent with SRP-SLR Section 3.1.2.2.3, item 1, and is, therefore, acceptable. The staff's evaluations regarding the neutron embrittlement TLAAs for RPV components are documented in SE Section 4.2.

Item 2. SLRA Section 3.1.2.2.3 associated with SLRA Table 3.1-1 AMR item 3.1.1-014, addresses loss of fracture toughness due to neutron irradiation embrittlement for the reactor vessel beltline, lower and intermediate shells, nozzles, and welds exposed to reactor coolant and neutron flux, which will be managed by the Neutron Fluence Monitoring Program and the Reactor Vessel Material Surveillance Program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.3 item 2.

In its review of components associated with AMR item 3.1.1-014, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Neutron Fluence Monitoring Program and Reactor Vessel Material Surveillance Program acceptable because it is consistent with AMR item IV.A2.RP-229 in the GALL-SLR Report. The staff's evaluation of the Neutron Fluence Monitoring Program and the Reactor Vessel Material Surveillance Program are documented in SE Sections 3.0.3.1.1 and 3.0.3.2.15, respectively.

Based on AMPs identified, the staff concludes that the applicant's programs meet SRP-SLR Section 3.1.2.2.3, item 2 criteria. For SLRA Table 3.1-1, item 3.1.1-014, associated with SLRA

Section 3.1.2.2.3, item 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report, and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

Item 3: SLRA Section 3.1.2.2.3.3, associated with SLRA Table 3.1-1 AMR item 3.1.1-015, 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-SLR Section 3.1.2.2.3.3.

In its review of components associated with AMR item 3.1.1-015, the staff finds this item is not applicable to MNGP because (1) this item is only applicable to B&W designed reactors and (2) the USAR identifies that the reactor at MNGP is a BWR design.

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

Item 1. SLRA Section 3.1.2.2.4, item 1, associated with SLRA Table 3.1-1 item 3.1.1-016, addresses cracking for stainless steel or nickel alloy reactor vessel flange leak detection lines exposed to uncontrolled indoor air, which will be managed by the One-Time Inspection program. The staff reviewed the applicant's proposal against the criteria in the SRP-SLR Section 3.1.2.2.4, item 1. The reactor vessel flange leak-off lines at MNGP are carbon steel and therefore not susceptible to SCC; however, some other reactor pressure vessel and reactor coolant pressure boundary components are constructed of stainless steel. A plant-specific review of operating experience (OE) has shown that the reactor vessel and reactor coolant pressure boundary components at MNGP have not been susceptible to SCC. In its review of components associated with item 3.1.1-016, the staff finds that the applicant has met the further evaluation criteria, and the proposal to manage the effects of aging using the One-Time Inspection program is acceptable because a one-time inspection to verify that cracking is not occurring in the associated components is consistent with the approach discussed in SRP-SLR Section 3.1.2.2.4, item 1. Based on the program identified, the staff concludes that the applicant's program meets SRP-SLR Section 3.1.2.2.4, item 1. For those items associated with item 1 of SLRA Section 3.1.2.2.4, the staff concludes that the SLRA is consistent with the GALL-SLR Report, and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 2. SLRA Section 3.1.2.2.4, item 2, associated with SRP-SLR Table 3.1-1, item 3.1.1-017, against the criteria in SRP-SLR Section 3.1.2.2.4. The staff verified by reviewing the USAR that SLRA Section 3.1.2.2.4, item 2, is not applicable for MNGP because it does not use an isolation condenser.

3.1.2.2.5 Crack Growth Due to Cyclic Loading

SLRA Section 3.1.2.2.5, associated with SLRA Table 3.1-1, item 3.1.1-018, 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 staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.5 and finds it acceptable because (1) the SRP-SLR Section 3.1.2.2.5 and the corresponding AMR item (i.e., item 3.1.1-018) are applicable only to PWR-designed reactors and (2) the USAR identifies that the reactor at MNGP is a BWR design.

3.1.2.2.6 Cracking Due to Stress Corrosion Cracking

Item 1. SLRA Section 3.1.2.2.6. associated with SLRA Table 3.1-1, AMR item 3.1.1-019, addresses cracking due to SCC in PWR stainless steel bottom-mounted instrument guide tubes exposed to reactor coolant. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria of SRP-SLR Section 3.1.2.2.6. item 1 and finds it acceptable because (1) the item is applicable only to PWRs and (2) the MNGP reactor is a BWR design.

Item 2. SLRA Section 3.1.2.2.6 associated with SLRA Table 3.1-1, AMR item 3.1.1-020, addresses cracking due to SCC for the ASME Code Class 1 CASS reactor coolant piping and piping components of the PWR exposed to the reactor coolant. The applicant claimed that this further evaluation item is applicable to PWRs and not to MNGP. The staff finds the applicant's claim acceptable because the MNGP reactor is a BWR.

Item 3. SLRA Section 3.1.2.2.6, associated with SLRA Table 3.1-1, AMR item 3.1.1-139, addresses cracking due to SCC for stainless steel or nickel alloy reactor vessel top head enclosure flange leakage detection lines that are exposed to air-indoor uncontrolled and reactor coolant leakage, which will be managed by the One-Time Inspection program. The applicant stated that this item is not applicable since it only applies to PWRs. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.6 item 3 and finds it acceptable because as stated in the SRP-SLR, this item is only applicable to PWRs.

3.1.2.2.7 Cracking Due to Cyclic Loading

SLRA Section 3.1.2.2.7, associated with SRP-SLR Table 3.1-1, item 3.1.1-021, against the criteria in SRP-SLR Section 3.1.2.2.7. The staff verified by reviewing the USAR that SLRA Section 3.1.2.2.7 is not applicable for MNGP because an isolation condenser is not used.

3.1.2.2.8 Loss of Material Due to Erosion

SLRA Section 3.1.2.2.8, associated with SLRA Table 3.1-1, AMR item 3.1.1-022, addresses loss of material due to erosion for steel steam generator feedwater impingement plates and supports exposed to secondary feedwater. The applicant stated that this item is not applicable because it applies only to PWRs. The staff reviewed the applicant's claim and finds it acceptable because the MNGP reactor is a BWR and therefore does not have steam generators.

3.1.2.2.9 Aging Management of Pressurized-Water Reactor Vessel Internals (Applicable to Subsequent License Renewal Periods Only)

SLRA Section 3.1.2.2.9, associated with SLRA Table 3.1-1, AMR items 3.1.1-028, -051a, -051b, -052a, -052b, -052c, -053a, -053b, -053c, -055a, -055b, -055c, -056a, -056b, -056c, -058a, -058b, -059a, -059b, -059c, -118, -119, addresses the aging management of PWR vessel internals, which will be managed by the Electric Power Research Institute (EPRI) MRP-227, Revision 1-A guidelines. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.9, as revised by SLR-ISG-2021-01-PWRVI.

In its review of components associated with AMR items 3.1.1-028, -051a, -051b, -052a, -052b, -052c, -053a, -053b, -053c, -055a, -055b, -055c, -056a, -056b, -056c, -058a, -058b, -059a, -059b, -059c, -118, -119, the staff finds these items are not applicable to MNGP because (1) these items are only applicable to PWR reactors, and (2) the USAR identifies that the MNGP reactor is BWR design.

3.1.2.2.10 Loss of Material Due to Wear

Item 1: SLRA Section 3.1.2.2.10, item 1, associated with SLRA Table 3.1-1 AMR items 3.1.1-116, addresses loss of material due to wear for nickel alloy control rod drive head penetration nozzles and thermal sleeves, which will be managed by a plant-specific AMP. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.10.1. In its review of components associated with AMR items 3.1.1-116, the staff finds this item is not applicable to MNGP because (1) it is applicable only to PWR reactors, and (2) the USAR identifies that the MNGP reactor is a BWR design.

Item 2: SLRA Section 3.1.2.2.10, item 2, associated with SLRA Table 3.1-1 AMR items 3.1.1-117, addresses loss of material due to wear for stainless steel control rod drive head penetration nozzles and thermal sleeves, which will be managed by a plant-specific AMP. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.10.2. In its review of components associated with AMR items 3.1.1-117, the staff finds this item is not applicable to MNGP because (1) it is applicable only to PWR reactors and (2) the USAR identifies that the MNGP reactor is a BWR design.

3.1.2.2.11 Cracking Due to Primary Water Stress Corrosion Cracking

SLRA Table 3.1-1, AMR item 3.1.1-025 addresses cracking due to primary water SCC for steel (with nickel alloy cladding) or nickel alloy steam generator primary side components: divider plate and tube-to-tube sheet welds exposed to reactor coolant. SLRA Section 3.1.2.2.11.1, associated with SLRA Table 3.1-1, AMR item 3.1.1-025, addresses cracking for nickel alloy steam generator divider plate assemblies exposed to reactor coolant. SLRA Section 3.1.2.2.11.2, associated with SLRA Table 3.1-1, AMR item 3.1.1-025, addresses cracking for nickel alloy steam generator tube-to-tube sheet welds exposed to reactor coolant. The applicant stated that these items are not applicable because they apply only to PWR reactors. The staff reviewed the applicant's claim and finds it acceptable because the MNGP reactor is a BWR and does not have steam generators.

3.1.2.2.12 Cracking Due to Irradiation-Assisted Stress Corrosion Cracking

SLRA Section 3.1.2.2.12, associated with SLRA Table 3.1-1 AMR item 3.1.1-103, addresses cracking due to SCC, intergranular SCC, and irradiation-assisted SCC for stainless steel and nickel alloy reactor internal components exposed to reactor coolant and neutron flux, which will be managed by the BWR Vessel Internals AMP. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.12.

In its review of components associated with AMR item 3.1.1-103, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the BWR Vessel Internals Program is acceptable because the applicant referenced the 80-year evaluation performed for irradiation-assisted SCC (and other cracking mechanisms) in topical report BWRVIP-315. The NRC issued the final safety evaluation for BWRVIP-315 on October 31, 2023 (ML23251A072). Given the staff's acceptance of the 80-year assessment in BWRVIP-315, the staff finds that the potential supplement examinations described in SRP-SLR Section 3.1.2.2.12 are unnecessary.

SLRA Section 3.1.2.2.12, associated with SLRA Table 3.1-1, AMR item 3.1.1-041, addresses SCC, intergranular SCC, and irradiation-assisted SCC for nickel alloy access hole covers exposed to reactor coolant. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.12 and finds it acceptable because the access hole covers at MNGP are welded, which is addressed in the applicable AMR item 3.1.1-029.

Based on the program identified, the staff concludes that the applicant's program meets SRP-SLR Section 3.12.2.12 criterion. For those AMR items associated with SLRA Section 3.1.2.2.12, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

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

SLRA Section 3.1.2.2.13, associated with SLRA Table 3.1-1 AMR item 3.1.1-099, addresses loss of fracture toughness due to neutron irradiation or thermal aging for stainless steel and nickel alloy reactor internal components exposed to reactor coolant and neutron flux, which will be managed by the BWR Vessel Internals AMP. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.13.

In its review of components associated with AMR item 3.1.1-099, 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 BWR Vessel Internals program is acceptable because the applicant referenced the 80-year evaluation performed for degradation of reactor internals in topical report BWRVIP-315. The NRC issued the final safety evaluation for BWRVIP-315 on October 31, 2023 (ML23251A072). Given the staff's acceptance of the 80-year assessment in BWRVIP-315, the staff finds that the potential supplement examinations described in SRP-SLR Section 3.1.2.2.12 are unnecessary.

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

SLRA Section 3.1.2.2.14, associated with SLRA Table 3.1-1 AMR item 3.1.1-120, addresses loss of preload for stainless steel core plate rim hold-down bolts exposed to reactor coolant and neutron flux, which the applicant addressed by the TLAA Loss of Preload for Core Plate Rim Hold-down Bolts (see Section 4.2.9 of the SLRA). The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.14.

In its review of components associated with AMR item 3.1.1-120, 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 TLAA Loss of Preload for Core Plate Rim Hold-down Bolts is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii). This is consistent with SRP-SLR Section 3.1.2.2.14 and is, therefore, acceptable. The staff's review of the TLAA for loss of preload for core plate rim hold-down bolts is documented in SE Section 4.2.9.

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

SLRA Section 3.1.2.2.15, associated with SLRA Table 3.1-1, AMR items 3.1.1-105 and 3.1.1-115, addresses:

(1) Loss of material due to general, crevice, or pitting corrosion for steel piping or piping components exposed to concrete (item 3.1.1-105).

(2) Loss of material due to crevice or pitting corrosion and cracking due to SCC for stainless steel piping and piping components exposed to concrete (item 3.1.1-115).

The applicant stated that there are no RCS steel or stainless steel piping or piping components within the scope of SLR exposed to concrete. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.15 and finds it acceptable because based on a review of the USAR and SLRA, there are no steel or stainless steel piping or piping components exposed to concrete in the RCS.

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

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

In SLRA Section 3.1.2.2.16, associated with SLRA Table 3.1-1, item 3.1.1-136 addresses loss of material due to pitting and crevice corrosion in stainless steel, nickel alloy piping, piping components exposed to air, condensation, which will be managed by the One-Time Inspection program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.16.

The applicant states that ambient air at MNGP is not subject to a marine atmosphere, but the plant is in the vicinity of a major road that is routinely salted for snow and ice. The applicant did a review of the over 69,000 records created from 2010 to 2021 showed that the ambient air environment does not contain sufficient halides (e.g., chlorides) in the presence of moisture to result in loss of material. Therefore, stainless steel and nickel alloy components exposed to uncontrolled indoor air in the RCS are not susceptible to potential cause of loss of material. In addition, MNGP OE associated with insulated stainless steel components in the RCS was evaluated to determine if prolonged exposure to moisture had resulted in loss of material due to pitting or crevice corrosion. Loss of material was not identified as an aging effect at MNGP for insulated stainless steel components in this environment, indicating that moisture intrusion into the insulation, and leaching of contaminants present in the insulation onto component surfaces or onto other components below the insulated component, resulting in loss of material, has not occurred.

In its review of components associated with AMR item 3.1.1-136, the staff finds that the applicant has met the further evaluation criteria and its proposal to manage the effects of aging using the One-Time Inspection program is acceptable because a review of plant-specific OE did not reveal a history of loss of material due to pitting or crevice corrosion. Additionally, the One-Time Inspection program will be used to confirm that these aging effects are not occurring or are occurring so slowly that they will not affect the intended function of the components during the subsequent period of extended operation, which is consistent with the recommendation in the SRP-SLR.

Based on the program identified, the staff concludes that the applicant's program meets the recommendations of SRP-SLR Section 3.1.2.2.16. For those AMR items associated with SLRA Section 3.1.2.2.16, the staff concludes that the SLRA is consistent with the GALL-SLR Report, and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.17 Ongoing Review of Operating Experience

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

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

The SLRA did not identify any AMR results in SLRA Tables 3.1.2-1 through 3.1.2-3 that are not consistent with, or not addressed in, the GALL-SLR Report.

3.2 Aging Management of Engineered Safety Features

3.2.1 Summary of Technical Information in the Application

SLRA Section 3.2 provides AMR results for those components the applicant identified in SLRA Section 2.3.2, "Engineered Safety Features," as being subject to an AMR. SLRA Table 3.2-1, "Summary of Aging Management Programs for Engineered Safety Features," is a summary comparison of the applicant's AMR results with those provided in the GALL-SLR Report for the ESF components.

3.2.2 Staff Evaluation

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

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

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2.1-001	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.1)
3.2.1-002	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-003	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-004	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.2)
3.2.1-005	Not applicable to BWRs
3.2.1-006	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.3)
3.2.1-007	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.4)
3.2.1-008	Not applicable to BWRs
3.2.1-009	Not applicable to BWRs

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2.1-010	Not applicable to MNGP
3.2.1-011	Consistent with the GALL-SLR Report
3.2.1-012	Not applicable to MNGP
3.2.1-013	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-014	Consistent with the GALL-SLR Report
3.2.1-015	Consistent with the GALL-SLR Report
3.2.1-016	Consistent with the GALL-SLR Report
3.2.1-017	Not applicable to MNGP
3.2.1-018	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-019	Consistent with the GALL-SLR Report
3.2.1-020	Not applicable to BWRs
3.2.1-021	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-022	Consistent with the GALL-SLR Report
3.2.1-023	Not applicable to MNGP
3.2.1-024	Not applicable to BWRs
3.2.1-025	Not Used (addressed by 3.3.1-040)
3.2.1-026	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-027	Not Used (addressed by 3.3.1-042)
3.2.1-028	Not applicable to MNGP
3.2.1-029	Not applicable to MNGP
3.2.1-030	Consistent with the GALL-SLR Report
3.2.1-031	Consistent with the GALL-SLR Report
3.2.1-032	Not applicable to MNGP
3.2.1-033	Not applicable to MNGP
3.2.1-034	Consistent with the GALL-SLR Report
3.2.1-035	Not applicable to BWRs
3.2.1-036	Not applicable to BWRs
3.2.1-037	Not applicable to MNGP
3.2.1-038	Consistent with the GALL-SLR Report
3.2.1-039	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-040	Consistent with the GALL-SLR Report
3.2.1-041	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-042	Not applicable to MNGP (see SE Section 3.2.2.2.10)
3.2.1-043	Consistent with the GALL-SLR Report
3.2.1-044	Consistent with the GALL-SLR Report
3.2.1-045	Not applicable to BWRs
3.2.1-046	Consistent with the GALL-SLR Report
3.2.1-047	Not applicable to BWRs
3.2.1-048	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.2)
3.2.1-049	Consistent with the GALL-SLR Report
3.2.1-050	Consistent with the GALL-SLR Report
3.2.1-051	Consistent with the GALL-SLR Report
3.2.1-052	Consistent with the GALL-SLR Report
3.2.1-053	Not applicable to MNGP

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2.1-054	Not Used (addressed by 3.2.1-114)
3.2.1-055	Not applicable to MNGP (see SE Section 3.2.2.2.9)
3.2.1-056	Not applicable to MNGP (see SE Section 3.2.2.2.10)
3.2.1-057	Consistent with the GALL-SLR Report
3.2.1-058	Not applicable to BWRs
3.2.1-059	Not applicable to MNGP
3.2.1-060	Consistent with the GALL-SLR Report
3.2.1-061	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-062	Not applicable to MNGP
3.2.1-063	Consistent with the GALL-SLR Report
3.2.1-064	Consistent with the GALL-SLR Report
3.2.1-065	Consistent with the GALL-SLR Report
3.2.1-066	Not applicable to MNGP (see SE Section 3.2.2.2.7)
3.2.1-067	Not applicable to MNGP
3.2.1-068	Not applicable to MNGP
3.2.1-069	Not Used (addressed by 3.2.1-040)
3.2.1-070	Not applicable to MNGP
3.2.1-071	Not applicable to MNGP
3.2.1-072	Not Used (addressed by 3.3.1-138)
3.2.1-073	Not Used (addressed by 3.3.1-139)
3.2.1-074	Not applicable to MNGP
3.2.1-075	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-076	Consistent with the GALL-SLR Report
3.2.1-077	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-078	Consistent with the GALL-SLR Report
3.2.1-079	Consistent with the GALL-SLR Report
3.2.1-080	Not applicable to MNGP (see SE Section 3.2.2.2.4)
3.2.1-081	Consistent with the GALL-SLR Report
3.2.1-082	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-083	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-084	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-085	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-086	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-087	Consistent with the GALL-SLR Report
3.2.1-088	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-089	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-090	Consistent with the GALL-SLR Report
3.2.1-091	Not applicable to MNGP (see SE Section 3.2.2.2.9)
3.2.1-092	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-093	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-094	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-095	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-096	Not applicable to MNGP
3.2.1-097	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2.1-098	Not applicable to MNGP
3.2.1-099	Not applicable to MNGP (see SE Section 3.2.2.2.2)
3.2.1-100	Not applicable to MNGP (see SE Section 3.2.2.2.8)
3.2.1-101	Not applicable to MNGP (see SE Section 3.2.2.2.8)
3.2.1-102	Not applicable to MNGP (see SE Section 3.2.2.2.8)
3.2.1-103	Not applicable to MNGP (see SE Section 3.2.2.2.4)
3.2.1-104	Not applicable to MNGP
3.2.1-105	Not applicable to MNGP (see SE Section 3.2.2.2.10)
3.2.1-106	Not applicable to MNGP (see SE Section 3.2.2.2.2)
3.2.1-107	Not applicable to MNGP (see SE Section 3.2.2.2.2)
3.2.1-108	Not applicable to MNGP (see SE Section 3.2.2.2.4)
3.2.1-109	Not applicable to MNGP (see SE Section 3.2.2.2.8)
3.2.1-110	Not applicable to MNGP (see SE Section 3.2.2.2.8)
3.2.1-111	Not applicable to MNGP (see SE Section 3.2.2.2.10)
3.2.1-112	Not applicable to MNGP (see SE Section 3.2.2.2.2)
3.2.1-113	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.2.1-114	Consistent with the GALL-SLR Report
3.2.1-115	Not applicable to MNGP
3.2.1-116	Not applicable to MNGP
3.2.1-117	Not applicable to MNGP
3.2.1-118	Not applicable to MNGP
3.2.1-119	Not applicable to MNGP (see SE Section 3.2.2.2.10)
3.2.1-120	Not applicable to MNGP
3.2.1-121	Not applicable to MNGP (see SE Section 3.2.2.2.10)
3.2.1-122	Consistent with the GALL-SLR Report
3.2.1-123	Consistent with the GALL-SLR Report
3.2.1-124	Not applicable to MNGP
3.2.1-125	Not applicable to MNGP
3.2.1-126	Not applicable to MNGP
3.2.1-127	Not applicable to MNGP
3.2.1-128	Not applicable to MNGP
3.2.1-129	Consistent with the GALL-SLR Report (see SE Section 3.2.2.1.2)
3.2.1-130	Consistent with the GALL-SLR Report
3.2.1-131	Not applicable to MNGP
3.2.1-132	Not applicable to MNGP
3.2.1-133	Not applicable to MNGP
3.2.1-134	Not applicable to MNGP

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

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

SE Section 3.2.2.1 document the review of components that required additional information or otherwise require explanation.

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

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

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

The following subsections document the NRC staff's review of AMR results listed in SLRA Tables 3.2.2-1 through 3.2.2-6 that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat its review of the matters described in the GALL-SLR Report; however, it did verify that the material presented in the SLRA was applicable and that the applicant identified the appropriate GALL-SLR Report AMRs. For those AMR items that the staff found to be consistent with the GALL-SLR Report and for which no additional evaluation or RAI applies, the staff's review and conclusions, as documented in the GALL-SLR Report, are considered to be the basis for acceptability of the AMR items. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SE Table 3.2-1, and no separate writeup is required or provided. For the AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in Section 3.2.2.1.2 below.

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

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

For SLRA Table 3.2-1, items 3.2.1-010, 3.2.1-012, 3.2.1-017, 3.2.1-023, 3.2.1-028, 3.2.1-029, 3.2.1-032, 3.2.1-033, 3.2.1-037, 3.2.1-042, 3.2.1-053, 3.2.1-055, 3.2.1-056, 3.2.1-059, 3.2.1-062, 3.2.1-066, through 3.2.1-068, 3.2.1-070, 3.2.1-071, 3.2.1-074, 3.2.1-080, 3.2.1-091, 3.2.1-096, 3.2.1-098 through 3.2.1-112, 3.2.1-115 through 3.2.1-121, 3.2.1-124 through 3.2.1-128, 3.2.1-131 through 3.2.1-134, the applicant claims that the corresponding AMR items in the GALL-SLR Report are neither used nor applicable to MNGP. The staff reviewed the SLRA and USAR and confirmed that the applicant's SLRA does not have any AMR results that are applicable for these items.

For SLRA Table 3.2-1, items 3.2.1-005, 3.2.1-008, 3.2.1-009, 3.2.1-020, 3.2.1-024, 3.2.1-035, 3.2.1-036, 3.2.1-045, 3.2.1-047, and 3.2.1-058, the applicant claims that the corresponding AMR item in the GALL-SLR Report is not applicable because the associated item is only applicable to PWRs. The staff reviewed the SRP-SLR, confirmed that this item only applies to PWRs, and finds that this item is not applicable to MNGP because it is a BWR.

For the following SLRA Table 3.2-1 items, the applicant claims that the corresponding items in the GALL-SLR Report are not used because they are addressed by other SLRA Table 1 items: 3.2.1-025 (addressed by 3.2.1-040), 3.2.1-027 (addressed by 3.2.1-042), 3.2.1-054 (addressed by 3.2.1-114), 3.2.1-069 (addressed by 3.2.1-040) 3.2.1-072 (addressed by 3.2.1-138) and 3.2.1-073 (addressed by 3.2.1-139). The staff reviewed the SLRA and confirmed that the aging effects will be addressed by other SLRA Table 1 items. Therefore, the staff finds the applicant's proposal to use alternate items acceptable.

3.2.2.1.2 Loss of Material Due to Pitting and Crevice Corrosion

SLRA Table 3.2-1, AMR item 3.2.1-129, as modified in response to RAI B.2.3.17-1 (ML23265A158) addresses loss of material due to pitting and crevice corrosion for stainless steel tanks exposed to concrete. The staff notes that, although the discussion for this item in SLRA Table 3.2-1 states that there are no tanks within the scope of the Outdoor and Large Atmospheric Metallic Storage Tanks AMP in the engineered safety features systems, the applicant chose to use this item, which credits the cited program. For the associated SLRA Table 2 AMR items that cite generic note E, the SLRA credits the One-Time Inspection program and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, program to manage loss of material for the stainless steel standby liquid control (SLC) tank bottom exposed to concrete. The AMR items cite plant-specific note 3, which states that the above-cited AMPs are being substituted for the Outdoor and Large Atmospheric Metallic Storage Tanks AMP to verify that cracking and loss of material on the stainless steel base plate of the SLC tank has been mitigated. Note 3 also states that the baseplate has experienced cracking, has been replaced, and an epoxy coating has been applied to the concrete tank pedestal to prevent future cracking as a result of chloride exposure from the concrete. The note also states that further evaluation is provided in SLRA Section 3.3.2.2.9.

Based on its review of components associated with AMR item 3.2.1-129, for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging acceptable because as clarified in the response to RAI B.2.3.17-1a (ML23313A158), the current in-service inspection plan that is implemented through the ASME Section XI Inservice Inspection IWB, IWC, and IWD AMP, includes periodic (i.e., three times within the 10-year in-service inspection interval) performance of a system leakage test for the SLC system. These inspections are capable of detecting loss of material due to pitting and crevice corrosion for stainless steel tanks exposed to concrete. For additional discussion, refer to SE Section 3.3.2.2.9.

3.2.2.2 Aging Management Review Results for which Further Evaluation Is Recommended by the GALL-SLR Report

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

3.2.2.2.1 Cumulative Fatigue Damage

SLRA Section 3.2.2.2.1, as supplemented by letter on July 18, 2023 (ML23199A154), is associated with SLRA Table 3.2-1, item 3.2.1-001. The applicant indicated that the TLAA on cumulative fatigue damage in the components of the engineered safety features is evaluated in accordance with 10 CFR 54.21(c) and is addressed in SLRA Section 4.3. The staff finds that the applicant's AMR results for the fatigue TLAA are consistent with SRP-SLR Section 3.2.2.2.1 and are acceptable. The staff's evaluation of the fatigue TLAA for components of the ESFs is documented in SE Section 4.3.

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

SLRA Section 3.2.2.2.2, associated with SLRA Table 3.2-1, AMR items 3.2.1-004 and 3.2.1-048, addresses loss of material due to pitting and crevice corrosion for stainless steel and nickel alloy piping and piping components exposed internally or externally to air or condensation, which will be managed by the One-Time Inspection program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.2.2.2.2.

In its review of components associated with AMR items 3.2.1-004 and 3.2.1-048, 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 One-Time Inspection program acceptable because plant-specific OE does not reveal a history of loss of material due to pitting or crevice corrosion for these components, and the proposed one-time inspections are capable of detecting whether loss of material is occurring.

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

SLRA Section 3.2.2.2.2, as amended by letter dated June 26, 2023 (ML23177A218), associated with SLRA Table 3.2-1, AMR items 3.2.1-099, 3.2.1-106, 3.2.1-107, and 3.2.1-112, addresses loss of material due to pitting and crevice corrosion for insulated and uninsulated stainless steel and nickel alloy tanks, insulated stainless steel and nickel alloy piping, piping components, and tanks, and underground stainless steel and nickel alloy piping, piping components and tanks exposed to air or condensation. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.2 and finds it acceptable because based on a review of the USAR and SLRA, there are no such stainless steel or nickel alloy components and environment combinations in the ESF systems.

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

In SLRA Section 3.2.2.2.3, associated with SLRA Table 3.2-1, item 3.2.1-006 addresses loss of material and flow blockage of metallic drywell and suppression chamber spray nozzles exposed to condensation, which will be managed by the One-Time Inspection program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.2.2.2.3.

The applicant stated that the drywell and suppression chamber spray nozzles within the residual heat removal system are copper alloy with greater than 15 percent zinc, and although loss of material is not an aging effect for copper alloys in a condensation environment, because the upstream piping is carbon steel, flow blockage due to fouling is an applicable aging effect for the spray nozzles. The applicant further stated that during in-service testing associated with the suppression chamber spray, the piping configuration and sequence of valve testing precludes wetting of the piping downstream of the inboard primary containment isolation. When the piping between suppression chamber spray inboard and outboard primary containment isolation valves is filled with water to support in-service testing, any leakage past the isolation valve during testing drains to the suppression chamber via the spray nozzles due to the piping configuration to maintain the piping downstream of the inboard isolation valve dry. Verification that each drywell spray nozzle is unobstructed is performed following maintenance that could result in nozzle blockage, and plant-specific OE has not revealed loss of material or flow blockage of drywell or suppression chamber spray nozzles.

In its review of components associated with AMR item 3.2.1-006, the staff finds that the applicant has met the further evaluation criteria. Additionally, the applicant's proposal to manage the effects of aging using the One-Time Inspection program is acceptable because as stated in the SRP-SLR, aging effects sufficient to result in a loss of intended function are not anticipated if:

(1) The applicant identifies those portions of the system that are normally dry but subject to periodic wetting.

(2) Plant-specific procedures exist to drain the normally dry portions that have been wetted during normal plant operation or inadvertently.

(3) The plant-specific configuration of the drains and piping allow sufficient draining to empty the normally dry pipe.

(4) Plant-specific OE has not revealed loss of material or flow blockage due to fouling.

(5) A one-time inspection is conducted to verify that loss of material or flow blockage due to fouling has not occurred.

Based on the program identified, the staff concludes that the applicant's program meets the recommendations of SRP-SLR Section 3.2.2.2.3. For those AMR items associated with SLRA Section 3.2.2.2.3, the staff concludes that the SLRA is consistent with the GALL-SLR Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.4 Cracking Due to Stress Corrosion Cracking in Stainless Steel Alloys

SLRA Section 3.2.2.2.4, associated with SLRA Table 3.2-1, AMR item 3.2.1-007, addresses cracking due to SCC for stainless steel piping, piping components, and tanks exposed to air or condensation, which will be managed by the One-Time Inspection program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.2.2.2.4.

In its review of components associated with AMR item 3.2.1-007, 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 One-Time Inspection program is acceptable because plant-specific OE does not reveal a history of cracking due to SCC for these components and the proposed one-time inspections are capable of detecting whether cracking is occurring.

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

SLRA Section 3.2.2.2.4, as amended by letter dated June 26, 2023 (ML23177A218), associated with Table 3.2-1, AMR items 3.2.1-080, 3.2.1-103, and 3.2.1-108 addresses cracking due to SCC for stainless steel underground piping, piping components, and tanks, stainless steel tanks within the scope of GALL-SLR Report AMP XI.M29 exposed to air or condensation, and insulated stainless steel piping, piping components, and tanks exposed to air or condensation. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.4 and finds the claim acceptable because based on a review of the USAR and SLRA, there are no such stainless steel component and environment combinations in the ESF systems.

3.2.2.2.5 Quality Assurance for Aging Management of Nonsafety-Related Components

SE Section 3.0.4 documents the staff's evaluation of the applicant's quality assurance (QA) Program.

3.2.2.2.6 Ongoing Review of Operating Experience

SE Section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of OE.

3.2.2.2.7 Loss of Material Due to Recurring Internal Corrosion

SLRA Section 3.2.2.2.7 is associated with SLRA Table 3.2-1, item 3.2.1-066, for loss of material due to recurring internal corrosion in metallic piping components and tanks exposed to several water environments. The applicant stated that reviews of OE over the past 10 years did not identify any instances that met the criteria of recurring internal corrosion in ESF systems. Consequently, the applicant determined that this item was not applicable and that there was no need to augment AMPs credited for managing internal loss of material in these systems. The staff evaluated the applicant's determination against the criteria in SRP-SLR Section 3.2.2.2.7 and finds it is acceptable because the staff did not identify instances of recurring internal corrosion ESF systems during its review of the OE documentation provided for the audit.

3.2.2.2.8 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

SLRA Section 3.2.2.2.8, associated with SLRA Table 3.2-1, AMR items 3.2.1-100, 3.2.1-101, 3.2.1-102, 3.2.1-109, and 3.2.1-110, addresses cracking due to SCC for aluminum components. The applicant stated that these items are not applicable because there are no aluminum components in the ESF systems. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.8 and finds it acceptable because based on a review of the USAR and SLRA, there are no aluminum components in the ESF systems.

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

SLRA Section 3.2.2.2.9, associated with SLRA Table 3.2-1, AMR items 3.2.1-055 and 3.2.1-091, addresses:

(1) loss of material due to general, crevice, or pitting corrosion in steel piping and piping components exposed to concrete (item 3.2.1-055

(2) loss of material due to crevice or pitting corrosion and cracking due to SCC in stainless steel piping and piping components exposed to concrete (item 3.2.1-091)

The applicant stated that there are no steel or stainless steel piping or piping components exposed to concrete in the ESF systems. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.9 and finds it acceptable because based on a review of the USAR and SLRA, there are no steel or stainless steel piping or piping components exposed to concrete in the ESF systems.

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

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

SLRA Section 3.2.2.2.10, associated with SLRA Table 3.2-1, AMR items 3.2.1-042, 3.2.1-056, 3.2.1-105, 3.2.1-111, 3.2.1-119, and 3.2.1-121, addresses loss of material due to pitting and crevice corrosion for aluminum components. The applicant stated that these items are not applicable because there are no aluminum components in the ESF systems. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.10 and finds it acceptable, because based on a review of the USAR and SLRA, there are no aluminum components in the ESF systems.

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

The following subsections document the staff's review of AMR results listed in SLRA Tables 3.2.2-1 through 3.2.2-6 that are either not consistent with or not addressed in the GALL-SLR 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 an SLRA Table 1 item, the subsections are organized by applicable AMR section and then by material and environment combinations.

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

3.2.2.3.1 Residual Heat Removal – Summary of Aging Management Evaluation

<u>Stainless Steel Strainer (Element) Exposed to Treated Water</u>. SLRA Table 3.2.2-5 states that flow blockage due to fouling for stainless steel strainer elements exposed to treated water will be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The AMR item cites generic note H for which the applicant has identified flow blockage due to fouling as an additional aging effect. During its review, the staff noted GALL-SLR Report item V.D1.E-439 states flow blockage due to fouling for stainless steel components exposed to raw water (i.e., a more aggressive environment) can be effectively managed using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The staff finds the applicant's proposal to manage flow blockage due to fouling acceptable because it is bounded by GALL-SLR Report recommendations.

3.3 Aging Management of Auxiliary Systems

3.3.1 Summary of Technical Information in the Application

SLRA Section 3.3 provides AMR results for those components the applicant identified in SLRA Section 2.3.3, “Auxiliary Systems,” as being subject to an AMR. SLRA Table 3.3-1, “Summary of Aging Management Evaluations for the Auxiliary Systems,” is a summary comparison of MNGP AMRs with those evaluated in the GALL-SLR Report for the auxiliary systems components.

3.3.2 Staff Evaluation

Table 3.3-1, below, summarizes the NRC staff’s evaluation of the component groups listed in SLRA Section 3.3 and addressed in the GALL-SLR Report.

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

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-001	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.1)
3.3.1-002	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.1)
3.3.1-003	Not applicable to BWRs (see SE Section 3.3.2.2.2)
3.3.1-003a	Not applicable to BWRs (see SE Section 3.3.2.2.2)
3.3.1-004	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.3)
3.3.1-005	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-006	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.4)
3.3.1-007	Not applicable to BWRs
3.3.1-008	Not applicable to BWRs
3.3.1-009	Not applicable to BWRs
3.3.1-010	Not applicable to MNGP
3.3.1-011	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-012	Consistent with the GALL-SLR Report
3.3.1-013	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-014	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-015	Consistent with the GALL-SLR Report
3.3.1-016	Not applicable to MNGP
3.3.1-017	Not applicable to MNGP
3.3.1-018	Not applicable to MNGP
3.3.1-019	Not applicable to MNGP
3.3.1-020	Consistent with the GALL-SLR Report
3.3.1-021	Consistent with the GALL-SLR Report
3.3.1-022	Consistent with the GALL-SLR Report
3.3.1-023	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-024	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-025	Consistent with the GALL-SLR Report
3.3.1-026	Not applicable to MNGP
3.3.1-027	Not applicable to MNGP
3.3.1-028	Not applicable to BWRs

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-029	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-030	Not applicable to MNGP
3.3.1-030a	Not applicable to MNGP
3.3.1-031	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-032	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-032a	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-033	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-034	Consistent with the GALL-SLR Report
3.3.1-035	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-036	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-037	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.2)
3.3.1-038	Consistent with the GALL-SLR Report
3.3.1-039	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-040	Consistent with the GALL-SLR Report
3.3.1-041	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-042	Consistent with the GALL-SLR Report
3.3.1-043	Not applicable to MNGP
3.3.1-044	Consistent with the GALL-SLR Report
3.3.1-045	Consistent with the GALL-SLR Report
3.3.1-046	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.3)
3.3.1-047	Consistent with the GALL-SLR Report
3.3.1-048	Not applicable to MNGP
3.3.1-049	Consistent with the GALL-SLR Report
3.3.1-050	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.4)
3.3.1-051	Not applicable to MNGP
3.3.1-052	Consistent with the GALL-SLR Report
3.3.1-053	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-054	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-055	Consistent with the GALL-SLR Report
3.3.1-056	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-057	Consistent with the GALL-SLR Report
3.3.1-058	Consistent with the GALL-SLR Report
3.3.1-059	Consistent with the GALL-SLR Report
3.3.1-060	Consistent with the GALL-SLR Report
3.3.1-061	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-062	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-063	Consistent with the GALL-SLR Report
3.3.1-064	Consistent with the GALL-SLR Report
3.3.1-065	Not applicable to MNGP
3.3.1-066	Consistent with the GALL-SLR Report
3.3.1-067	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-068	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-069	Consistent with the GALL-SLR Report
3.3.1-070	Consistent with the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-071	Consistent with the GALL-SLR Report
3.3.1-072	Consistent with the GALL-SLR Report
3.3.1-073	Not applicable to MNGP
3.3.1-074	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-075	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-076	Consistent with the GALL-SLR Report
3.3.1-077	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-078	Consistent with the GALL-SLR Report
3.3.1-079	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-080	Consistent with the GALL-SLR Report
3.3.1-081	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-082	Consistent with the GALL-SLR Report
3.3.1-083	Not applicable to MNGP
3.3.1-084	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-085	Consistent with the GALL-SLR Report
3.3.1-086	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-087	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-088	Consistent with the GALL-SLR Report
3.3.1-089	Consistent with the GALL-SLR Report
3.3.1-090	Consistent with the GALL-SLR Report
3.3.1-091	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.5)
3.3.1-092	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-093	Consistent with the GALL-SLR Report
3.3.1-094	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.4)
3.3.1-094a	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.3)
3.3.1-095	Consistent with the GALL-SLR Report
3.3.1-096	Consistent with the GALL-SLR Report
3.3.1-096a	Consistent with the GALL-SLR Report
3.3.1-096b	Not applicable to MNGP
3.3.1-097	Consistent with the GALL-SLR Report
3.3.1-098	Consistent with the GALL-SLR Report
3.3.1-099	Consistent with the GALL-SLR Report
3.3.1-100	Consistent with the GALL-SLR Report
3.3.1-101	Consistent with the GALL-SLR Report
3.3.1-102	Consistent with the GALL-SLR Report
3.3.1-103	Not applicable to MNGP
3.3.1-104	Not applicable to MNGP
3.3.1-105	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-106	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-107	Not applicable to MNGP
3.3.1-108	Not applicable to MNGP
3.3.1-109	Consistent with the GALL-SLR Report
3.3.1-109a	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-110	Not Used (addressed by 3.3.1-020 and 3.3.1-244)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-111	Not Used (addressed by 3.5.1-100) (see SE Section 3.3.2.1.1)
3.3.1-112	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.9)
3.3.1-113	Consistent with the GALL-SLR Report
3.3.1-114	Consistent with the GALL-SLR Report
3.3.1-115	Not applicable to MNGP
3.3.1-116	Consistent with the GALL-SLR Report
3.3.1-117	Consistent with the GALL-SLR Report
3.3.1-118	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-119	Consistent with the GALL-SLR Report
3.3.1-120	Consistent with the GALL-SLR Report
3.3.1-121	Consistent with the GALL-SLR Report
3.3.1-122	Not applicable to MNGP
3.3.1-123	Not applicable to MNGP
3.3.1-124	Consistent with the GALL-SLR Report
3.3.1-125	Consistent with the GALL-SLR Report
3.3.1-126	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.6)
3.3.1-127	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.7)
3.3.1-128	Not applicable to MNGP
3.3.1-129	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-130	Consistent with the GALL-SLR Report
3.3.1-131	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.7)
3.3.1-132	Consistent with the GALL-SLR Report
3.3.1-133	Not applicable to MNGP
3.3.1-134	Consistent with the GALL-SLR Report
3.3.1-135	Consistent with the GALL-SLR Report
3.3.1-136	Consistent with the GALL-SLR Report
3.3.1-137	Not applicable to MNGP
3.3.1-138	Consistent with the GALL-SLR Report
3.3.1-139	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.8)
3.3.1-140	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.9)
3.3.1-141	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-142	Consistent with the GALL-SLR Report
3.3.1-143	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-144	Consistent with the GALL-SLR Report
3.3.1-145	Consistent with the GALL-SLR Report
3.3.1-146	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.3)
3.3.1-147	Not applicable to MNGP
3.3.1-148	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-149	Not applicable to MNGP
3.3.1-150	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.10)
3.3.1-151	Consistent with the GALL-SLR Report
3.3.1-152	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-153	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-154	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-155	Consistent with the GALL-SLR Report
3.3.1-156	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-157	Consistent with the GALL-SLR Report
3.3.1-158	Not applicable to MNGP
3.3.1-159	Not applicable to MNGP
3.3.1-160	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.11)
3.3.1-161	Not Used (addressed by 3.3.1-151)
3.3.1-162	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-163	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-164	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-165	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-166	Not applicable to MNGP
3.3.1-167	Not applicable to MNGP
3.3.1-168	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-169	Consistent with the GALL-SLR Report
3.3.1-170	Consistent with the GALL-SLR Report
3.3.1-171	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-172	Not applicable to MNGP
3.3.1-173	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-174	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-175	Consistent with the GALL-SLR Report
3.3.1-176	Not Used (addressed by 3.3.1-175)
3.3.1-177	Not applicable to MNGP
3.3.1-178	Not applicable to MNGP
3.3.1-179	Consistent with the GALL-SLR Report
3.3.1-180	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-181	Not applicable to MNGP
3.3.1-182	Not Used (addressed by 3.2.1-087)
3.3.1-183	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-184	Not applicable to MNGP
3.3.1-185	Not applicable to MNGP
3.3.1-186	Not applicable to MNGP (see SE Section 3.3.2.2.8)
3.3.1-187	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-188	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-189	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.8)
3.3.1-190	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-191	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-192	Not applicable to MNGP (see SE Section 3.3.2.2.8)
3.3.1-193	Consistent with the GALL-SLR Report
3.3.1-194	Not applicable to MNGP
3.3.1-195	Consistent with the GALL-SLR Report
3.3.1-196	Not applicable to MNGP
3.3.1-197	Consistent with the GALL-SLR Report
3.3.1-198	Not Used (addressed by 3.3.1-064)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-199	Consistent with the GALL-SLR Report
3.3.1-200	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-201	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-202	Not applicable to MNGP (see SE Section 3.3.2.2.9)
3.3.1-203	Consistent with the GALL-SLR Report
3.3.1-204	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-205	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.3)
3.3.1-206	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-207	Not applicable to MNGP
3.3.1-208	Not applicable to MNGP
3.3.1-209	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-210	Not applicable to MNGP
3.3.1-211	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-212	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-213	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-214	Not applicable to MNGP
3.3.1-215	Not applicable to MNGP
3.3.1-216	Not applicable to MNGP
3.3.1-217	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-218	Not applicable to MNGP
3.3.1-219	Not applicable to MNGP
3.3.1-220	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-221	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-222	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.4)
3.3.1-223	Not applicable to MNGP (see SE Section 3.3.2.2.10)
3.3.1-224	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-225	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-226	Not applicable to MNGP
3.3.1-227	Not applicable to MNGP (see SE Section 3.3.2.2.10)
3.3.1-228	Not applicable to MNGP (see SE Section 3.3.2.2.4)
3.3.1-229	Not applicable to MNGP
3.3.1-230	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.9)
3.3.1-231	Not applicable to MNGP (see SE Section 3.3.2.2.3)
3.3.1-232	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.4)
3.3.1-233	Not applicable to MNGP (see SE Section 3.3.2.2.8)
3.3.1-234	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.10)
3.3.1-235	Consistent with the GALL-SLR Report
3.3.1-236	Not applicable to MNGP
3.3.1-237	Not applicable to MNGP
3.3.1-238	Not applicable to MNGP
3.3.1-239	Not applicable to MNGP
3.3.1-240	Not applicable to MNGP (see SE Section 3.3.2.2.10)
3.3.1-241	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.4)
3.3.1-242	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.10)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-243	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-244	Consistent with the GALL-SLR Report
3.3.1-245	Not applicable to MNGP (see SE Section 3.3.2.2.10)
3.3.1-246	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.4)
3.3.1-247	Not applicable to MNGP (see SE Section 3.3.2.2.10)
3.3.1-248	Not applicable to MNGP
3.3.1-249	Consistent with the GALL-SLR Report
3.3.1-250	Not applicable to MNGP
3.3.1-251	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-252	Not applicable to MNGP
3.3.1-253	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.2)
3.3.1-254	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.8)
3.3.1-255	Consistent with the GALL-SLR Report
3.3.1-256	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-257	Consistent with the GALL-SLR Report
3.3.1-258	Consistent with the GALL-SLR Report
3.3.1-259	Not applicable to MNGP
3.3.1-260	Consistent with the GALL-SLR Report
3.3.1-261	Not applicable to MNGP
3.3.1-262	Not applicable to MNGP
3.3.1-263	Consistent with the GALL-SLR Report
3.3.1-264	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.3.1-265	Not applicable to MNGP
3.3.1-266	Not applicable to MNGP
3.3.1-267	Not applicable to MNGP
3.3.1-268	Consistent with the GALL-SLR Report
3.3.1-269	Consistent with the GALL-SLR Report

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

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

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

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

3.3.2.1 Results Consistent with the GALL-SLR Report

The following subsections document the NRC staff's review of AMR results listed in SLRA Tables 3.3.2-1 through 3.3.2-18 that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat its review of the matters described in the GALL-SLR Report. The staff verified that the material presented in the SLRA was applicable and the applicant identified the appropriate GALL-SLR Report AMRs. For those AMR items that the staff found to be consistent with the GALL-SLR Report, and for which no additional evaluation or RAI applies, the staff's review and conclusions, as documented in the GALL-SLR Report, are considered to be the basis for acceptability of the AMR items. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SE Table 3.3-1, and a separate writeup is neither required nor provided. For AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in Sections 3.3.2.1.2 through 3.3.2.1.11 below.

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

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

For SLRA Table 3.3-1, items 3.3.1-010, 3.3.1-016 through 3.3.1-019, 3.3.1-026, 3.3.1-027, 3.3.1-030, 3.3.1-030a, 3.3.1-043, 3.3.1-048, 3.3.1-051, 3.3.1-065, 3.3.1-073, 3.3.1-083, 3.3.1-096a, 3.3.1-103, 3.3.1-104, 3.3.1-107, 3.3.1-108, 3.3.1-115, 3.3.1-122, 3.3.1-123, 3.3.1-128, 3.3.1-133, 3.3.1-137, 3.3.1-147, 3.3.1-149, 3.3.1-158, 3.3.1-159, 3.3.1-166, 3.3.1-167, 3.3.1-172, 3.3.1-177, 3.3.1-178, 3.3.1-181, 3.3.1-184, 3.3.1-185, 3.3.1-186, 3.3.1-192, 3.3.1-194, 3.3.1-196, 3.3.1-202, 3.3.1-207, 3.3.1-208, 3.3.1-210, 3.3.1-214 through 3.3.1-216, 3.3.1-218, 3.3.1-219, 3.3.1-223, 3.3.1-226 through 3.3.1-229, 3.3.1-231, 3.3.1-233, 3.3.1-236 through 3.3.1-240, 3.3.1-245, 3.3.1-247, 3.3.1-248, 3.3.1-250, 3.3.1-252, 3.3.1-259, 3.3.1-261, 3.3.1-262 and 3.3.1-265 through 3.3.1-028 the applicant claims that the corresponding AMR items in the GALL-SLR Report are neither used nor applicable to MNGP. The staff reviewed the SLRA and USAR and confirmed that the applicant's SLRA does not have any AMR results that are applicable to these items.

For SLRA Table 3.3-1, items 3.3.1-003, 3.3.1-003a, 3.3.1-007, 3.3.1-008, 3.3.1-009 and 3.3.1-028, the applicant claims that the corresponding AMR item in the GALL-SLR Report is not applicable because the associated item is applicable to only PWRs. The staff reviewed the SRP-SLR, confirmed that this item only applies to PWRs, and finds that this item is not applicable because MNGP is a BWR.

For the following SLRA Table 3.1-1 items, the applicant claims that the corresponding items in the GALL-SLR Report are not used because they are addressed by other SLRA Table 1 items: 3.3.1-110 (addressed by 3.3.1-020 and 3.3.1-244), 3.3.1-111 (addressed by 3.3-1, 100), 3.3.1-161 (addressed by 3.3.1-151), 3.3.1-176 (addressed by 3.3.1-175), 3.3.1-182 (addressed by 3.2.1-087), and 3.3.1-198 (addressed by 3.3.1-064). The staff reviewed the SLRA and confirmed that the aging effects will be addressed by other SLRA Table 1 items. Therefore, the staff finds the applicant's proposal to use alternate items acceptable.

SLRA Table 3.3-1, AMR item 3.3.1-111, addresses managing loss of material due to general, pitting, and crevice corrosion for structural steel exposed to air-indoor uncontrolled environment. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim, as modified by SLRA Supplement 2 (ML23177A218), and finds it acceptable because this AMR item applies to new fuel storage racks made of steel. The aging effect of loss of material due to pitting and crevice corrosion and cracking due to SCC for new aluminum fuel storage racks exposed to air-indoor uncontrolled environment is managed by the Structures Monitoring program and addressed under AMR item 3.5.1-100.

3.3.2.1.2 Loss of Material

SLRA Table 3.3-1, AMR item 3.3.1-037 addresses loss of material due to general, pitting, crevice corrosion, microbiologically influenced corrosion (MIC), and flow blockage due to fouling for nickel alloy, copper-alloy piping and piping components exposed to raw water. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage loss of material in carbon steel chiller components and exposed to raw water. Based on its review of components associated with AMR item 3.3.1-037 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 program acceptable because based on the staff's review of GALL-SLR Report item VII.C1.AP-194, loss of material can be effectively managed for carbon steel components exposed to raw water using this program.

SLRA Table 3.3-1, AMR item 3.3.1-253 addresses loss of material for polyvinyl chloride (PVC) pump casing components exposed to treated water. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage loss of material in PVC pump casing components exposed to treated water. Based on its review of components associated with AMR item 3.3.1-253 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 program acceptable because based on the staff's review of GALL-SLR Report item VII.G.A-787b, loss of material can be effectively managed for PVC components exposed to treated water using this program.

3.3.2.1.3 Loss of Material Due to General (Steel Only), Pitting, Crevice Corrosion, MIC

SLRA Table 3.3-1, AMR item 3.3.1-046 addresses loss of material for gray cast iron components on the shell side of heat exchangers and copper alloy with greater than 15 percent zinc tubes and tube sheets exposed to closed-cycle cooling water. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting program to manage the aging effect for gray cast iron components on the shell side of heat exchangers and copper alloy with greater than 15 percent zinc tubes and tube sheets. Based on its review of components associated with AMR item 3.3.1-046, 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 program acceptable because the program includes visual inspections that are capable of detecting loss of material.

3.3.2.1.4 Reduction of Heat Transfer Due to Fouling

SLRA Table 3.3-1, AMR item 3.3.1-050 addresses reduction of heat transfer due to fouling for copper alloy with greater than 15 percent zinc heat exchanger tubes exposed externally to closed-cycle cooling water. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting program to manage the aging effect for copper alloy with greater than 15 percent zinc heat exchanger tubes. Based on its review of components associated with AMR item 3.3.1-050 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 program acceptable because the program includes visual inspections that are capable of detecting fouling.

3.3.2.1.5 Loss of Material Due to General, Pitting, Crevice Corrosion, MIC; Flow Blockage Due to Fouling

SLRA Table 3.3-1, AMR item 3.3.1-091 addresses (1) loss of material due to general, pitting, and crevice corrosion, and MIC and (2) flow blockage due to fouling for steel piping, piping components, heat exchanger components, and tanks exposed to wastewater. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the External Surfaces Monitoring of Mechanical Components program to manage loss of material for steel drip pans exposed to wastewater. Based on its review of components associated with AMR item 3.3.1-091 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 for the following two reasons:

(1) The intended function of the subject components is leakage boundary not pressure boundary; therefore, flow blockage due to fouling is not an aging effect requiring management.

(2) Based on the staff's review of GALL-SLR Report item VII.E5.A-410, loss of material can be effectively managed for steel components exposed to waste water using the External Surfaces Monitoring of Mechanical Components program.

3.3.2.1.6 Wall Thinning Due to Erosion

SLRA Table 3.3-1, item 3.3.1-126, addresses wall thinning due to erosion for piping, valves, and other component types with steel, stainless steel, gray cast iron, and copper alloy materials, exposed to a raw water environment. The SLRA cites generic note E and credits either the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, the Open-Cycle Cooling Water System program, or the Fire Water System program, instead of the GALL-recommended Flow-Accelerated Corrosion program, to manage wall thinning due to erosion.

Based on its review of components associated with item 3.3.1-126 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the three above-named programs acceptable, because periodic visual inspections of internal surfaces performed for each program are capable of detecting wall thinning due to erosion, which is consistent with the guidance in the Flow-Accelerated Corrosion program to use plant-specific OE to identify susceptible locations.

3.3.2.1.7 Flow Blockage due to Fouling of Steel, Stainless Steel, Copper Alloy, and Aluminum

SLRA Table 3.3-1, AMR item 3.3.1-131 addresses flow blockage of steel, stainless steel, copper alloy, or aluminum piping and piping components exposed to air or condensation. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the Fire Protection program to manage flow blockage for the stainless steel halon system spray nozzles exposed internally to condensation. These AMR items cite plant-specific note 4, which states, “The Fire Protection (B.2.3.15) program will be used to manage flow blockage in stainless steel halon system spray nozzles with an internal environment of Condensation.”

In addition, for the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage flow blockage for the carbon steel strainers (elements) exposed internally to condensation. This AMR item cites plant-specific note 1, which states, “The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.3.24) AMP is being substituted for the Fire Water System (B.2.3.16) program to manage flow blockage of the carbon steel strainer element components exposed to condensation.”

Based on its review of components associated with AMR items 3.3.1-131 for which the applicant cited generic note E, the staff finds the applicant’s proposal to manage flow blockage for the stainless steel halon system spray nozzles using the Fire Protection program acceptable because the periodic functional test and air flow test through the headers and nozzles performed by the program are capable of detecting blockage before a loss of intended function. Managing aging of the halon fire suppression system by the Fire Protection program is consistent with the GALL-SLR Report. In addition, the staff finds the applicant’s proposal to manage flow blockage for the carbon steel strainers (elements) using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because the inspections performed by the program are capable of detecting flow blockage before a loss of intended function.

3.3.2.1.8 Loss of Material due to General Corrosion, Pitting, Crevice Corrosion, and MIC

SLRA Table 3.3-1, AMR item 3.3.1-139 addresses loss of material due to general corrosion, pitting, crevice corrosion, MIC for metallic piping, piping components, heat exchangers, and tanks with Internal Coatings/linings exposed to closed-cycle cooling water, raw water, raw water (potable), treated water, treated borated water, wastewater, lubricating oil, fuel oil, air–dry, air, and condensation. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the following AMPs.

<u>Fire Water System</u>

For the SLRA Table 2 AMR item that cite generic note E, the SLRA (as amended by letter dated June 26, 2023 (ML23177A218)) credits the Fire Water System program for managing loss of material for internally coated gray cast iron and ductile iron fire system piping and piping components exposed to raw water.

Based on its review of components associated with AMR item 3.3.1-139 for which the applicant cited generic note E, the staff finds the applicant’s proposal to manage loss of material using the Fire Water System program acceptable because these same components also cite AMR item 3.3.1-138, for which the applicant cites generic note A, to manage loss of coating or lining integrity. Also, the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program requires opportunistic inspections, flow tests capable of detecting through-wall flaws, and consideration of plant-specific OE consistent with the guidance in SLR-ISG-2021-02-MECHANICAL for these components. Finally, the Fire Water System program requires follow-up volumetric inspection when irregularities are detected, making the Fire Water System program more appropriate than the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program for detecting and managing loss of material for this component.

Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program for managing loss of material for internally coated gray cast iron radwaste piping/piping components exposed to wastewater, carbon steel reactor building cooling water heat exchanger tube side components exposed to raw water, carbon steel depth filter/softener tanks/brine tanks exposed to raw water, carbon steel circulating water piping/piping components exposed to raw water, carbon steel service/seal water piping/piping components exposed to raw water, carbon steel recirculating motor generator set oil cooler heat exchanger tube side components exposed to raw water, and carbon steel SLC accumulator exposed to treated water.

Based on its review of components associated with AMR item 3.3.1-139 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage loss of material using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because that program is appropriate for assessing loss of material and detecting surface irregularities that could be indicative of corrosion. For the carbon steel components listed in the preceding paragraph, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program also specifies volumetric examination following the detection of surface irregularities. In addition, loss of material due to selective leaching for gray cast iron components also is managed by the Selective Leaching program described in Section 3.3.2.1.9. Finally, it should be noted all the components described in the preceding paragraph also cite AMR item 3.3.1-138, for which the applicant cites generic note A, to manage loss of coating or lining integrity.

One-Time Inspection combined with Water Chemistry

For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the One-Time Inspection program combined with the Water Chemistry program to manage loss of material for internally coated carbon steel skimmer surge tanks exposed to treated water.

Based on its review of components associated with AMR item 3.3.1-139 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage loss of material using the One-Time Inspection program combined with the Water Chemistry program acceptable because this same component also cites AMR item 3.3.1-138, for which the applicant cites generic note A, to manage loss of coating or lining integrity. Also, the GALL-SLR Report considers a Water Chemistry program based on industry guidelines contained in BWRVIP-190 to be an acceptable method of mitigating the aging effects of loss of material due to corrosion in components exposed to treated water.

Open-Cycle Cooling Water System

For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Open-Cycle Cooling Water System program to manage loss of material for internally coated carbon steel residual heat removal heat exchanger tube side components, gray cast iron emergency diesel generator jacket water heat exchanger tube side components, carbon steel emergency filtration train condenser tube side and tube sheet components, and carbon steel emergency service water piping/piping components. All these components are exposed to raw water.

Based on its review of components associated with AMR item 3.3.1-139 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage loss of material using the Open-Cycle Cooling Water System program acceptable because these same components also cite AMR item 3.3.1-138, for which the applicant cites generic note A, to manage loss of coating or lining integrity. Also, the Open-Cycle Cooling System program implements enhancements to the guidance in NRC GL 89-13 that address OE to provide reasonable assurance that the aging effect of loss of material is adequately managed.

3.3.2.1.9 Loss of Material due to Selective Leaching

SLRA Table 3.3-1, AMR item 3.3.1-140 addresses loss of material due to selective leaching. For the SLRA Table 2 AMR item that cites generic note E, the SLRA (as amended by letter dated June 26, 2023 (ML23177A218)) credits the Selective Leaching program for managing loss of material due to selective leaching for internally coated gray cast iron radwaste piping/piping components exposed to waste water, heat exchanger jacket water tube side components exposed to raw water, and gray cast iron and ductile iron fire system piping/piping components exposed to raw water.

Based on its review of components associated with AMR item 3.3.1-140 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage loss of material due to selective leaching using the Selective Leaching program acceptable because these same components also cite AMR item 3.3.1-138, for which the applicant cites generic note A, for managing loss of coating or lining integrity. Also, the Selective Leaching program contains additional mechanical and destructive testing requirements not found in the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program, which are appropriate condition monitoring regimens for materials such as gray cast iron and ductile iron that are susceptible to selective leaching.

3.3.2.1.10 Cracking and Loss of Material Exposed to Air (Outdoor and Indoor Uncontrolled)

SLRA Table 3.3-1, AMR item 3.3.1-150 addresses loss of material and cracking for fiberglass electrical enclosures exposed to outdoor air or uncontrolled indoor air. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Structures Monitoring program for managing the aging effect for fiberglass electrical enclosures. Based on its review of components associated with AMR item 3.3.1-150, 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 the Structures Monitoring program includes inspection of the component supports commodity group and architectural items with periodic visual inspections performed by personnel qualified in accordance with GALL-SLR requirements using criteria derived from industry codes and standards contained in the plant CLB.

3.3.2.1.11 Cracking due to Stress Corrosion Cracking

SLRA Table 3.3-1, AMR item 3.3.1-160, as modified by Supplement 2 (ML23177A218), addresses cracking due to SCC for copper alloy (with greater than 15 percent zinc or 8 percent aluminum) piping, piping components, and heat exchanger components exposed to closed-cycle cooling water, raw water, or wastewater. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program for managing cracking for heat exchanger tubes and tube sheets, piping and piping components, and valves made of copper alloy (with greater than 15 percent zinc) and exposed to raw water and closed-cycle cooling water. The GALL-SLR Report recommends the use of programs similar to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program for managing this material-environment-aging effect combination. The staff notes that the AMR item submitted with a note E and crediting the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting program could have been submitted as a note A. Based on its review of components associated with AMR item 3.3.1-160 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 program acceptable because it is consistent with the recommendation in the GALL-SLR.

3.3.2.2 Aging Management Review Results for which Further Evaluation Is Recommended by the GALL-SLR Report

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

3.3.2.2.1 Cumulative Fatigue Damage

SLRA Section 3.3.2.2.1, as supplemented by letter on July 18, 2023 (ML23199A154), is associated with SLRA Table 3.3-1 items 3.3.1-001 and 3.3.1-002. The applicant indicated the TLAA on cumulative fatigue damage in the components of the auxiliary systems is evaluated in accordance with 10 CFR 54.21(c) and is addressed in SLRA Section 4.3. In addition, the applicant explained that the fatigue TLAA for the cranes and lifting devices is addressed in SLRA 4.6.1, and the fatigue TLAA for the condensate backwash receiving tank is addressed in SLRA Section 4.6.3.

The staff finds that the applicant's aging management review results for the fatigue TLAA are consistent with SRP-SLR Section 3.3.2.2.1 and are, therefore acceptable. The staff's evaluation of the fatigue TLAA for the components of the auxiliary systems is documented in SE Section 4.3. In addition, the staff's evaluation of the fatigue TLAA for cranes and lifting devices is documented in SE Section 4.6.1 and the staff's evaluation of the fatigue TLAA for the condensate backwash receiving tank is documented in SE Section 4.6.3.

3.3.2.2.2 Cracking Due to SCC and Cyclic Loading

SLRA Section 3.3.2.2.2, associated with SLRA Table 3.3-1 items 3.3.1-003 and 3.3.1-003a, applies to SCC and cyclic loading that could occur in stainless steel PWR nonregenerative heat exchanger tubing exposed to treated borated water greater than 60°C (140°F) in the chemical and volume control system. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria of SRP-SLR Section 3.3.2.2.2 and finds the claim acceptable because the item is only applicable to PWRs.

3.3.2.2.3 Cracking Due to SCC in Stainless Steel Alloys

SLRA Section 3.3.2.2.3, as modified by SLRA Supplement 4 (ML23199A154) and in response to RAI B.2.3.17-1 (ML23265A158), is associated with SLRA Table 3.3-1, AMR items 3.3.1-004, 3.3.1-094a, 3.3.1-146 and 3.3.1-205 and addresses cracking due to SCC for stainless steel piping, piping components, and tanks, both insulated and uninsulated, and ducting and ducting components, exposed to air or condensation, which will be managed by the (1) One-Time Inspection program, (2) Buried and Underground Piping and Tanks program, and (3) ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.3.

In its review of components associated with AMR items 3.3.1-004, 3.3.1-094a, and 3.3.1-205, which cite generic note A, the staff finds that the applicant has met the further evaluation criteria and its proposal to manage the effects of aging using the One-Time Inspection program is acceptable because the plant-specific OE does not reveal a history of cracking due to SCC for these components, and the proposed one-time inspections are capable of detecting if cracking is occurring.

By letter dated July 18, 2023 (ML23199A154), the applicant amended SLRA Section 3.3.2.2.3 and added AMR item 3.3.1-146 to address cracking due to SCC for underground stainless steel piping, which will be managed by the Buried and Underground Piping and Tanks program. The amended application section notes that a portion of the carbon steel control rod drive system piping had been replaced with stainless steel piping due to plant-specific OE, which had identified corrosion from occasional wetting. The applicant clarified several aspects associated with the Buried and Underground Piping and Tanks program in its responses to RAI B.2.3.27-3 (ML23237A483) and RAI B.2.3.27-3a (ML23313A158) and through SLRA Supplement 8. The staff's evaluation and acceptance of the applicant's responses to RAI B.2.3.27-3, B.2.3.27-3a and their proposal to manage the associated effects of aging with the cited program is documented in SE Section 3.0.3.2.19, "Buried and Underground Piping and Tanks."

By letter dated September 22, 2023 (ML23265A158), in response to RAI B.2.3.17-1, the applicant amended SLRA Section 3.3.2.2.3 and AMR item 3.3.1-004 to address SCC of the stainless steel SLC tank as a result of plant-specific OE. In lieu of the One-Time Inspection program, the applicant proposed the use of the ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD program to manage the associated effects of aging. As clarified in response to RAI B.2.3.17-1a (ML23313A158), the applicant noted that the current in-service inspection plan includes periodic system leakage tests (i.e., three times during each 10-year in-service inspection period) of the SLC system, which include the tank.

In its review of components associated with AMR item 3.3.1-004, which cite generic note E, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the above cited program is acceptable because the periodic system leakage test of the SLC system through the ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD program are capable of identifying cracking on the tank prior to a loss of intended.

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

SLRA Section 3.3.2.2.3 also includes AMR item 3.3.1-231, which addresses cracking due to SCC for stainless steel tanks within the scope of the Outdoor and Large Atmospheric Metallic Storage Tanks program that are exposed to air or condensation. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because, based on a review of the USAR and SLRA, there are no stainless steel tanks within the scope of the cited program in the auxiliary systems.

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

SLRA Section 3.3.2.2.4, as modified by SLRA Supplement 4 (ML23199A154) and in response to RAI B.2.3.17-1 (ML23265A158), is associated with SLRA Table 3.3-1, AMR items 3.3.1-006, 3.3.1-094, 3.3.1-222, 3.3.1-232, 3.3.1-241, and 3.3.1-246 and addresses loss of material due to pitting and crevice corrosion for stainless steel and nickel alloy piping, piping components, tanks, ducting components, and heat-exchanger components exposed to air or condensation, which will be managed by the One-Time Inspection program or the Buried and Underground Piping and Tanks program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.4.

In its review of components associated with AMR items 3.3.1-006, 3.3.1-094, 3.3.1-222, 3.3.1-232, and 3.3.1-241, 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 One-Time Inspection program acceptable because the plant-specific OE does not reveal a history of loss of material due to pitting or crevice corrosion for these components, and the proposed one-time inspections are capable of detecting whether loss of material is occurring.

By letter dated July 18, 2023 (ML23199A154), the applicant amended SLRA Section 3.3.2.2.4 and AMR item 3.3.1-246 to addresses loss of material due to pitting and crevice corrosion for underground stainless steel and nickel alloy piping, piping components, and tanks, which will be managed by the Buried and Underground Piping and Tanks program. The amended application section notes that a portion of the carbon steel control rod drive system piping had been replaced with stainless steel piping due to plant-specific OE, which had identified corrosion from occasional wetting. The applicant clarified several aspects associated with the Buried and Underground Piping and Tanks program in its responses to RAI B.2.3.27-3 (ML23237A483) and RAI B.2.3.27-3a (ML23313A158) and through SLRA Supplement 8. The staff's evaluation and acceptance of the applicant's response to RAI B.2.3.27-3, B.2.3.27-3a and their proposal to manage the associated effects of aging with the cited program is documented in SE Section 3.0.3.2.19, "Buried and Underground Piping and Tanks."

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

SLRA Section 3.3.2.2.4 also includes AMR item 3.3.1-228, which addresses loss of material due to pitting or crevice corrosion for stainless steel and nickel alloy tanks within the scope of the Outdoor and Large Atmospheric Metallic Storage Tanks program that are exposed to air or condensation. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because based on a review of the USAR and SLRA, there are no in-scope stainless steel or nickel alloy tanks within the scope of the cited program in the auxiliary systems.

3.3.2.2.5 Quality Assurance for Aging Management of Nonsafety-Related Components

SE Section 3.0.4 documents the NRC staff's evaluation of the applicant's QA Program.

3.3.2.2.6 Ongoing Review of Operating Experience

SE Section 3.0.5 documents the NRC staff's evaluation of the applicant's ongoing review of OE.

3.3.2.2.7 Loss of Material Due to Recurring Internal Corrosion

SLRA Section 3.3.2.2.7 is associated with SLRA Table 3.3-1, item 3.3.1-127, for loss of material due to recurring internal corrosion of metallic piping components and tanks exposed to several water environments. The applicant stated that recurring internal corrosion is an applicable aging effect for steel components in raw water systems containing Mississippi River water. The applicant also stated that the associated programs managing this material-environment-aging effect combination (i.e., Open-Cycle Cooling Water Systems, Fire Water System, and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components) are enhanced to address this issue.

The staff reviewed the applicant's disposition of recurring internal corrosion against the criteria in SRP-SLR Section 3.3.2.2.7 for the components associated with item 3.3.1-127. The staff notes that the applicant's Open-Cycle Cooling Water System program and Fire Water System program include specific enhancements to the "corrective action" program elements to address this issue. In addition, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting program is a new program for SLR that includes specific considerations to manage recurring internal corrosion. Based on the above, the staff determined the applicant has adequately addressed recurring internal corrosion in auxiliary systems and finds that the applicant's approach will adequately manage this aging effect/mechanism.

3.3.2.2.8 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

SLRA Section 3.3.2.2.8, associated with SLRA Table 3.3-1, AMR items 3.3.1-189 and 3.3.1-254, addresses cracking due to SCC for aluminum piping, piping components, and tanks exposed to air, condensation, raw water, raw water (potable), wastewater, and heat exchanger components exposed to air or condensation, which will be managed by the One-Time Inspection program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.8.

In its review of components associated with AMR items 3.3.1-189 and 3.3.1-254, 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 One-Time Inspection program is acceptable because the plant-specific OE does not reveal a history of cracking due to SCC for these components, and the proposed one-time inspections are capable of detecting whether cracking is occurring.

Based on the program identified, the staff concludes that the applicant's programs meet SRP-SLR Section 3.3.2.2.8 criteria. For those AMR items associated with SLRA Section 3.3.2.2.8, the staff concludes that the SLRA is consistent with the GALL-SLR Report and 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 subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

SLRA Section 3.3.2.2.8, associated with SLRA Table 3.3-1, AMR items 3.3.1-186, 3.3.1-192, and 3.3.1-233 addresses cracking due to SCC for aluminum tanks within the scope of GALL-SLR AMP XI.M29 exposed to air, condensation, soil, concrete, raw water, or wastewater, underground piping, piping components and tanks, and insulated aluminum piping, piping, and piping components exposed to air or condensation. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.8 and finds the claim acceptable because based on a review of the USAR and SLRA, there are no such aluminum components and environment combinations in the auxiliary systems.

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

SLRA Section 3.3.2.2.9, as modified in response to RAI B.2.3.17-1 (ML23265A158), is associated with SLRA Table 3.3-1, items 3.3.1-112 and 3.3.1-202, and addresses loss of material due to general (steel only), crevice, or pitting corrosion and cracking due to SCC (stainless steel only) for steel and stainless steel piping, piping components, exposed to concrete, which will be managed by the One-Time Inspection and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD programs. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.9.

For the AMR items associated with this further evaluation section, the discussion in SLRA Table 3.3-1 for item 3.3.1-112 states that there are no aging effects requiring management for steel components exposed to concrete that are not subject to wetting. The staff finds this determination acceptable because, as provided in the discussion in SRP-SLR Section 3.3.2.2.9, loss of material is not an applicable aging effect for steel piping if it is not potentially exposed to groundwater. The discussion in SLRA Table 3.3-1 for item 3.3.1-202, states that the only stainless steel component exposed to concrete that is susceptible to SCC is the SLC tank, which is addressed by item 3.3.1-230.

By letter dated September 22, 2023, the applicant modified the discussion in SLRA Table 3.3-1 for item 3.3.1-230 by including the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, in addition to the One-Time Inspection program. As clarified in response to RAI B.2.3.17-1a (ML23313A158), the applicant noted that the current in-service inspection plan includes periodic system leakage tests (i.e., three times during each 10-year in-service inspection period) of the SLC system, which include the tank. In addition, the applicant modified the discussion in SLRA Section 3.3.2.2.9 by noting that an internal One-Time Inspection using a volumetric inspection technique, consistent with the guidance from GALL-SLR Table XI.M29-1, note 3, will look for indications of aging on the inside of the SLC tank.

In its review of components associated with AMR items 3.3.1-230, which cite generic note E, the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the above-cited program is acceptable because the periodic system leakage tests of the SLC system through the ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD program and the proposed volumetric inspection through the One-Time Inspection program are capable of identifying loss of material and cracking on the tank prior to a loss of intended function.

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

SLRA Section 3.3.2.2.10, associated with SLRA Table 3.3-1, AMR items 3.3.1-234 and 3.3.1-242, addresses loss of material due to pitting and crevice corrosion for aluminum piping, piping components, tanks, and heat exchanger components exposed to air or condensation, which will be managed by the One-Time Inspection program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.10.

In its review of components associated with AMR items 3.3.1-234 and 3.3.1-242, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the One-Time Inspection program is acceptable because the plant-specific OE does not reveal a history of loss of material due to pitting or crevice corrosion for these components, and the proposed one-time inspections are capable of detecting whether loss of material is occurring.

SLRA Section 3.3.2.2.10, associated with SLRA Table 3.3-1, AMR items 3.3.1-223, 3.3.1-227, 3.3.1-240, 3.3.1-245, and 3.3.1-247, addresses loss of material due to pitting or crevice corrosion for aluminum underground piping, piping components, and tanks within the scope of GALL-SLR AMP XI.M29, insulated aluminum piping, piping components, and tanks exposed to air or condensation, and aluminum piping, piping components, tanks, and heat exchanger components exposed to wastewater. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.10 and finds it acceptable because based on a review of the USAR and SLRA, there are no such aluminum component and environment combinations in the auxiliary systems.

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

The following subsections document the staff's review of AMR results listed in SLRA Tables 3.3.2-1 through 3.3.2-18 that either are not consistent with or not addressed in the GALL-SLR 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 an SLRA Table 1 item, the subsections are organized by applicable AMR section and then by material and environment combinations.

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

3.3.2.3.1 Standby Liquid Control – Summary of Aging Management Evaluation

SLRA Table 3.3.2-17, states that loss of material and long-term loss of material for carbon steel piping and piping components exposed internally to sodium pentaborate solution will be managed by the Water Chemistry and One-Time Inspection program.

3.3.2.3.2 Loss of Material and Long-Term Loss of Material

SLRA Table 3.3.2-17 states that the loss of material and long-term loss of material for carbon steel piping and piping components will be managed by Water Chemistry and One-Time Inspection programs. The AMR items cite generic note G. The AMR items cite plant-specific note 1, which states, "The Water Chemistry Program (B.2.3.2) manages the aging effects on the SLC system components subject to the sodium pentaborate environment by monitoring and controlling SLC poison storage tank treated water chemistry. Aging effects on carbon steel exposed to a sodium pentaborate environment are established using a treated water environment."

The staff reviewed the associated items in the SLRA and considered whether the aging effects proposed by the applicant constitute all of the applicable aging effects for this component, material, and environment combination. Based on its review of GALL-SLR, which states that carbon steel is not typically susceptible to SCC but is mainly susceptible to loss of material, the staff finds that the applicant has identified all applicable aging effects for this component, material, and environment combination.

The staff also reviewed the following documents:

- NUREG/CR-6001, "Aging Assessment of BWR Standby Liquid Control Systems," dated August 17,1992. This report focused on the corrosion of stainless steel components and compared the corrosion of the Standby Liquid Control System to the corrosion in Spent Fuel Pool system as both systems involve borated chemistries and operate at similar temperature and pressures. The study concludes by stating that the pH in the SLC system is generally greater than 6.8, and this results in a less aggressive environment compared to the Spent Fuel Pool Environment.
- EPRI Report 1010639, "Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools," Revision 4, discusses the borated water in the SLC system. This EPRI report states that the borated water system typically uses sodium pentaborate decahydrate as its source of boron, and the pH of the solution in the system is in the 6.8–8.5 range, which is relatively benign to the typical materials in the system and is much less aggressive than concentrated boric acid.
- EPRI Report 1000975, "Boric Acid Corrosion Guidebook," Revision 1, outlines the corrosion rates of carbon and low alloy steel in various concentrations of aerated boric acid and states that the corrosion rates are typically low (0.05 mm/yr-1.1 mm/yr [0.002 in/yr-0.043 in/yr]) at temperatures up to 60°C.

The staff finds the applicant's proposal for managing aging effects acceptable because the Water Chemistry program will be used to monitor the concentrations of contaminants in the water storage tanks that provide the makeup water for the SLC system containing the sodium pentaborate solution. Furthermore, the staff find the applicant's proposal to use the One-Time Inspection program acceptable because the corrosion rates of the carbon steel piping and piping components are expected to be low enough so that the loss of material is not likely to cause a loss of intended function for these components. The One-Time Inspection will verify this or reveal a need for additional aging management activities.

3.4 Aging Management of Steam and Power Conversion Systems

3.4.1 Summary of Technical Information in the Application

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

3.4.2 Staff Evaluation

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

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

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4.1-001	Consistent with the GALL-SLR Report (see SE Section 3.4.2.2.1)
3.4.1-002	Consistent with the GALL-SLR Report (see SE Section 3.4.2.2.2)
3.4.1-003	Consistent with the GALL-SLR Report (see SE Section 3.4.2.2.3)
3.4.1-004	Not applicable to BWRs
3.4.1-005	Consistent with the GALL-SLR Report
3.4.1-006	Consistent with the GALL-SLR Report
3.4.1-007	Not applicable to MNGP
3.4.1-008	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-009	Consistent with the GALL-SLR Report
3.4.1-010	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-011	Consistent with the GALL-SLR Report
3.4.1-012	Consistent with the GALL-SLR Report
3.4.1-013	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-014	Consistent with the GALL-SLR Report
3.4.1-015	Consistent with the GALL-SLR Report
3.4.1-016	Consistent with the GALL-SLR Report
3.4.1-017	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-018	Consistent with the GALL-SLR Report
3.4.1-019	Not Used (addressed by 3.4.1-091)
3.4.1-020	Not applicable to MNGP
3.4.1-021	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-022	Not applicable to MNGP
3.4.1-023	Not applicable to MNGP
3.4.1-024	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-025	Not applicable to MNGP
3.4.1-026	Consistent with the GALL-SLR Report (see SE Section 3.4.2.1.2)
3.4.1-027	Not applicable to MNGP
3.4.1-028	Not applicable to MNGP
3.4.1-029	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-030	Consistent with the GALL-SLR Report
3.4.1-031	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-032	Not applicable to MNGP
3.4.1-033	Consistent with the GALL-SLR Report
3.4.1-034	Consistent with the GALL-SLR Report
3.4.1-035	Not applicable to MNGP (see SE Section 3.4.2.2.9)
3.4.1-036	Not applicable to MNGP
3.4.1-037	Consistent with the GALL-SLR Report
3.4.1-038	Not applicable to BWRs
3.4.1-039	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-040	Consistent with the GALL-SLR Report
3.4.1-041	Not applicable to BWRs
3.4.1-042	Not applicable to BWRs

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4.1-043	Consistent with the GALL-SLR Report
3.4.1-044	Consistent with the GALL-SLR Report
3.4.1-045	Not applicable to MNGP
3.4.1-046	Not applicable to BWRs
3.4.1-047	Consistent with the GALL-SLR Report
3.4.1-048	Not applicable to MNGP
3.4.1-049	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-050	Consistent with the GALL-SLR Report
3.4.1-051	Not applicable to MNGP (see SE Section 3.4.2.2.8)
3.4.1-052	Not applicable to MNGP
3.4.1-053	Not applicable to MNGP
3.4.1-054	Consistent with the GALL-SLR Report
3.4.1-055	Consistent with the GALL-SLR Report
3.4.1-056	Not applicable to MNGP
3.4.1-057	Not applicable to MNGP
3.4.1-058	Not applicable to MNGP
3.4.1-059	Consistent with the GALL-SLR Report
3.4.1-060	Consistent with the GALL-SLR Report
3.4.1-061	Not applicable to MNGP (see SE Section 3.4.2.2.6)
3.4.1-062	Consistent with the GALL-SLR Report
3.4.1-063	Consistent with the GALL-SLR Report
3.4.1-064	Not Used (addressed by 3.2.1-087)
3.4.1-065	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-066	Consistent with the GALL-SLR Report
3.4.1-067	Consistent with the GALL-SLR Report (see SE Section 3.4.2.1.3)
3.4.1-068	Not applicable to MNGP
3.4.1-069	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-070	Consistent with the GALL-SLR Report
3.4.1-071	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-072	Consistent with the GALL-SLR Report
3.4.1-073	Consistent with the GALL-SLR Report
3.4.1-074	Not applicable to MNGP (see SE Section 3.4.2.2.2)
3.4.1-075	Not applicable to MNGP
3.4.1-076	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-077	Consistent with the GALL-SLR Report
3.4.1-078	Not applicable to MNGP
3.4.1-079	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-080	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-081	Consistent with the GALL-SLR Report
3.4.1-082	Not applicable to MNGP (see SE Section 3.4.2.2.8)
3.4.1-083	Consistent with the GALL-SLR Report
3.4.1-084	Consistent with the GALL-SLR Report
3.4.1-085	Consistent with the GALL-SLR Report
3.4.1-086	Not applicable to MNGP

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4.1-087	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-088	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-089	Not applicable to MNGP
3.4.1-090	Consistent with the GALL-SLR Report
3.4.1-091	Consistent with the GALL-SLR Report
3.4.1-092	Not applicable to MNGP
3.4.1-093	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-094	Not applicable to MNGP (see SE Section 3.4.2.2.9)
3.4.1-095	Not applicable to MNGP (see SE Section 3.4.2.2.3)
3.4.1-096	Not applicable to MNGP
3.4.1-097	Not applicable to MNGP (see SE Section 3.4.2.2.9)
3.4.1-098	Not applicable to MNGP (see SE Section 3.4.2.2.3)
3.4.1-099	Not applicable to MNGP
3.4.1-100	Not applicable to MNGP (see SE Section 3.4.2.2.2)
3.4.1-101	Not applicable to MNGP
3.4.1-102	Not applicable to MNGP (see SE Section 3.4.2.2.7)
3.4.1-103	Consistent with the GALL-SLR Report (see SE Section 3.4.2.2.3)
3.4.1-104	Consistent with the GALL-SLR Report (see SE Section 3.4.2.2.2)
3.4.1-105	Not applicable to MNGP (see SE Section 3.4.2.2.7)
3.4.1-106	Consistent with the GALL-SLR Report (see SE Section 3.4.2.1.4)
3.4.1-107	Not applicable to MNGP
3.4.1-108	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-109	Not applicable to MNGP (see SE Section 3.4.2.2.7)
3.4.1-110	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-111	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-112	Not applicable to MNGP (see SE Section 3.4.2.2.7)
3.4.1-113	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-114	Not applicable to MNGP
3.4.1-115	Not applicable to MNGP
3.4.1-116	Not applicable to MNGP
3.4.1-117	Not applicable to MNGP
3.4.1-118	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-119	Not applicable to MNGP (see SE Section 3.4.2.2.9)
3.4.1-120	Not applicable to MNGP (see SE Section 3.4.2.2.9)
3.4.1-121	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.4.1-122	Consistent with the GALL-SLR Report
3.4.1-123	Not applicable to MNGP
3.4.1-124	Not applicable to MNGP
3.4.1-125	Not applicable to MNGP
3.4.1-126	Not applicable to MNGP
3.4.1-127	Not applicable to MNGP
3.4.1-128	Not applicable to MNGP
3.4.1-129	Not applicable to MNGP
3.4.1-130	Not applicable to MNGP

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4.1-131	Not applicable to BWRs
3.4.1-132	Not applicable to BWRs
3.4.1-133	Not applicable to MNGP
3.4.1-134	Not applicable to MNGP
3.4.1-135	Not applicable to MNGP
3.4.1-136	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report

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

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

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

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

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

The following subsections document the NRC staff's review of AMR results listed in SLRA Tables 3.4.2-1 through 3.4.2-6 that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat its review of the matters described in the GALL-SLR Report; however, the staff did verify that the material presented in the SLRA was applicable and that the applicant identified the appropriate GALL-SLR Report AMRs. For those AMR items that the staff found to be consistent with the GALL-SLR Report, and for which no additional evaluation or RAI applies, the staff's review and conclusions, as documented in the GALL-SLR Report, are considered to be the basis for acceptability of the AMR items. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SE Table 3.4-1, and no separate writeup is required or provided. For AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in Sections 3.4.2.1.2 through 3.4.2.1.4 below.

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

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

For SLRA Table 3.4-1, items 3.4.1-007, 3.4.1-020, 3.4.1-022, 3.4.1-023, 3.4.1-025, 3.4.1-027, 3.4.1-028, 3.4.1-032, 3.4.1-035, 3.4.1-036, 3.4.1-045, 3.4.1-048, 3.4.1-051 through 3.4.1-053, 3.4.1-056 through 3.4.1-058, 3.4.1-061, 3.4.1-068, 3.4.1-074, 3.4.1-075, 3.4.1-078, 3.4.1-082, 3.4.1-086, 3.4.1-089, 3.4.1-092, 3.4.1-094 through 3.4.1-102, 3.4.1-105, 3.4.1-107, 3.4.1-109, 3.4.1-112, 3.4.1-114 through 3.4.1-117, 3.4.1-119, 3.4.1-120, 3.4.1-123 through 3.4.1-13 and

3.4.1-133 through 3.4.1-135, the applicant claims that the corresponding AMR items in the GALL-SLR Report are neither used nor applicable to MNGP. The staff reviewed the SLRA and USAR and confirmed that the applicant's SLRA does not have any AMR results that are applicable for these items.

For SLRA Table 3.4-1, items 3.4.1-004, 3.4.1-038, 3.4.1-041, 3.4.1-042, 3.4.1-046, 3.4.1-131, and 3.4.1-132, the applicant claims that the corresponding AMR item in the GALL-SLR Report is not applicable because the associated item is only applicable to PWRs. The staff reviewed the SRP-SLR, confirmed that this item only applies to PWRs, and finds that this item is not applicable because MNGP is a BWR.

For the following SLRA Table 3.1-1 items, the applicant claims that the corresponding items in the GALL-SLR Report are not used because they are addressed by other SLRA Table 1 items: 3.4.1-019 (addressed by 3.4.1-091) and 3.4.1-064 (addressed by 3.4.1-087). The staff reviewed the SLRA and confirmed that the aging effects will be addressed by other SLRA Table 1 items. Therefore, the staff finds the applicant's proposal to use alternate items acceptable.

3.4.2.1.2 Loss of Material Due to Pitting, Crevice Corrosion, and MIC

SLRA Table 3.4-1, AMR item 3.4.1-026 addresses loss of material of stainless steel heat exchanger tubes exposed externally to closed-cycle cooling water. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting program to manage the aging effect for stainless steel heat exchanger tubes in the Off Gas system. Based on its review of components associated with AMR item 3.4.1-026 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 program acceptable because the program includes visual inspections that are capable of detecting loss of material.

3.4.2.1.3 Loss of Material due to General Corrosion, Pitting, Crevice Corrosion, and MIC

SLRA Table 3.4-1, AMR item 3.4.1-067 addresses loss of material due to general corrosion, pitting, crevice corrosion, MIC for any material piping, piping components, heat exchangers, tanks with Internal Coatings/linings exposed to closed-cycle cooling water, raw water, treated water, and lubricating oil. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage loss of material for internally coated carbon steel reactor feedwater pump lubricating oil cooler heat exchanger tube side components exposed to raw water.

Based on its review of components associated with AMR item 3.4.1-067 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage loss of material using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because that program is appropriate to assess loss of material and to detect surface irregularities that could be indicative of corrosion, including specifying volumetric examinations following the detection of surface irregularities. Finally, these same components also cite AMR item 3.4.1-066, for which the applicant cites generic note A, to manage loss of coating or lining integrity.

3.4.2.1.4 Cracking of Material Exposed Externally to Uncontrolled Indoor Air

SLRA Table 3.4-1, AMR item 3.4.1-106 addresses cracking of copper alloy with greater than 15 percent zinc in chillers that are exposed externally to uncontrolled indoor air. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage the aging effect for copper alloy with greater than 15 percent zinc in chillers in the emergency filtration train. Based on its review of components associated with AMR item 3.4.1-106 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because the program includes visual inspections and, when appropriate, surface examinations.

3.4.2.2 Aging Management Review Results for which Further Evaluation Is Recommended by the GALL-SLR Report

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

3.4.2.2.1 Cumulative Fatigue Damage

SLRA Section 3.4.2.2.1, as supplemented by letter on July 18, 2023 (ML23199A154), addresses the TLAA on cumulative fatigue damage in the components of the steam and power conversion systems. The SLRA section is associated with SLRA Table 3.4-1 item 3.4.1-001 for steel components. In addition, SLRA Section 3.4.2.2.1 is associated with SLRA Table 3.3-1, item 3.3.1-002 for the stainless steel components of the steam and power conversion systems.

The applicant explained that the TLAA on cumulative fatigue damage in the steam and power conversion system components is evaluated in accordance with 10 CFR 54.21(c) and is addressed in SLRA Section 4.3. The staff finds that the applicant's aging management review results for the fatigue TLAA are consistent with SRP-SLR Report Section 3.4.2.2.1 and are, therefore, acceptable. The staff's evaluation of the fatigue TLAA for the components of the steam and power conversion systems is documented in SE Section 4.3.

3.4.2.2.2 Cracking Due to Stress Corrosion Cracking in Stainless Steel Alloys

SLRA Section 3.4.2.2.2, as amended by letter dated June 26, 2023 (ML23177A218), associated with SLRA Table 3.4-1, AMR items 3.4.1-002 and 3.4.1-104, addresses cracking due to SCC for stainless steel piping, piping components, and tanks, insulated or not insulated, exposed to air or condensation, and underground stainless steel piping, piping components, and tanks, which will be managed by the One-Time Inspection program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.4.2.2.2.

In its review of components associated with AMR items 3.4.1-002 and 3.4.1-104, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging for AMR items 3.4.1-002 and 3.4.1-104 using the One-Time Inspection program is acceptable because the plant-specific OE does not reveal a history of cracking due to SCC for these components, and the proposed one-time inspections are capable of detecting whether cracking is occurring.

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

SLRA Section 3.4.2.2.2, associated with SLRA Table 3.4-1, AMR items 3.4.1-074 and 3.4.1-100, addresses cracking due to SCC for underground stainless steel piping, piping components, and tanks, and stainless steel tanks within the scope of GALL-SLR Report XI.M29 exposed to air or condensation. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.2 and finds it acceptable because based on a review of the USAR and SLRA, there are no such stainless steel component and environment combinations in the steam and power conversion systems.

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

SLRA Section 3.4.2.2.3, as amended by letter dated June 26, 2023 (ML23177A218), associated with SLRA Table 3.4-1, AMR items 3.4.1-003 and 3.4.1-103, addresses loss of material due to pitting and crevice corrosion for uninsulated and insulated stainless steel and nickel alloy piping, piping components, and tanks, exposed to air or condensation, which will be managed by the One-Time Inspection program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.4.2.2.3.

In its review of components associated with AMR items 3.4.1-003 and 3.4.1-103, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging for AMR item 3.4.1-003 and 3.4.1-103 using the One-Time Inspection program is acceptable because the plant-specific OE does not reveal a history of loss of material due to pitting or crevice corrosion for these components, and the proposed one-time inspections are capable of detecting whether loss of material is occurring.

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

SLRA Section 3.4.2.2.3, associated with SLRA Table 3.4-1, AMR items 3.4.1-095 and 3.4.1-098, addresses loss of material due to pitting or crevice corrosion for stainless steel or nickel alloy underground piping, piping components, and tanks, and for stainless steel and nickel alloy tanks within the scope of GALL-SLR AMP X.M29 exposed to air or condensation. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.3 and finds the claim acceptable because based on a review of the USAR and SLRA, there are no such stainless steel or nickel alloy component and environment combinations in the steam and power conversion systems.

3.4.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

SE Section 3.0.4 documents the 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

SLRA Section 3.4.2.2.6 is associated with SLRA Table 3.4-1, item 3.4.1-061, for loss of material due to recurring internal corrosion in metallic piping components and tanks exposed to multiple water environments. The applicant stated that reviews of OE over the past 10 years did not identify any instances that met the criteria of recurring internal corrosion in the steam and power conversion systems. Consequently, the applicant determined that this item was not applicable and there was no need to augment aging management programs credited for managing internal loss of material in these systems. The staff evaluated the applicant's determination against the criteria in SRP-SLR Section 3.4.2.2.6 and finds it is acceptable because the staff did not identify instances of recurring internal corrosion in steam and power conversion systems during its review of the OE documentation provided as part of the audit.

3.4.2.2.7 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

SLRA Section 3.4.2.2.7, associated with SLRA Table 3.4-1, AMR items 3.4.1-102, 3.4.1-105, 3.4.1-109, and 3.4.1-112, addresses cracking due to SCC for aluminum components. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.7 and finds the claim acceptable because based on a review of the USAR and SLRA there are no in-scope aluminum components in the steam and power conversion systems.

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

SLRA Section 3.4.2.2.8 associated with SLRA Table 3.4-1, AMR items 3.4.1-051 and 3.4.1-082, addresses (1) loss of material due to general, crevice, or pitting corrosion in steel piping and piping components exposed to concrete (item 3.4.1-051) and (2) loss of material due to crevice or pitting corrosion and cracking due to SCC in stainless steel piping and piping components exposed to concrete (item 3.4.1-082). The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.4.2.2.8. The applicant stated that there are no steel or stainless steel piping or piping components exposed to concrete in the steam and power conversion systems. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.8 and finds the claim acceptable because based on a review of the USAR and SLRA, there are no steel or stainless steel piping or piping components exposed to concrete in the steam and power conversion systems.

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

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

SLRA Section 3.4.2.2.9, associated with SLRA Table 3.4-1, AMR items 3.4.1-035, 3.4.1-094, 3.4.1-097, 3.4.1-119, and 3.4.1-120, addresses loss of material due to pitting and crevice corrosion for aluminum components. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.9 and finds the claim acceptable because based on a review of the USAR and SLRA, there are no in-scope aluminum components in the steam and power conversion systems.

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

The SLRA did not identify any AMR results in SLRA Tables 3.4.2-1 through 3.4.2-6 that are not consistent with, or not addressed in, the GALL-SLR Report.

3.5 Aging Management of Containments, Structures, and Component Supports

3.5.1 Summary of Technical Information in the Application

SLRA Section 3.5 provides AMR results for those components the applicant identified in SLRA Section 2.4, "Scoping and Screening Results: Structures," as being subject to an AMR. SLRA Table 3.5-1, "Containment, Structures and Structural Components/Commodities—Summary of Aging Management Programs," is a summary comparison of the applicant's AMR results with those provided in the GALL-SLR Report for the containments, structures, and component supports components.

3.5.2 Staff Evaluation

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

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

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.5.1-001	Not applicable to MNGP (see SE Section 3.5.2.2.1.1)
3.5.1-002	Not applicable to MNGP (see SE Section 3.5.2.2.1.1)
3.5.1-003	Not applicable to MNGP (see SE Section 3.5.2.2.1.2)
3.5.1-004	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.3 item 1)
3.5.1-005	Not applicable to BWRs (see SE Section 3.5.2.2.1.3 item 1)
3.5.1-006	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.3 item 2)
3.5.1-007	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.3 item 3)
3.5.1-008	Not applicable to BWRs (see SE Section 3.5.2.2.1.4)
3.5.1-009	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.5)
3.5.1-010	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.6)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.5.1-011	Not applicable to MNGP (see SE Section 3.5.2.2.1.7)
3.5.1-012	Not applicable to MNGP (see SE Section 3.5.2.2.1.8)
3.5.1-013	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.5.1-014	Not applicable to MNGP (see SE Section 3.5.2.2.1.9)
3.5.1-015	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.5.1-016	Not applicable to MNGP
3.5.1-017	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.5.1-018	Not applicable to MNGP
3.5.1-019	Not applicable to MNGP
3.5.1-020	Not applicable to MNGP
3.5.1-021	Not applicable to MNGP
3.5.1-022	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.5.1-023	Not applicable to MNGP
3.5.1-024	Not applicable to MNGP
3.5.1-025	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.5.1-026	Consistent with the GALL-SLR Report
3.5.1-027	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.5)
3.5.1-028	Consistent with the GALL-SLR Report
3.5.1-029	Consistent with the GALL-SLR Report
3.5.1-030	Consistent with the GALL-SLR Report
3.5.1-031	Consistent with the GALL-SLR Report
3.5.1-032	Not applicable to BWRs
3.5.1-033	Consistent with the GALL-SLR Report
3.5.1-034	Consistent with the GALL-SLR Report
3.5.1-035	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.3. item 1)
3.5.1-036	Consistent with the GALL-SLR Report
3.5.1-037	Consistent with the GALL-SLR Report
3.5.1-038	Not applicable to MNGP (see SE Section 3.5.2.2.1.6)
3.5.1-039	Consistent with the GALL-SLR Report (see SE Sections 3.5.2.1.2 and 3.5.2.2.1.6)
3.5.1-040	Not applicable to MNGP (see SE Section 3.5.2.2.1.5)
3.5.1-041	Consistent with the GALL-SLR Report
3.5.1-042	Not applicable to MNGP (see SE Section 3.5.2.2.2.1 item 1)
3.5.1-043	Not applicable to MNGP (see SE Section 3.5.2.2.2.1 item 2)
3.5.1-044	Not applicable to MNGP (see SE Section 3.5.2.2.2.1 item 3)
3.5.1-045	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.5.1-046	Not used (addressed by 3.5.1-044) (see SE Section 3.5.2.2.2.1 item 3)
3.5.1-047	Not applicable to MNGP (see SE Section 3.5.2.2.2.1 item 4)
3.5.1-048	Not applicable to MNGP (see SE Section 3.5.2.2.2.2)
3.5.1-049	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.3 item 1)
3.5.1-050	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.3 item 2)
3.5.1-051	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.3 item 3)
3.5.1-052	Not applicable to MNGP (see SE Section 3.5.2.2.2.4)
3.5.1-053	Not applicable to MNGP (see SE Section 3.5.2.2.2.5)
3.5.1-054	Consistent with the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.5.1-055	Consistent with the GALL-SLR Report
3.5.1-056	Consistent with the GALL-SLR Report
3.5.1-057	Consistent with the GALL-SLR Report
3.5.1-058	Not applicable to MNGP
3.5.1-059	Consistent with the GALL-SLR Report
3.5.1-060	Consistent with the GALL-SLR Report
3.5.1-061	Consistent with the GALL-SLR Report
3.5.1-062	Not applicable to MNGP
3.5.1-063	Consistent with the GALL-SLR Report
3.5.1-064	Consistent with the GALL-SLR Report
3.5.1-065	Consistent with the GALL-SLR Report
3.5.1-066	Consistent with the GALL-SLR Report
3.5.1-067	Consistent with the GALL-SLR Report
3.5.1-068	Not Used (see SE Section 3.5.2.1.1)
3.5.1-069	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.5.1-070	Consistent with the GALL-SLR Report
3.5.1-071	Consistent with the GALL-SLR Report
3.5.1-072	Consistent with the GALL-SLR Report
3.5.1-073	Not Used (addressed by 3.5.1-034)
3.5.1-074	Not Used (addressed by 3.5.1-075) (see SE Section 3.5.2.1.1)
3.5.1-075	Consistent with the GALL-SLR Report
3.5.1-076	Not Used (addressed by 3.5.1-075) (see SE Section 3.5.2.1.1)
3.5.1-077	Consistent with the GALL-SLR Report
3.5.1-078	Consistent with the GALL-SLR Report
3.5.1-079	Consistent with the GALL-SLR Report
3.5.1-080	Consistent with the GALL-SLR Report
3.5.1-081	Consistent with the GALL-SLR Report
3.5.1-082	Consistent with the GALL-SLR Report
3.5.1-083	Consistent with the GALL-SLR Report
3.5.1-084	This item number is not used in either the SRP-SLR Report or the GALL-SLR Report
3.5.1-085	Consistent with the GALL-SLR Report
3.5.1-086	Not applicable to MNGP (see SE Section 3.5.2.1.1)
3.5.1-087	Consistent with the GALL-SLR Report
3.5.1-088	Consistent with the GALL-SLR Report
3.5.1-089	Not applicable to BWRs
3.5.1-090	Not Used (addressed by 3.5.1-085)
3.5.1-091	Consistent with the GALL-SLR Report
3.5.1-092	Consistent with the GALL-SLR Report
3.5.1-093	Not Used (addressed by 3.5.1-082 and 3.5.1-077) (see SE Section 3.5.2.1.1)
3.5.1-094	Consistent with the GALL-SLR Report
3.5.1-095	Not Used (addressed by 3.5.1-082 and 3.5.1-077) (see SE Section 3.5.2.1.1)
3.5.1-096	Consistent with the GALL-SLR Report
3.5.1-097	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.6)
3.5.1-098	Not Used (addressed by 3.5.1-099)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.5.1-099	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.4)
3.5.1-100	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.4)

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

(1) SE Section 3.5.2.1 discusses AMR results for components that the applicant states are either not applicable to MNGP or are consistent with the GALL-SLR 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 require explanation.

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

(3) SE Section 3.5.2.3 discusses AMR results for components that the applicant stated are neither consistent with nor addressed in the GALL-SLR Report. These AMR results typically are identified by generic notes F through J and plant-specific notes in the SLRA.

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

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

SE Section 3.5.2.1.1 documents the NRC staff's review of AMR items the applicant determined to be neither applicable nor used.

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

For SLRA Table 3.4-1, items 3.5.1-001 through 3.5.1-004, 3.5.1-011, 3.5.1-012, 3.5.1-014, 3.5.1-016, 3.5.1-018 through 3.5.1-021, 3.5.1-023, 3.5.1-024, 3.5.1-040, 3.5.1-042 through 3.5.1-044, 3.5.1-046 through 3.5.1-048, 3.5.1-052, 3.5.1-053, 3.5.1-058, 3.5.1-062, 3.5.1-068, and 3.5.1-086 , the applicant claims that the corresponding AMR items in the GALL-SLR Report are neither used nor applicable to MNGP. The staff reviewed the SLRA and USAR and confirmed that the applicant's SLRA does not have any AMR results that are applicable for these items.

For SLRA Table 3.5-1, items 3.5.1-005, 3.5.1-008, 3.5.1-032, and 3.5.1-089, the applicant claims that the corresponding AMR item in the GALL-SLR Report is not applicable to MNGP because the associated item is applicable only to PWRs. The staff reviewed the SRP-SLR, confirmed that this item only applies to PWRs, and finds that this item is not applicable because MNGP is a BWR.

For the following SLRA Table 3.1-1 items, the applicant claims that the corresponding items in the GALL-SLR Report are not used because they are addressed by other SLRA Table 1 items: 3.5.1-073 (addressed by 3.5.1-034), 3.5.1-074 (addressed by 3.5.1-075), 3.5.1-076 (addressed by 3.5.1-075), 3.5.1-090 (addressed by 3.5.1-085), 3.5.1-093 (addressed by 3.5.1-082 and 3.5.1-077), 3.5.1-095 (addressed by 3.5.1-082 and 3.5.1-077), and 3.5.1-098 (addressed by 3.5.1-099). The staff reviewed the SLRA and confirmed that the aging effects will be addressed by other SLRA Table 1 items. Therefore, the staff finds the applicant's proposal to use alternate items acceptable.

SLRA Table 3.5-1, AMR item 3.5.1-068, as amended by Supplement 2 dated June 26, 2023, addresses managing SCC for high-strength (HS) steel structural bolting exposed to air. The applicant stated that this item is "not used" because HS structural bolting currently is not used in MNGP component supports. However, the applicant further stated that preventive actions and guidance for HS steel structural bolting is included for the ASME Section XI, Subsection IWF AMP to ensure proper aging management will be used to address the potential to use HS bolting in the future. The staff evaluated the applicant's claim and finds it acceptable for the following reasons:

(1) The staff confirmed during the audit, based on review of drawings, specifications; and procedures, that HS bolting (actual measured yield strength greater than or equal to 150 kilopounds per square inch [ksi]) are not used in the CLB of MNGP component supports.

(2) If HS bolting is used in the future, the SLRA B.2.3.30 "ASME Section XI, Subsection IWF" AMP includes enhancements corresponding to SLR Commitments 33(b) and 33(h) requiring preventive actions and periodic volumetric examination of a sample of applicable HS bolting (if used) that would assure adequate aging management of SCC for HS bolting during the subsequent period of extended operation.

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

SLRA Table 3.5-1, AMR item 3.5-1, 076, addresses managing loss of mechanical function due to corrosion, distortion, accumulation of dirt or debris, overload, wear for the sliding surfaces at radial beam seats in a BWR drywell exposed to air-indoor uncontrolled environment. The applicant stated that this item is not used. The staff evaluated the applicant's claim and finds the claim acceptable because this line item is not used, and its aging effect of loss of mechanical function due to corrosion, distortion, accumulation of dirt or debris, overload, wear for the sliding surfaces at radial beam seats in a BWR drywell exposed to air-indoor uncontrolled environment is managed by the ASME Section XI, Subsection IWF program and addressed under AMR item 3.5-1, 075.

SLRA Table 3.5-1, AMR item 3.5.1-086 addresses managing loss of material due to corrosion for steel structural bolting exposed to “air-outdoor.” The applicant stated that this item is not applicable. The staff evaluated the applicant’s claim and finds it acceptable because there are no ASME Class 1, 2, 3 or MC structural bolts in an air-outdoor environment at MNGP.

SLRA Table 3.5-1, AMR item 3.5-1, 093, addresses managing loss of material due to pitting, crevice corrosion for the galvanized steel support members, bolted connections, and support anchorage to building structure exposed to air-indoor uncontrolled or air-outdoor environment. The applicant stated that this item is not used. The staff evaluated the applicant’s claim and finds it acceptable because this line item is not used, and its aging effect of loss of material due to pitting, crevice corrosion for the galvanized steel support members, bolted connections, and support anchorage to building structure exposed to air-indoor uncontrolled or air-outdoor environment is managed by the Structures Monitoring program and addressed under AMR items 3.5.1-077 and 3.5.1-082.

SLRA Table 3.5-1, AMR item 3.5-1, 095, addresses the galvanized steel support members, bolted connections, and support anchorage to building structure exposed to air-indoor uncontrolled environment. There are no aging effect and aging management program associated with this AMR item. The applicant stated that this item is not used. The staff evaluated the applicant’s claim and finds it acceptable because this line item is not used, and its aging effect of loss of material due to pitting, crevice corrosion for the galvanized steel support members, bolted connections, and support anchorage to building structure exposed to air-indoor uncontrolled or air-outdoor environment is managed by the Structures Monitoring program and addressed under AMR items 3.5.1-077 and 3.5.1-082.

3.5.2.1.2 Cracking Due to Stress Corrosion Cracking

SLRA Table 3.5.1, AMR item 3.5.1-039, addresses cracking due to SCC for stainless steel RPV to drywell refueling seal exposed to air-indoor uncontrolled. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Structures Monitoring AMP to manage the aging effect for stainless steel RPV to drywell refueling seal. The AMR item cites plant-specific note 3, which states, ”The RPV to drywell refueling seal will be managed by the Structures Monitoring (B.2.3.33) AMP instead of ASME Section XI, Subsection IWE (B.2.3.29) AMP; as it is not a pressure-retaining component.”

Based on its review of components associated with AMR item 3.5.1-039 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 AMP acceptable because plant-specific OE has not identified cracking due to SCC for the refueling seal, the refueling seal does not have pressure-retaining function, and as indicated by note 3 of GALL-SLR Report Table XI.M32-1 and considering safety-significance, the visual examination of the Structures Monitoring AMP are considered adequate to detect potential for cracking for components that are not pressure-retaining.

3.5.2.2 AMR Results for which Further Evaluation Is Recommended by the GALL-SLR Report

In SLRA Section 3.5.2.2, the applicant further evaluated aging management for certain containments, structures, and component supports components, as recommended by the GALL-SLR Report, and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria contained in SRP-SLR Report Section 3.5.2.2. The following subsections document the staff's review.

3.5.2.2.1 Pressurized-Water Reactor and Boiling Water Reactor Containments

3.5.2.2.1.1 Cracking and Distortion Due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, and Cracking Due to Differential Settlement and Erosion of Porous Concrete Sub-Foundations

SLRA Section 3.5.2.2.1.1, associated with SLRA Table 3.5-1 AMR items 3.5.1-001 and 3.5.1-002, addresses cracking and distortion due to increased stress levels from settlement, and the reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete sub-foundations, respectively, for containment concrete elements exposed to soil or flowing water environment. The applicant stated that the AMR items are not applicable because MNGP has a Mark I steel containment and does not have an ASME Section XI, Subsection IWL program. Further, the SLRA notes that the aging effects associated with settlement (AMR item 3.5.1-001) are not applicable because the primary containment structure is completely enclosed and sheltered within the air-indoor environments of the reactor building and supported by the reactor building basemat; therefore, the containment internal concrete is not exposed to groundwater or soil environment. Additionally, the aging effects associated with erosion of porous concrete sub-foundations (AMR item 3.5.1-002) are not applicable because the reactor building foundations are not constructed with porous foundations and no dewatering system is relied upon. The staff reviewed applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.1 and finds it acceptable because, based on review of USAR Section 12.2.2 and Section 15 drawings, the staff verified that MNGP primary containment is not a concrete containment and the internal concrete structures are not exposed to the soil/flowing water environment, and MNGP does not have porous concrete sub-foundations or a dewatering system (i.e., the component, material and environment for the aging effects do not exist for MNGP steel primary containment).

3.5.2.2.1.2 Reduction of Strength and Modulus Due to Elevated Temperature

SLRA Section 3.5.2.2.1.2, associated with SLRA Table 3.5-1, AMR item 3.5.1-003, addresses reduction of strength and modulus of elasticity due to elevated temperature in concrete components (e.g., dome, wall, basemat, ring girders, buttresses, containment, concrete fill-in annulus) of containment structures exposed to air-indoor uncontrolled or air-outdoor environment. The applicant stated that this AMR item is not applicable. The staff evaluated the applicant's claim, as modified by SLRA Supplement 6 (ML23248A474), against the criteria in SRP-SLR Section 3.5.2.2.1.2 and finds it acceptable because:

(1) Drywell atmosphere cooling system removes heat from the drywell to maintain the bioshield wall concrete temperatures below 150°F for general areas and 200°F for local areas.

(2) Drywell atmosphere cooling system is managed by the External Surfaces Monitoring of Mechanical Components program and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program.

(3) Thermal insulation is credited to maintain the concrete temperature in the bioshield wall and is managed by the External Surfaces Monitoring of Mechanical Components program.

Therefore, the containment concrete is not expected to exceed the GALL-SLR Report recommended threshold limits of 150°F for general areas and 200°F for local areas, and plant OE has not identified any aging effects for containment concrete related to elevated temperature.

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

Item 1. SLRA Section 3.5.2.2.1.3 item 1, as amended by Supplement 2 dated 06/26/2023, associated with SLRA Table 3.5-1 items 3.5.1-004, 3.5.1-005 and 3.5.1-035, addresses loss of material due to general, pitting and crevice corrosion for inaccessible and accessible areas of containment integral attachments, penetration sleeves, drywell shell, drywell head, drywell shell in sand pocket regions, and drywell embedded shell of steel material exposed to air-indoor uncontrolled environment, which will be managed by the ASME Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J AMPs. The staff reviewed the applicant’s proposal against the criteria in SRP-SLR Section 3.5.2.2.1.3 item 1.

The applicant stated that item 3.5.1-005 is not applicable to the MNGP Mark I steel containment, noting that the item applies only to Mark II and Mark III containments. The staff noted from reviews of the SRP-SLR and the GALL-SLR Report that items 3.5.1-004 and 3.5.1-005 apply only to BWR Mark I concrete containments in addition to BWR Mark II, Mark III, and PWR containments. Therefore, the staff finds the applicant’s claim acceptable because the staff confirmed from GALL-SLR Report Chapter II that the AMR items corresponding to 3.5.1-005 applied to all containments other than Mark I steel containments, and MNGP has a BWR Mark I steel containment.

For AMR items 3.5.1-004 (as amended by Supplement 2) and 3.5.1-035, which the applicant claimed as applicable, the staff noted that a plant-specific program to manage this aging effect in inaccessible or accessible areas of the MNGP primary containment is not required based on the following:

(1) The containment design includes a periodically monitored accessible moisture barrier at the interior drywell floor interface and an inaccessible sheet metal cover and joint sealing compound above the sand pocket region on the exterior of the drywell shell, to prevent moisture intrusion into inaccessible areas of drywell shell and to the sand pocket.

(2) There has been no drywell corrosion detected near the moisture barrier location.

(3) The drywell air gap design incorporates three drainage paths consisting of several drain lines for removing leakage into the drywell air gap.

(4) In accordance with ASME Section XI, Subsection IWE, the AMP monitors for blockage and leakage of the drywell air gap and sand pocket drain line outlets during each refueling outage when the refueling cavity is flooded.

(5) MNGP OE has not shown any significant corrosion of the containment drywell shell.

Continued monitoring of the containment shell in accordance with the ASME Section XI, Subsection IWE AMP and leakage testing in accordance with 10 CFR 50, Appendix J program provide reasonable assurance that loss of material due to corrosion of the drywell steel elements will be detected and corrected prior to loss of intended function. In its review of components associated with items 3.5.1-004 and 3.5.1-035, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWE Program and the 10 CFR Part 50, Appendix J Program is acceptable because:

(1) The robust drywell design features along with monitoring and preventive measures provide substantial defense against water entering the drywell air gap region and sand pocket region, thereby preventing degradation of the inaccessible exterior side of the drywell.

(2) There has been no OE regarding moisture intrusion or degradation of inaccessible drywell areas or any significant corrosion in accessible areas.

(3) Continued monitoring using these programs provides reasonable assurance that any occurrence of abnormal conditions or degradation will be identified and corrected prior to loss of intended function.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-SLR Section 3.5.2.2.1.3, item 1 criteria. For those AMR items associated with SLRA Section 3.5.2.2.1.3, item 1, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that 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 MNGP during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

<u>Item 2</u>. SLRA Section 3.5.2.2.1.3 item 2, associated with SLRA Table 3.5-1 AMR item 3.5.1-006, addresses loss of material due to general, pitting, crevice corrosion for steel torus shell exposed to air-indoor uncontrolled or treated water, which will be managed by the ASME Section XI, Subsection IWE Program and the 10 CFR Part 50, Appendix J AMPs. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.2 item 2.

The SLRA states that examinations conducted in accordance with ASME Section XI, Subsection IWE for the steel torus shell have not identified significant corrosion, and the deepest observed pit was within acceptance criteria. In its review of components associated with AMR item 3.5.1-006, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWE Program, and the 10 CFR Part 50, Appendix J Program is acceptable because the programs have demonstrated that the aging effects are adequately managed consistent with the GALL-SLR Report recommendations, and examinations have not identified significant corrosion degradation in the steel torus shell.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-SLR Section 3.5.2.2.1.3 item 2 criteria. For those AMR items associated with SLRA Section 3.5.2.2.1.3 item 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

Item 3. SLRA Section 3.5.2.2.1.3, item 3, associated with SLRA Table 3.5-1, AMR item 3.5.1-007, addresses loss of material for steel torus ring girders and steel downcomers exposed to air -indoor uncontrolled or treated water, which will be managed by the ASME Section XI, Subsection IWE AMP. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.3, item 3.

In its review of components associated with AMR item 3.5.1-007, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWE Program is acceptable because the proposed program will be consistent (with unrelated exception) with the GALL-SLR Report recommendation to adequately manage the aging effects, and plant-specific OE has not identified significant corrosion degradation in the torus ring girders and downcomers.

Based on the program identified, the staff concludes that the applicant's program meets SRP-SLR Section 3.5.2.2.1.3 item 3 criteria. For those AMR items associated with SLRA Section 3.5.2.2.1.3 item, the staff concludes that the SLRA is consistent with the GALL-SLR Report and the applicant has demonstrated that the effects of aging will be managed adequately; therefore, the intended function(s) will be maintained consistent with the MNGP CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.5.2.2.1.4 Loss of Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature

SLRA Section 3.5.2.2.1.4, associated with SLRA Table 3.5-1, AMR item 3.5.1-008, addresses loss of prestress due to relaxation, shrinkage, creep, and elevated temperature for steel prestressing system tendons exposed to air-indoor uncontrolled or air-outdoor. The applicant stated that this item is not applicable to the MNGP Mark I steel containment because the aging effect is only applicable to prestressed concrete containments. The staff evaluated the applicant's claim and finds the claim acceptable because the staff reviewed the MNGP USAR Section 12.2.2 and Section 15 drawings and confirmed that MNGP employs a BWR Mark 1 steel containment, which is not a prestressed concrete containment, and therefore does not have prestressing tendons.

3.5.2.2.1.5 Cumulative Fatigue Damage

SLRA Section 3.5.2.2.1.5, as amended by Supplement 4 dated July 18, 2023 (ML23199A154) and response to RAI 3.5.2.2.1.5-1 by letter dated August 15, 2023 (ML23227A175), associated with SLRA Table 3.5.1, AMR items 3.5.1-009 (as amended), 3.5.1-027 and 3.5.1-040, addresses cumulative fatigue damage (when CLB fatigue analysis exist) and/or cracking (when CLB fatigue analysis exists) due to cyclic loading (when CLB fatigue analysis does not exist) for primary containment pressure-retaining boundary components of steel, stainless steel and dissimilar metal weld (DMW) material exposed to air-indoor uncontrolled or treated water. The components include torus penetrations (including the HPCI and RCIC turbine exhaust penetrations), torus shell, emergency core cooling system suction header, vent header, vent lines, downcomers, and vent line bellows, as well as primary containment process penetration bellows (hot pipe penetration bellows) and refueling bellows skirt. The staff reviewed the applicant's proposal against the criteria for SRP-SLR Section 3.5.2.2.1.5, as modified by SLR-ISG-2021-03-STRUCTURES (ML20181A381).

For components associated with AMR item 3.5.1-009, as amended, SLRA Section 3.5.2.2.1.5 (as amended) states that the associated fatigue TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1). The SLRA further states that the evaluation of these TLAAs for fatigue of the MNGP suppression chamber downcomers, torus penetrations (including high-pressure coolant injection [HPCI] and reactor core isolation cooling [RCIC] turbine exhaust penetrations), torus shell, emergency core cooling system suction header, vent lines and vent liner bellows, drywell hot pipe penetration bellows and refueling bellows skirt of steel, stainless steel, or DMW are addressed in SLRA Sections 4.5, 4.6.2 (HPCI and RCIC penetrations) and 4.3.3 (refueling bellows skirt), as amended. This is consistent with SRP-SLR Section 3.5.2.2.1.5 (as modified by SLR-ISG-2021-03-STRUCTURES) and is, therefore, acceptable. The staff's evaluation regarding the TLAAs for fatigue of the above stated primary containment components is documented in SE Sections 4.5, 4.6.2, and 4.3.3.

For components associated with AMR item 3.5.1-040 (CLB fatigue analysis does not exist), as amended, the applicant stated the item is not applicable because it applies to BWR Mark II containments only. The staff evaluated the applicant's non-applicability claim and finds it acceptable because review of the corresponding GALL-SLR Report AMR items (II.B2.1.CP-142 and II.B2.2.CP-64) indicate that it applies only to BWR Mark II steel or concrete containments, and MNGP has a BWR Mark I steel containment.

For specific components (i.e., high temperature drywell piping penetrations adapters) associated with AMR item 3.5.1-027 (CLB fatigue analysis does not exist), the applicant stated that the aging effects will be managed by the ASME Section XI, Subsection IWE, using the enhancement for performing supplemental surface examinations.

For other containment pressure-retaining boundary components associated with AMR item 3.5.1-027 (i.e., drywell shell, non-high temperature Class MC drywell penetrations and penetration sleeves, and non-piping penetrations (CRD hatch, equipment hatch, personnel airlocks, electrical penetrations and seismic restraint inspection ports)) for which CLB fatigue analysis do not exist, the applicant stated in the SLRA, as amended by the response to RAI 3.5.2.2.1.5-1 (ML23227A175), that the aging effect does not require management based on a fatigue waiver analysis performed for these components in accordance with paragraph NE-3222.4(d), of the ASME Code, Section III, Division 1 (1974 edition) that satisfied the six conditions specified in the ASME Code. The six conditions evaluated fatigue cycles through the end of the subsequent period of extended operation due to the following:

(1) atmospheric-to-operating pressure cycle
(2) normal operation pressure fluctuation
(3) temperature difference–startup and shutdown
(4) temperature difference–normal operation
(5) temperature difference–dissimilar materials
(6) mechanical loads

The staff finds the response to RAI 3.5.2.2.1.5-1 acceptable because it adequately summarized and demonstrated how the six fatigue waiver criteria of the ASME Code were met, and therefore provided the basis that the aging effect does not require management for the specified components consistent with the acceptance criteria in SRP-SLR Section 3.5.2.2.1.5, as modified by SLR-ISG-2021-03-STRUCTURES. The fatigue waiver analysis thus justifies the related exceptions taken in the SLRA B.2.3.29 "ASME Section XI, Subsection IWE" program that cracking due to cyclic loading does not require aging management for the drywell shell, non-high temperature and non-piping drywell penetrations and penetration sleeves.

In its review of specific components associated with AMR item 3.5.1-027 (i.e., penetration adapters of high temperature drywell piping penetrations), the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWE Program or 10 CFR 50, Appendix J Program is acceptable because:

(1) The examination methods proposed for detecting cracking (i.e., supplemental surface examinations or enhanced visual examinations (EVT-1)) are consistent with those recommended in GALL-SLR AMP XI.S1, "ASME Section XI, Subsection IWE."

(2) The SLRA ASME Section XI, Subsection IWE Program with enhancements (consistent with GALL-SLR Report AMP XI.S1) and exceptions was determined to be adequate to manage applicable aging effects as documented in SE Section 3.0.3.2.20.

In its review of the other components associated with AMR item 3.5.1-027 (drywell shell, non-high temperature and non-piping drywell penetrations, and penetration sleeves), the staff finds that the applicant has met the further evaluation criteria, and its justification that cracking due to cyclic loading aging effect does not require management is acceptable because the applicant performed a fatigue waiver analysis for these components in accordance with paragraph NE-3222.4(d) of the ASME Code, Section III, Division 1 (1974 edition) that satisfied the six conditions specified in the code to conclude that a detailed fatigue analysis is not necessary and the aging effect does not require management.

Based on the programs identified and the fatigue waiver analyses performed, the staff concludes that the applicant's further evaluation meets SRP-SLR Section 3.5.2.2.1.5 criteria (as modified by SLR-ISG-2021-03-STRUCTURES). For those AMR items associated with SLRA Section 3.5.2.2.1.5, as amended, the staff concludes that the SLRA is consistent with the GALL-SLR Report and the applicant has demonstrated that the effects of aging will be adequately managed; therefore, the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.5.2.2.1.6 Cracking Due to Stress Corrosion Cracking

SLRA Section 3.5.2.2.1.6, as amended by Supplement 2 dated 06/26/2023 (ML23177A218), associated with SLRA Table 3.5-1 AMR items 3.5.1-010, 3.5.1-038 and 3.5.1-039, addresses cracking due to SCC for stainless steel or Inconel® nickel alloy (in one instance) and DMWs of penetration assemblies – electrical or mechanical (bellows), and vent line bellows exposed to air-indoor uncontrolled, which will be managed by the ASME Section XI, Subsection IWE and the 10 CFR Part 50, Appendix J AMPs. The staff reviewed the applicant's proposal, as modified by SLRA Supplement 2, against the criteria in SRP-SLR Section 3.5.2.2.1.6.

For components associated with AMR items 3.5.1-038, the applicant stated in SLRA Table 3.5-1 that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because review of the corresponding AMR items in the GALL-SLR Report (i.e., II.B3.1.CP-24 and II.B3.2.CP-24) indicate that it applies only to BWR Mark III steel or concrete containments, and MNGP has a BWR Mark I steel containment.

For components associated with AMR item 3.5.1-010 and 3.5.1-039, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWE (as amended by Supplement 2) and the 10 CFR Part 50, Appendix J AMPs is acceptable for the following reasons:

(1) ASME Section XI, Subsection IWE program will be enhanced (SLR Commitment 32(d)) to conduct supplemental one-time surface examinations or enhanced visual examinations (EVT-1) which are methods recommended in the GALL-SLR Report for detecting cracking due to SCC to confirm the absence of SCC aging effects.

(2) The examination will be performed on a representative sample size of five (i.e., 20 percent of high temperature (above 140°F) stainless steel penetrations or DMWs), which is consistent with GALL-SLR recommendation for one-time inspections.

(3) ASME Section XI, Subsection IWE program will be enhanced (SLR Commitment 32(f)) to include additional examinations if SCC is identified because of the supplemental one-time inspections, and if necessary periodic inspections to assure that aging effect of cracking due to SCC is adequately managed through the applicant’s corrective action program.

(4) Plant-specific OE (from IWE inspections and Appendix J leak rate tests) since 1998 have not identified cracking due to SCC associated with DMWs or stainless steel bellows.

(5) The proposed IWE program with enhancements will be consistent with the GALL-SLR Report recommendations to adequately manage this aging effect during the subsequent period of extended operation.

Based on the programs identified, the staff concludes that the applicant’s programs meet SRP-SLR Section 3.5.2.2.1.6 criteria. For those AMR items associated with SLRA Section 3.5.2.2.1.6, as amended by SLRA Supplement 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and the applicant has demonstrated that the effects of aging will be adequately managed; therefore, the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.1.7 Loss of Material (Scaling, Spalling) and Cracking Due to Freeze-Thaw

SLRA Section 3.5.2.2.1.7, associated with SLRA Table 3.5-1 AMR item 3.5.1-011, addresses loss of material (spalling, scaling) and cracking due to freeze-thaw of inaccessible areas of containment concrete components exposed to air-outdoor or groundwater/soil environments. The applicant stated that this item is not applicable to the MNGP Mark I steel containment because the primary containment structure is completely enclosed and sheltered within the reactor building air-indoor environment, and therefore, the internal concrete is not exposed to air-outdoor or groundwater/soil environments. The staff reviewed the applicant’s proposal against the criteria in SRP-SLR Section 3.5.2.2.1.7 and finds it acceptable because based on review of USAR Section 12.2.2 and Section 15 drawings, the staff verified the MNGP containment is a Mark I steel containment that is completely enclosed within the reactor building; therefore, the environment for these aging effects does not exist for the containment internal concrete.

3.5.2.2.1.8 Cracking Due to Expansion from Reaction with Aggregates

SLRA Section 3.5.2.2.1.8, associated with SLRA Table 3.5-1 AMR item 3.5.1-012, addresses cracking due to expansion from reaction with aggregates in inaccessible areas of containment concrete components exposed to any environment. The applicant stated that this item is not applicable to MNGP because the primary containment structure is a Mark I steel containment (not concrete) that is completely enclosed and sheltered within the reactor building air-indoor environment, and the primary containment internal concrete elements are classified as Group 4 structures for which the aging effect is managed by AMR item 3.5.1-043. The staff reviewed the applicant’s proposal against the criteria in SRP-SLR Section 3.5.2.2.1.8 and finds it acceptable because based on review of USAR Section 12.2.2 and Section 15 drawings, the staff verified that the MNGP primary containment structure is a Mark I steel containment completely enclosed within the reactor building; therefore, the material and environment for the aging effect does not exist for the primary containment structure, and the containment internal concrete, which is part of GALL-SLR Group 4 structures, is appropriately addressed by AMR item 3.5.1-043.

3.5.2.2.1.9 Increase in Porosity and Permeability Due to Leaching of Calcium Hydroxide and Carbonation

SLRA Section 3.5.2.2.1.9, associated with SLRA Table 3.5-1 AMR item 3.5.1-014, addresses increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of containment concrete components exposed to a flowing water environment. The applicant stated that this item is not applicable because the MNGP primary containment structure is a Mark I steel containment (not concrete) that is completely enclosed and sheltered within the reactor building air-indoor environment, and the primary containment internal concrete elements are not exposed to air-outdoor or groundwater/soil environments in which leaching could occur. Additionally, the applicant stated there has been no OE of the aging effects observed at MNGP in accessible containment internal concrete elements The staff reviewed the applicant’s proposal against the criteria in SRP-SLR Section 3.5.2.2.1.8 and finds it acceptable, because based on review of USAR Section 12.2.2 and Section 15 drawings, the staff verified the MNGP primary containment structure is a Mark I steel containment that completely enclosed within the reactor building; therefore, the flowing water environment for the aging effect does not exist for the MNGP primary containment structure and the containment internal concrete.

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

In SLRA Section 3.5.2.2, the applicant further evaluated aging management, as recommended in the GALL-SLR Report, for the containments, structures, and component supports components and provided information concerning how it will manage the applicable aging effects. The staff reviewed the applicant’s evaluation of component groups for which the GALL-SLR Report recommends further evaluation against the criteria contained in SRP-SLR Section 3.5.2.2. The following subsections document the staff’s review.

3.5.2.2.2.1 Aging Management of Inaccessible Areas

Item 1. SLRA Section 3.5.2.2.2.1, item 1, associated with SLRA Table 3.5-1, AMR item 3.5.1-042, addresses loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Groups 1–3, 5, and 7–9 structures exposed to air-outdoor or groundwater/soil environments, which is managed by the Structures Monitoring program. The staff noted that Group 7 and 8 structures are not applicable to MNGP, and concrete associated with missile barriers are evaluated with the associated structure and the Condensate Storage Tank foundations are evaluated with Group 3 structures. MNGP is located in a “severe” weathering region as shown in ASTM C33-90, Figure 1. The staff reviewed the applicant’s proposal, as modified by SLRA Supplement 2 (ML23177A218), against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 1.

In its review of components associated with AMR item 3.5.1-042, the staff finds that the applicant has met further evaluation criteria, and the applicant’s proposal to manage the effects of aging using the Structures Monitoring program is acceptable because:

(1) The concrete mix designs contain an air-entraining admixture capable of entraining 3-6 percent air in accordance with ASTM standards.

(2) Plant-specific OE has not identified signs of significant freeze-thaw damage; therefore, a plant-specific aging management program is not needed.

(3) The Structures Monitoring program will opportunistically confirm the absence of aging effects by examining normally inaccessible structural components when scheduled maintenance work and planned plant modifications permit access and will evaluate observed aging effects in accessible areas that could be indicative of degradation in inaccessible areas.

Based on the program identified, the staff concludes that the applicant's program meets SRP-SLR Section 3.5.2.2.2.1, item 1 criteria. For those AMR items associated with SLRA Section 3.5.2.2.2.1, item 1, the staff concludes that the SLRA is consistent with the GALL-SLR Report and the applicant has demonstrated that the effects of aging will be managed adequately; therefore, the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 2. SLRA Section 3.5.2.2.2.1, item 2, associated with SLRA Table 3.5-1, item 3.5.1-043, addresses cracking due to expansion from reaction with aggregates in inaccessible areas of Groups 1–3, 5, and 7–9 structures exposed to any environment, which will be managed by the Structures Monitoring program. The staff noted that Group 7 and 8 structures are not applicable to MNGP, and concrete associated with missile barriers are evaluated with the associated structure and the Condensate Storage Tank foundations are evaluated with Group 3 structures. The staff reviewed the applicant's proposal, as modified by SLRA Supplement 2 (ML23177A218), against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 2.

In its review of components associated with AMR item 3.5.1-043, the staff finds that the applicant has met further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable because:

(1) Plant-specific OE has not identified any indications of alkali-silica reaction (ASR) for the concrete structures at site; therefore, a plant-specific aging management program is not needed.

(2) The enhanced inspections for ASR performed every 5 years under the Structure Monitoring program will be capable of identifying conditions that could be indicative of ASR in accessible areas.

(3) The Structures Monitoring program will opportunistically confirm the absence of aging effects by examining normally inaccessible structural components when scheduled maintenance work and planned plant modifications permit access and will evaluate observed aging effects in accessible areas that could be indicative of degradation in inaccessible areas.

Based on the program identified, the staff concludes that the applicant's program meets SRP-SLR Section 3.5.2.2.2.1, item 2 criteria. For those AMR items associated with SLRA Section 3.5.2.2.2.1, item 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. SLRA Section 3.5.2.2.2.1, item 3, associated with SLRA Table 3.5-1, AMR item 3.5.1-044, addresses 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 environments, which will be managed by the Structures Monitoring program. The staff noted that Group 7 and 8 structures are not applicable to MNGP, and concrete associated with missile barriers are evaluated with the associated structure and the Condensate Storage Tank foundations are evaluated with Group 3 structures. The staff reviewed the applicant's proposal, as modified by SLRA Supplement 2 (ML23177A218), against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 3.

In its review of components associated with AMR item 3.5.1-044, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable because the applicant does not credit a dewatering system that relied upon for settlement control at MNGP.

SLRA Table 3.5-1, item 3.5.1-046, addresses the aging effects of reduction in foundation strength, and cracking due to differential settlement and erosion of porous concrete sub-foundations in below-grade inaccessible concrete areas of Groups 1, 3, 5–9 structures exposed to water-flowing environments. The applicant stated that the item is not used. The staff evaluated the applicant's claim, as modified by SLRA Supplement 2 (ML23177A218), and finds it acceptable because the aging effects of reduction in foundation strength, and cracking due to differential settlement and erosion of porous concrete sub-foundations in below-grade inaccessible concrete areas of Groups 1, 3, 5-9 structures exposed to water-flowing environment, are managed by the Structures Monitoring program and addressed under AMR item 3.5.1-044.

Based on the program identified, the staff concludes that the applicant's program meets SRP-SLR Section 3.5.2.2.2.1, item 3 criteria. For those AMR items associated with SLRA Section 3.5.2.2.2.1, item 3, the staff concludes that the SLRA is consistent with the GALL-SLR Report and 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 subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 4. SLRA Section 3.5.2.2.2.1, item 4, associated with SLRA Table 3.5-1, item 3.5.1-047, addresses increases 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 Structures Monitoring program. The staff noted that Group 7 and 8 structures are not applicable to MNGP, and concrete associated with missile barriers are evaluated with the associated structure and the Condensate Storage Tank foundations are evaluated with Group 3 structures. The staff reviewed the applicant's proposal, as modified by SLRA Supplement 2 (ML23177A218), against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 4.

In its review of components associated with item 3.5.1-047, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable because:

(1) The applicant's evaluation determined that the observed leaching of calcium hydroxide and carbonation in accessible areas has no impact on the intended function; therefore, a plant-specific aging management program is not needed for inaccessible areas.

(2) The Structures Monitoring program inspects for evidence of the aging effect in accessible areas and require that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas.

(3) The Structures Monitoring program will perform opportunistic inspections of inaccessible, below-grade concrete when excavated for any reason.

Based on the program identified, the staff concludes that the applicant's program meets SRP-SLR Section 3.5.2.2.2.1, item 4 criteria. For those items associated with SLRA Section 3.5.2.2.2.1, item 4, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.2 Reduction of Strength and Modulus Due to Elevated Temperature

SLRA Section 3.5.2.2.2.2, associated with SLRA Table 3.5-1, item 3.5.1-048, addresses reduction of strength and modulus of elasticity due to elevated temperature in Group 1–5 concrete structures exposed to an air-indoor uncontrolled environment. SLRA Section 3.5.2.2.2.2 also states that plant areas that bound high temperature considerations are the drywell general area and BSW piping penetration local area, which experience temperatures of 135°F and 179°F, respectively. Safety evaluation of the concrete temperatures in the drywell general area and BSW is evaluated and documented in Section 3.5.2.2.1.2 of this SE. The applicant stated that item 3.5.1-048 is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.2.2 and finds it acceptable because based on its review of the SLRA, concrete temperatures at MNGP are kept below the GALL-SLR Report recommended threshold limits of 150°F for general areas and 200°F for local areas. Additionally, a review of plant-specific OE identified no issues related to elevated temperatures affecting concrete structures.

3.5.2.2.2.3 Aging Management of Inaccessible Areas for Group 6 Structures

Item 1. SLRA Section 3.5.2.2.2.3, item 1, associated with SLRA Table 3.5-1, item 3.5.1-049, addresses loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of water-control structures (Group 6) exposed to air-outdoor or groundwater/soil environments, which is managed by the Structures Monitoring program. MNGP is located in a "severe" weathering region as shown in ASTM C33-90, Figure 1. The staff reviewed the applicant's proposal, as modified by SLRA Supplement 2 (ML23177A218), against the criteria in SRP-SLR Section 3.5.2.2.2.3, item 1.

During its review, the staff noted plant-specific OE that includes cracking in the Intake Structure roof due to the frequent use of deicing salt. The Intake Structure roof concrete was evaluated and repaired, and a new roof membrane was installed. Use of deicing salt on the Intake Structure roof was prohibited.

In its review of components associated with AMR item 3.5.1-049, the staff finds that the applicant has met further evaluation criteria, and its proposal to manage the effects of aging using the Structures Monitoring program is acceptable because:

(1) The air content of the concrete associated with Group 6 structures is within the bounds of 3–8 percent specified in NUREG-2192.

(2) The Intake Structure roof was repaired and an evaluation was performed to confirm the structural integrity of the Intake Structure roof. There were no immediate concerns that would affect the equipment within the Intake Structure; therefore, a plant-specific program is not needed.

(3) The Structures Monitoring program will opportunistically confirm the absence of aging effects by examining normally inaccessible structural components when scheduled maintenance work and planned plant modifications permit access and will evaluate observed aging effects in accessible areas that could be indicative of degradation in inaccessible areas.

Based on the program identified, the staff concludes that applicant's program meets SRP-SLR Section 3.5.2.2.2.3, item 1 criteria. For those AMR items associated with SLRA Section 3.5.2.2.2.3, item 1, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 2. SLRA Section 3.5.2.2.2.3, item 2, associated with SLRA Table 3.5-1, item 3.5.1-050, addresses cracking due to expansion from reaction with aggregates in inaccessible concrete areas of water-control structures (Group 6) exposed to any environment, which will be managed by the Structures Monitoring program. The staff reviewed the applicant's proposal, as modified by SLRA Supplement 2 (ML23177A218), against the criteria in SRP-SLR Section 3.5.2.2.2.3, item 2.

In its review of components associated with AMR item 3.5.1-050, the staff finds that the applicant has met further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable because:

(1) Plant-specific OE has not identified any indications of ASR for the concrete structures at the MNGP site; therefore, a plant-specific aging management program is not needed.

(2) Enhanced inspections for ASR performed every 5 years under the Structure Monitoring program will be capable to identify conditions that could be indicative of ASR in accessible areas.

(3) The Structures Monitoring program will opportunistically confirm the absence of aging effects by examining normally inaccessible structural components when scheduled maintenance work and planned plant modifications permit access and will evaluate observed aging effects in accessible areas that could be indicative of degradation in inaccessible areas.

Based on the program identified, the staff concludes that the applicant's program meets SRP-SLR Section 3.5.2.2.2.3, item 2 criteria. For those AMR items associated with SLRA Section 3.5.2.2.2.3, item 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. SLRA Section 3.5.2.2.2.3, item 3, associated with SLRA Table 3.5-1, item 3.5.1-051, addresses increases in porosity and permeability and losses of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of concrete components for water-control structures (Group 6) exposed to a water-flowing environment, which will be managed by the Structures Monitoring program. The staff reviewed the applicant's proposal, as modified by SLRA Supplement 2 (ML23177A218), against the criteria in SRP-SLR Section 3.5.2.2.2.3, item 3.

In its review of components associated with item 3.5.1-051, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable because:

(1) The applicant's evaluation determined that the observed leaching of calcium hydroxide and carbonation in accessible areas was corrected prior to a loss of the intended function for the Intake Structure; therefore, a plant-specific aging management program is not needed for inaccessible areas.

(2) The Structures Monitoring program inspects for evidence of the aging effect in accessible areas and requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas.

(3) The Structures Monitoring program will perform opportunistic inspections of inaccessible, below-grade concrete when excavated for any reason.

Based on the program identified, the staff concludes that the applicant's program meets SRP-SLR Section 3.5.2.2.2.3, item 3 criteria. For those items associated with SLRA Section 3.5.2.2.2.3, item 3, the staff concludes that the SLRA is consistent with the GALL-SLR 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 subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.4 Cracking Due to Stress Corrosion Cracking, and Loss of Material Due to Pitting and Crevice Corrosion

SLRA Section 3.5.2.2.2.4, associated with SLRA Table 3.5-1 AMR items 3.5.1-052, 3.5.1-099 and 3.5.1-100, addresses SCC and loss of material due to pitting and crevice corrosion for stainless steel tank liners exposed to standing water, aluminum and stainless steel support members, welds, bolted connections, and support anchorage to building structure exposed to air or condensation, which will be managed by either the One-Time Inspection program, the ASME Section XI, Subsection IWF program, or the Structures Monitoring program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Report Section 3.5.2.2.2.4.

For SLRA AMR item 3.5.1-052, the applicant stated that the corresponding item of stainless steel tank liners in the GALL-SLR Report is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.2.4 and finds it acceptable because a search of applicant's SLRA and USAR confirmed that there are no stainless steel tank liners exposed to standing water in the scope of subsequent license renewal.

SLRA Table 3.5-1 AMR item 3.5.1-099 addresses SCC and loss of material due to pitting and crevice corrosion for aluminum and stainless steel supports and anchorage of ASME Code piping and components exposed to air. The applicant stated that the aluminum fuel prep machine framing is managed for the cracking and loss of material by the One-Time Inspection program, and stainless steel ASME Class 1, 2, or 3 and MC support components are managed for loss of material and cracking by the ASME Section XI, Subsection IWF program. In its review of aluminum and stainless steel components associated with AMR item number 3.5-1, 099 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 either the One-Time Inspection program or the ASME Section XI, Subsection IWF program for the applicable ASME Code aluminum and stainless steel structural components is acceptable for the following reasons:

(1) The use of the One-Time Inspection program to detect cracking and loss of material in the aluminum fuel prep machine framing will provide reasonable assurance that the effects of aging will be managed so that the intended function of the component will be maintained consistent with the CLB throughout the subsequent period of extended operation.

(2) Use of periodic visual inspections in accordance with the ASME Section XI, Subsection IWF program to detect cracking and loss of material in stainless steel structural support components will allow degradation to be detected and corrective action to be taken prior to a loss of intended function.

SLRA Table 3.5-1 AMR item 3.5.1-100 addresses loss of material due to pitting and crevice corrosion and cracking due to SCC for the aluminum and stainless steel supports and anchorage of non-ASME Code piping and components exposed to air. In its review of components associated with AMR item number 3.5-1, 100, for which the applicant cited generic note A, the staff noted that the SLRA credits the Structures Monitoring program to manage the aging effect for aluminum and stainless steel electrical enclosures, aluminum platform components, aluminum fuel storage racks (new fuel), stainless steel cap, and other miscellaneous stainless steel structural components exposed to air. The staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program for the applicable non-ASME Code aluminum and stainless steel structural components is acceptable because the use of periodic visual inspections in accordance with the Structures Monitoring program to detect cracking and loss of material in aluminum and stainless steel structural support components will allow degradation to be detected and corrective action to be taken prior to a loss of intended function.

Based on the programs identified, the staff concludes that the applicant's programs meet SRP-SLR Section 3.5.2.2.2.4 criteria. For those AMR items associated with SLRA Section 3.5.2.2.2.4, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated the effects of aging will be adequately managed so the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.5 Cumulative Fatigue Damage

SLRA Section 3.5.2.2.2.5 is associated with SLRA Table 3.5.1, item 3.5.1-053. The SLRA section indicates that SLRA Table 3.5.1, item 3.5.1-053, is not appliable to MNGP because the plant does not have component support members, anchor bolts, or welds for Group B1.1, B1.2, and B1.3 supports that have a CLB fatigue analysis. The SLRA also explains that the fatigue TLAA for the reactor pressure vessel support skirt is separately addressed in relation to SLRA Table 3.1-1, item 3.1.1-004 as part of the reactor pressure vessel components (SLRA Section 4.3.3).

With respect to SLRA Table 3.5.1, Item 3.5.1-053, the staff reviewed the USAR and did not identify a CLB fatigue analysis for the component supports other than the fatigue TLAA for the reactor pressure vessel support skirt discussed above. The staff's evaluation of the fatigue TLAA for the reactor pressure vessel components including the support skirt is documented in SE Section 4.3.3.

The staff finds that the applicant's AMR results for the fatigue TLAA on the component supports are acceptable because the fatigue TLAA for the reactor pressure vessel support skirt is separately addressed as part of the fatigue TLAA for the reactor pressure vessel (SLRA Section 4.3.3), and the MNGP does not have other component supports to which SLRA Table 3.5.1, item 3.5.1-053 is applicable.

3.5.2.2.2.6 Reduction of Strength and Mechanical Properties of Concrete Due to Irradiation

SLRA Section 3.5.2.2.2.6, as amended by Supplement 5 dated August 28, 2023 (ML23240A695), Supplement 7 dated November 30, 2023 (ML23334A147), and Supplement 8 dated January 11, 2024 (ML24012A051), associated with SLRA Table 3.5-1, AMR item 3.5-1, 097, addresses the applicant's further evaluation related to reduction of strength and mechanical properties of the BSW and the reactor vessel pedestal structural concrete that are exposed to neutron and gamma radiation and radiation induced heating in air-indoor uncontrolled environment. SLRA Section 3.5.2.2.2.6, as amended by Supplements 5, 7, and 8 also addresses the applicant's further evaluation of the reactor vessel steel support structures (skirt, seismic restraints and stabilizer lateral support structure components) and BSW steel structural components and liner, with their aging management evaluated through revised SLRA Tables 3.5.2-1 and 3.5.2-7 to include AMR items for loss of fracture toughness due to neutron irradiation embrittlement in air-indoor uncontrolled environment having a generic note H (i.e., aging effect not in GALL-SLR (NUREG-2191, Revision 0) for the component, material and environment). The section is also associated with SLRA Sections 2.3.1.1, 2.4.1, 2.4.7, 3.5.2.2.1.2, 4.2.1, B.2.2.2, B.2.3.19, B.2.3.30, and B.2.3.33.

Based on its evaluation, the applicant determined that a plant-specific program is not required to manage the effects of irradiation on the concrete and steel components of the BSW and reactor vessel supports; however, the aging effects will be monitored through periodic visual examinations of the Structures Monitoring and ASME Section XI, Subsection IWF AMPs recommended guidance. The staff reviewed the applicant's further evaluation for concrete components against the criteria in SRP-SLR (NUREG-2192, Revision 0) Section 3.5.2.2.2.6, as modified by SLR-ISG-2021-03-STRUCTURES (ML23229A004). For steel components, the staff reviewed the further evaluation against NUREG-1509 applicable and recommended guidance, consistent with SRP-SLR Appendix A.1 "Aging Management Review – Generic (Branch Technical Position RLSB-1)."

The applicant stated that potential reduction of strength and of mechanical properties of concrete, evidenced for example as cracking, due to irradiation is a concern for the BSW structural concrete that surrounds the reactor vessel and reactor vessel support pedestal. As indicated in Figure 3.5.2.2.2.6-1 of the SLRA, as amended by Supplement 8, the BSW concrete is approximately 26 in. thick and 46 ft tall above the top of its supporting reactor vessel concrete pedestal. As noted in the USAR 12.2.2.1.1 (ML23006A146) and the SLRA, the BSW concrete is encapsulated by a double walled shell formed by two steel-plate cylinders interconnected with wide flange columns and beams "capable of transmitting loads due to seismic and jet forces acting on it." Only the lower 12 ft (shaded blue in Figure 3.5.2.2.2.6-1) of the encapsulated BSW concrete above the top of the reactor vessel concrete pedestal are designed and credited in the CLB as structural reinforced concrete (i.e., up to elevation [EL] 959 ft 3 in.). Above EL 959 ft 3 in., the concrete fill serves only a shielding function for radiation and thermal effects.

From SLRA Supplement 8 Figure 3.5.2.2.2.6-1 and USAR Figure 4.2-1 (ML23006A152), the staff noted that the active fuel core region of the reactor vessel is 12 ft high with its top at EL 978 ft 8.5 in. and bottom at EL 966 ft 8.5 in., and the seismic stabilizer brackets are at EL 992 ft 5.5 in. Therefore, the centerline (or midplane) and the bottom of the active fuel core region are approximately 25.5 ft and 19.5 ft, respectively, above the top of the reactor vessel pedestal which is at EL 947 ft 3 in., and the top of structural reinforced concrete part of BSW and centerline of the seismic stabilizers are, respectively, approximately 13.5 ft below and 19.75 ft above the fuel core midplane. From SLRA Table 4.2.1.1-4, the axial length of the MNGP beltline region (neutron fluence >1 x 1017 n/cm^2, E >1 MeV, 72 effective full-power years [EFPY]) is 193.2 in. or approximately 16 ft (i.e., 8 ft each above and below the fuel core midplane).

The applicant also stated that a loss of (or reduction in) fracture toughness due to irradiation embrittlement of the reactor vessel support steel is a potential aging effect considered. The reactor vessel support steel includes the cylindrical reactor vessel steel skirt that is welded to the bottom of reactor vessel. As noted in USAR Sections 4.2.2 (ML23006A152), 12.2.2.1.1 (ML23006A146), Appendix A (ML23006A135), and the SLRA, the skirt extends through the drywell into the foundation and is attached through shear rings into a reinforced concrete pedestal, which carries the load through the drywell to the reactor building foundation slab. Stabilizers provide lateral support between the reactor vessel and BSW below the vessel flange and well above the active fuel core region at EL 994 ft 2 in. to limit horizontal vibration and help resist seismic and jet forces. A truss consisting of pipes laterally supports the BSW with the drywell at El 992 ft 5.5 in.

The applicant determined that for the BSW concrete with its encapsulating double walled steel shell and interconnecting steel elements (columns, welds), reactor vessel reinforced concrete pedestal, reactor vessel skirt support steel, and the seismic restraint and stabilizer structure, the effects of aging due to radiation are adequately managed and their intended function(s) are maintained consistent with the CLB through the subsequent period of extended operation. The staff evaluated SLRA Section 3.5.2.2.2.6, as amended, to ensure that consistent with 10 CFR 54.21(a)(3) there is a reasonable assurance that the intended functions of the concrete and steel structures and components will be maintained through the subsequent period of extended operation.

Evaluation of Neutron Fluence and Gamma Dose Estimation Methodology

The staff reviewed SLRA Section 3.5.2.2.2.6, as amended by Supplement 5, and noted that the applicant provided estimates for the neutron fluence and gamma dose using the methodology described in BWRVIP-114-A, “RAMA Fluence Methodology Theory Manual,” (RAMA – Radiation Analysis Modeling Application) (ML092650376), benchmarked with a plant-specific capsule dosimetry analysis, and compared against the fluence estimates provided in EPRI Report 3002008128, which estimated the fluence after 80 years of operation for BWR plants. The staff noted that both the results were below the SRP-SLR fluence threshold; however, the EPRI report is not an NRC-endorsed report, and therefore, the staff review was limited to only portions applicable to this evaluation. Neutron fluence analytic uncertainties are typically limited to 20 percent when following the guidance in RG 1.190, “Calculation and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence.” The applicant calculated the total ex-vessel uncertainty to be 11.6 percent, thus the methodology is consistent with Regulatory Guide 1.190. The applicant determined the peak neutron fluence to be 6.59×10^{18} neutrons/cm^2 (E>0.1 MeV) and the peak gamma dose to be 4.85×10^{10} rad incident on the inner surface of the BSW concrete at 72 EFPY (corresponding to 80 years of operation). The applicant clarified in Supplement 5 that its analysis assumed the gamma dose at 72 EFPY is proportional to the gamma flux. The staff considers this assumption to be reasonable because flux can be approximated to be constant at fuel core midplane for full power operation. These neutron fluence and gamma dose values calculated across the centerline of the active fuel core (core midplane) are the highest possible values for the BSW concrete and structural steel, reactor vessel pedestal structural concrete, and support steel skirt. The applicant states in Supplement 5 that credit is taken for the shielding and spatial dispersion of radiation for materials that are distant from the peak location, such as the structural concrete located below the height of the active core.

The staff notes that the RAMA methodology is generically applicable to BWR/4 plants but may be applied to plant groups with different geometries provided there is at least one plant-specific capsule dosimetry analysis to quantify the potential presence of a bias and assure that the uncertainty is within the RG 1.190 guidance limits. During the audit (ML23214A241), the staff reviewed the applicant's plant-specific capsule dosimetry analysis. The analysis confirmed the applicant's statement that the total uncertainty in neutron fluence and gamma dose is 11.6 percent with no discernable bias and within Regulatory Guide 1.190 limits. The staff noted that the dosimetry analysis showed agreement between the calculated and measured values. Regulatory Guide 1.190 allows applicants to report the best estimate fluence if the standard deviation (1σ) is less than 20 percent. Because the applicant's uncertainty is less than 20 percent, consistent with Regulatory Guide 1.190 guidance, additional biases are not needed, including any biases associated with cycle-to-cycle variations such as fuel assembly design. Similarly, the applicant's analysis also appropriately credits the spatial dispersion of neutron and gamma radiation using the RAMA methodology in a manner consistent with Regulatory Guide 1.190. Therefore, the staff determined that the use of RAMA for determining the neutron fluence and gamma dose in this application is acceptable.

The staff finds that the applicant's use of the RAMA methodology in this SLRA is acceptable because it adheres to Regulatory Guide 1.190, is appropriately applied, and remains within the range of applicability that RAMA was approved for. Furthermore, the staff confirmed that the applicant addressed all necessary conditions delineated in the NRC safety evaluation of BWRV IP-114-A. Therefore, the staff also finds the applicant's calculated neutron fluence and gamma dose values to be reasonable estimations.

Neutron Fluence Biological Shield Wall (BSW) Concrete Irradiation Evaluation

SRP-SLR Section 3.5.2.2.2.6, as modified by SLR-ISG-2021-03-STRUCTURES, states that the threshold for strength reduction and degradation of material properties of concrete due to neutron irradiation is a fluence of 1×10^{19} neutrons/cm^2 (E >0.1 MeV). The calculated peak neutron fluence along the fuel core midplane at the inner surface of the BSW concrete reported in the SLRA is 6.59×10^{18} neutrons/cm2. Further, because the top of reactor vessel pedestal is located well below the active fuel core region, the neutron fluence on the reactor vessel pedestal concrete will attenuate and be below the SLRA reported peak value. The staff noted that the calculated neutron fluence is less than the threshold for reduction of strength and degradation of material properties. Also, since the neutron fluence is below the SRP-SLR Report threshold limit, potential effects from radiation induced volumetric expansion of the aggregates is expected to be negligible. Therefore, the staff finds that a plant-specific program is not required to manage the aging effects of neutron irradiation on the BSW and reactor vessel pedestal structural concretes during the subsequent period of extended operation.

Gamma Dose BSW Concrete Irradiation Evaluation

The staff notes that ANSI/ANS-6.4-2006, “Nuclear Analysis and Design of Concrete Radiation Shielding for Nuclear Power Plants,” states, “in many reactor shielding situations, the secondary gamma radiation produced within the primary [bio]shield is a more important contribution to the dose outside the shield than is the neutron radiation.” To counter the RAMA methodology’s inability to explicitly account for secondary sources of radiation, the applicant performed additional analyses to account for secondary radiation. The relevant neutronics information from RAMA were input into the ORIGEN computer code to calculate secondary and delayed gamma radiation. The total dose from the prompt radiation, calculated in RAMA, and the delayed and secondary radiation, calculated in ORIGEN, were combined. The staff finds that this approach to calculating the delayed and secondary radiation is acceptable and will result in a bounding estimate of the gamma exposure to the BSW concrete.

SRP-SLR Section 3.5.2.2.2.6, as modified by SLR-ISG-2021-03-STRUCTURES, states that the threshold for strength reduction and degradation of material properties of concrete due to gamma irradiation is a gamma dose of 1×10^{10} rads. From SLRA Section 3.5.2.2.2.6, as amended, the calculated peak gamma dose, using the above approach, at the inner surface of the BSW concrete across the fuel core midplane is 4.85×10^{10} rads. The calculated gamma dose is greater than the threshold for reduction of strength and degradation of concrete material properties. Therefore, the applicant performed further analysis and evaluation to address potential reduction of concrete strength and material properties to manage the aging effects due to gamma irradiation in the subsequent period of extended operation.

The staff reviewed SLRA Section 3.5.2.2.2.6, as amended by Supplement 5 and Supplement 8, in which the applicant summarized its analysis/evaluation of the potential reduction in concrete strength and material properties, including gamma heating effects, of the BSW structural reinforced concrete (i.e., the lower 12 ft above the reactor vessel pedestal), resulting from the peak gamma dose exceedance over the SRP-SLR threshold. The staff noted that the applicant attenuated the gamma flux along the height of the shield wall normalized to the flux at fuel core midplane, based on Figure 3-7, “Axial Gamma Flux Variation Relative to Core Fuel Mid-Height” of Report ORNL/TM-2018/769, Revision 0, (also in Figure 2-7 of EPRI Report 3002011710) and the assumption that gamma dose at 72 EFPY is proportional to flux, which the staff finds reasonable. The staff also notes that the above referenced publications are not NRC endorsed reports, therefore the staff review was limited to only portions applicable to this evaluation. Using this approach, the applicant determined the gamma dose at the bottom of the active fuel core region (approximately 6 ft below the fuel core midplane) to be 0.35 times the peak gamma dose at the fuel core midplane for 72 EFPY (i.e., $0.35 \times 4.85 \times 10^{10}$ rads or 1.7×10^{10} rads). The staff noted that the applicant conservatively considered the gamma dose at the top of the structural reinforced concrete part of the BSW (which 7.5 ft below the bottom of the active fuel core region) to be the same as the estimated value at the bottom of the active fuel core region of 1.7×10^{10} rads. The staff further noted that for the pedestal below the BSW anchorage, the top of concrete is sufficiently remote from the active fuel core region (25.5 ft below core midplane or 19.5 ft below bottom of active core region) that the gamma dose is less than the threshold of concern that the concrete strength and its mechanical properties are not affected.

The staff finds that the above estimated gamma dose considered at the top of the BSW structural reinforced concrete section for its structural integrity evaluation is reasonable and conservative, because:

(1) It is based on a generic normalized curve from a published literature referenced above.

(2) The gamma dose at the top of the BSW structural reinforced concrete section (12 ft from top of reactor vessel concrete pedestal), although attenuated because of its distance from the core, is conservatively considered to be the same (1.7×10^{10} rad) as that at the bottom of the active fuel core region located 7.5 ft above it.

The staff further noted that, using the conservative gamma dose value of 1.7×10^{10} rads, which is above the SRP-SLR threshold, the applicant determined the reduction in the specified concrete compressive strength (fc') of 4,000 psi, as noted in Supplement 8 (ML24012A051), due to this level of gamma radiation using applicable data from literature (Figure 7, Hilsdorf et al.) is less than 10 percent and that the reinforcing steel does not experience degradation of its properties at the calculated level of gamma radiation. The applicant then re-evaluated the design of the BSW structural reinforced concrete section for the controlling load combination (included jet and seismic (SSE) forces) using the ACI 318-63 (code of record) methodology and acceptance criteria consistent with the original calculation but using a degraded value of f'c conservatively rounded down to 3,500 psi. Accordingly, the applicant determined that the demand to capacity (D/C) of resulting stress ratios for the degraded BSW reinforced concrete case were less than 1.0, with the maximum D/C ratio of 0.98 (ML24012A051); indicating that the capacity remains greater than demand at 72 EFPY, and thus acceptable for the subsequent period of extended operation.

The staff finds that the applicant's re-evaluation of the lower 12 ft structural reinforced concrete portion of the BSW for potential reduction in strength due to gamma dose during the subsequent period of extended operation reasonable and acceptable because:

(1) The estimated gamma dose at the top of the BSW structural concrete section used for the structural integrity evaluation is very conservative.

(2) The evaluation determined the reduction in concrete compressive strength corresponding to the estimated gamma dose value from appropriate data in published literature (i.e., Hilsdorf et al.).

(3) The evaluation applied the reduced compressive strength and re-evaluated the design of the wall section consistent with method and acceptance criteria in the original CLB calculation and showed that the acceptance criteria was met for the degraded case for the subsequent period of extended operation.

The staff further finds that for the reactor vessel pedestal concrete to which the BSW is anchored, the gamma dose value will be considerably less than the SRP-SLR Report threshold of 1.0×10^{10} rads because, as noted previously, the top of the reactor vessel pedestal is at EL 947 ft 3 in., which is 19.5 ft below the active fuel core bottom that further attenuates the 1.7×10^{10} rads gamma dose to below the SRP-SLR Report threshold value. Therefore, the staff finds reasonable assurance that there will be no impact of the effects of irradiation on the reactor vessel pedestal structural concrete.

Evaluation of the BSW Structural Concrete Temperature Increase from Potential Gamma Heating Effect

The staff reviewed SLRA Section 3.5.2.2.2.6, as amended by Supplement 5 and Supplement 8, and noted that the applicant asserted that the heating effect in the BSW structural concrete from gamma ray irradiation to be limited to approximately 1.12°F temperature rise. The staff noted that the applicant determined the change in temperature by extrapolating results of a theoretical case study example presented in Figures 5-6 and Figure 5-7 of NRC Research Information Letter (RIL) 2021-007, Radiation Effects on Concrete – An Approach for Modeling Degradation of Concrete Properties (ML21238A064). The staff notes that RIL 2021-07 states that the "theoretical models" presented therein require certain input properties and parameters for which there is lack of data and therefore at this time, the framework can be used only for sensitivity analyses." The staff further notes that the RIL also states that subsequent research needs focus on characterizing, verifying, and validating the input parameters used in the examples presented therein. However, the staff also notes that the SLRA neither appeared to document a plant-specific analysis applying the meso-scale modeling approach in RIL 2021-07 nor did the applicant demonstrate applicability of the specific assumed input properties and parameters used in the RIL example case study to corresponding plant-specific input material properties and other relevant parameters to MNGP. Hence, the staff finds that the SLRA asserted temperature change of 1.12°F due to gamma heating was not adequately supported on a plant-specific basis and appears also to not account for further increase in temperature inside the concrete from thermal conductivity. As such, the staff's reasonable assurance evaluation below, for effects of temperature change due to potential gamma radiation in the BSW structural concrete is based on a risk-informed bounding approach founded on available margin(s) to accommodate expected nominal temperature changes from gamma heating.

The staff notes that paragraph E-4.1 of ACI 349-13 permits allowable concrete temperature limits to be increased to 180°F for general areas and 230°F for local areas if the tested concrete strength (e.g., measured compressive strength at 28 days or more) is equal to or greater than 115 percent of the specified 28-day compressive design strength (f'c). The staff noted that for BSW concrete, the measured compressive strength at 28 days (or more) should be greater than or equal to 4,600 psi (i.e., 1.15 x f'c = 1.15 x 4,000 psi) for the increased concrete temperature limits to be applicable. The staff noted from the SLRA, as amended by Supplement 8, that the 28 days test strength of similar concrete pours for other containment elements is above the 4,600 psi criterion of ACI 349-13. During the limited scope audit (ML24054A158), the staff reviewed plant-specific concrete "Placement and Test Reports" data of BSW representative concrete pours and verified that the measured (tested) compressive strengths at 28 days and 90 days generally exceeded 4,600 psi; therefore, the increased concrete temperature limits can be applied for evaluating the BSW wall concrete.

The staff reviewed SLRA Section 3.5.2.2.2.6, as amended by Supplement 5 and Supplement 8, and noted that "plant areas that bound high temperature considerations are the drywell general area and BSW piping penetration local area, which experience temperatures of 135°F (average) and 179°F, respectively." The amended SLRA also states that insulation is credited with maintaining the BSW penetration temperatures below the local limits of 200°F of the SRP-SLR Report. It also states that MNGP Technical Specification Limiting Condition for Operation 3.6.1.4 requires the drywell average air temperature to be maintained and periodically verified to be less than or equal to 135°F. The SLRA states that this temperature is maintained by the primary containment cooling and ventilation system. The amended SLRA further states that a heat transfer analysis of the air gap cavity between the reactor vessel and the BSW determined the upper bound air cavity temperature at the steel inner liner surface of the BSW structural concrete as approximately 141°F.

Therefore, considering the upper bound temperature at the concrete inner surface to be the same as the temperature of the inner steel liner, the available margin to accommodate additional general area temperature increase inside the concrete including thermal conductivity and gamma heating effects is 39°F (i.e., 180°F – 141°F). For a bounding assessment, the staff used the temperature profiles of a generic BSW concrete, including the effects of gamma radiation for varying air gap temperatures and air flows, shown in Figure 7 of published literature (Bruck et al.). From this Figure 7, the staff noted that, from the temperature profile for the inner gap air temperature of 140°F (closest to upper bound 141°F for MNGP), the maximum temperature in the concrete section is approximately 159°F. This temperature increase of 19°F (i.e., 159°F -140°F) in the concrete includes effects of gamma heating. Conservatively, considering an additional 25 percent increase in temperature due to potential variations in concrete conductivity, cavity air flow and incident gamma dose, a bounding increase in concrete temperature, including gamma heating effects, inside the BSW structural concrete is approximated as not to exceed 24°F (i.e.,1.25 x 19°F rounded up). This potential increase is well below the available margin of 39°F to accommodate the general area change in temperature inside the BSW structural concrete, including gamma heating.

Likewise applying the 24°F increase to the BSW maximum local area temperature of 179°F yields a maximum local area temperature of 203°F, which is below the ACI 349-13 increased limit of 230°F with margin. Therefore, the staff finds that there is reasonable assurance that the maximum temperature including gamma heating effects inside the BSW structural concrete would be below the increased general area and local area limits permitted by ACI 349-13, such that aging effects related to elevated general or local area concrete temperature would not be present during the subsequent period of extended operation.

Overall, the staff thus finds that based on evaluations of the structural concrete as above, aging effects discussed above will not affect the structural integrity of the BSW and the reactor vessel pedestal structural concretes through the subsequent period of extended operation, and no additional aging management of concretes beyond that provided through the Structures Monitoring AMP (SLRA Section B.2.3.33) is necessary to manage the aging effects of irradiation through the subsequent period of extended operation.

Based on the above evaluation, the staff concludes that the applicant’s evaluation has demonstrated that a plant-specific AMP is not necessary to manage the aging effects of irradiation on the lower 12 ft structural reinforced concrete section of the BSW and the reactor vessel pedestal structural reinforced concrete for the subsequent period of extended operation, and that the Structures Monitoring AMP’s periodic monitoring and inspections of the accessible areas on an interval not to exceed 5 years is adequate to monitor and manage the irradiation induced aging effects.

Conclusion for BSW and Reactor Vessel Pedestal Structural Concrete Evaluation

In its review of concrete components associated with AMR item 3.5.1-097, the staff finds that MNGP has met the further evaluation criteria, and its proposal to manage the effects of aging on the BSW and reactor vessel pedestal structural concretes using the Structures Monitoring AMP is acceptable because:

(1) For the reactor vessel pedestal structural concrete, the peak neutron fluence and gamma dose values will not exceed the SRP-SLR Report thresholds at which radiation-induced aging effects are expected to degrade its concrete mechanical properties during the subsequent period of extended operation.

(2) For the BSW structural concrete that serves a structural function, the neutron fluence will not exceed the SRP-SLR Report limits. However, the impact of the exceedance of the gamma dose over SRP-SLR Report threshold was evaluated in a conservative manner for the structural reinforced concrete portion of the BSW and shown to meet the acceptance criteria of the original calculations for the subsequent period of extended operation. Further, it was shown that the concrete temperatures, including the effects of gamma radiation heating remain below the ACI 349-13 Appendix E limits during the subsequent period of extended operation.

(3) The Structures Monitoring AMP will monitor for absence of, or indications of, radiation induced aging effects as well as those for loss of material, cracking, and distortion by performing periodic inspections of the of accessible BSW and reactor vessel pedestal structural concretes on an interval not to exceed 5 years consistent with the GALL-SLR Report. Therefore, a plant-specific program is not necessary to manage the irradiation aging effects for structural concrete of the BSW and reactor vessel pedestal concretes.

(4) The BSW concrete (except for the lower 12 ft of the shield wall) does not perform a structural function and is only required to provide radiation shielding, which remains unaffected to radiation effects.

Reactor Vessel Support Steel Irradiation Evaluation

In SLRA Section 3.5.2.2.2.6 and its Supplement 5, the applicant stated that Section 4.2.1 of NUREG-1509 notes that irradiation embrittlement is not an issue for reactor vessel support skirts and referenced EPRI Report 300202099, “BWRVIP-342,” for additional clarification on the effects of irradiation on hardening and embrittlement of steel supports in the calculation of record for MNGP. The applicant also clarified that the information cited in BWRVIP-342 has no bearing on actual design basis transients and calculated design loads used in the analysis for MNGP.

The applicant stated that the reactor vessel lateral supports, seismic restraints, and stabilizer structure are sufficiently remote from the active fuel core (approximately 11 ft above the reactor beltline) and not subject to the embrittlement threshold of greater than 1×10^{17} n/cm^2 (E >1 MeV) specified in Appendix H to 10 CFR 50 for reactor vessel steel. The applicant also reported a fluence value of 3.25×10^{16} n/cm^2 (E >1 MeV) at 72 EFPY at a nozzle location below the reactor beltline and noted that the top portion of the MNGP reactor vessel steel skirt is approximately 11 ft below the bottom of the active fuel. The applicant stated that, as such, the fluence value at the MNGP reactor vessel steel skirt is below the 1×10^{17} n/cm^2 (E >1 MeV) threshold. Finally, the applicant stated that the current ASME Code, Section XI, Subsection IWF AMP inspection of reactor vessel supports will be used to confirm that there is no visible evidence of a loss of fracture toughness. In SLRA Section 3.5.2.2.2.6, Table 3.5.2-7, and its Supplement 7 (Enclosure 03), the applicant clarified that the ASME Section XI Subsection IWF AMP (SLRA Section B.2.3.30) manages loss of fracture toughness through monitoring for cracking of the ASME Class 1 structural support steel.

The staff finds that the MNGP reactor vessel steel skirt, reactor vessel lateral support seismic restraints, and stabilizer structure do not need be evaluated for the effects of irradiation embrittlement because:

(1) The fluence values through the subsequent period of extended operation for these reactor vessel support components are less than the exposure level above which embrittlement effects would need to be evaluated.

(2) Evidence of aging effects due to irradiation, via confirmation that there is no visible evidence of a loss of fracture toughness (e.g., cracking), will be performed through the ASME Code, Section XI, Subsection IWF AMP.

The staff did not evaluate the information in EPRI Report BWRVIP-342, which contained additional clarification on the effects of irradiation on hardening and embrittlement of steel supports, specifically reactor vessel steel skirt designs, because the applicant did not use the report as a basis for its evaluation of the impact of irradiation on the MNGP reactor vessel steel skirt.

Additionally, in the staff's regulatory audit report dated August 31, 2023 (ML23214A241), the staff confirmed that the ASME Code, Section XI, Subsection IWF in-service inspection reports indicated acceptable results for the reactor vessel steel supports.

Biological Shield Wall (BSW) Structural Steel Evaluation

In SLRA Section 3.5.2.2.2.6 and its Supplements 5, 7, and 8, the applicant evaluated the steel elements of the BSW structural steel (i.e., wide flange steel columns, interior and exterior steel liners, and associated welds) for radiation embrittlement, using the guidance in NUREG-1509. The applicant stated that the maximum radiation exposure level at the BSW steel corresponding mid-height of the active fuel core is 2.07×10^{-3} displacements per atom (dpa) at 72 EFPY. The applicant performed a fracture mechanics evaluation in accordance with NUREG-1509 because this maximum dpa exposure level is greater than the NUREG-1509 guidance of 2.0×10^{-5} dpa.

The applicant stated that the MNGP BSW structural steel is fabricated from steel conforming to ASTM A36 low carbon steel (specifically, carbon-manganese steel), based on original construction specifications and confirmed in the material receipt records (i.e., Certified Material Test Reports, as identified in the limited scope audit (ML24054A158)). The applicant also stated that the original specifications for the BSW structural steel did not specify additional copper or nickel be incorporated into the ASTM A36 material and that there were no chemical measurements for copper or nickel in the material receipt records for the BSW structural steel. For the purposes of the further evaluation, the applicant stated that the weld materials are similar to the ASTM A36 materials. In SLRA Section 3.5.2.2.2.6, Table 3.5.2-1, and its Supplement 7 (Enclosure 03), the applicant clarified that the enhanced Structures Monitoring AMP (SLRA Section B.2.3.33) manages loss of fracture toughness through monitoring for cracking of the BSW steel liner.

Fracture mechanics evaluation

In SLRA Section 3.5.2.2.2.6 and its Supplements 5 and 8, the applicant summarized the fracture mechanics evaluation of the BSW structural steel. The applicant clarified in Supplement 8 (Enclosure 03) that nil-ductility transition temperature evaluations were not credited and that a fracture mechanics evaluation in accordance with NUREG-1509 was credited instead. The applicant determined operational stresses resulting from design basis loads through finite element analysis. The applicant stated that the controlling load case is the sum of “Jet Force,” “Preload,” and “Seismic Forces.” The staff noted the “Jet Force” comes from shearing a recirculation nozzle and shearing an outlet steam line per the MNGP USAR 4.2.3.4. The maximum operational tensile stress resulting from the controlling load case is 4.49 ksi. The staff confirmed during the audit that the location of this maximum tensile stress of 4.49 ksi is at the inner steel liner. The applicant added a maximum weld residual stress of 36 ksi to the operational stress of 4.49 ksi, resulting in a total applied stress of 40.49 ksi.

The applicant then determined the limiting stress intensity factor (SIF) value of 21.2 ksi-in$^{1/2}$, which was calculated in accordance with the NUREG-1509 guidance using conservative values for flaw size and flaw shape parameter. The staff verified the SIF value of 21.2 ksi-in$^{1/2}$ due to the total applied stress of 40.49 ksi using the SIF equations provided in NUREG-1509. The staff confirmed that the applicant’s calculated SIF value of 21.2 ksi-in$^{1/2}$ includes conservatisms, e.g., how the flaw shape parameter in the NUREG-1509 SIF equation was applied. Accordingly, the staff finds the operational stresses acceptable because they include effects of seismic and jet forces (i.e., break(s) in large bore piping such as recirculation nozzle and outlet steam line), and weld residual stress.

In SLRA Section 3.5.2.2.2.6 and its Supplement 8 (Enclosure 02a), the applicant explained that because the BSW concrete has a slightly smaller thermal expansion coefficient than the steel liner, the thermal expansion of the inner steel liner is constrained by the concrete as it (i.e., the inner steel liner) will try to expand more than the surrounding concrete. Given this lower thermal expansion coefficient of the concrete, the applicant stated that the expansion of the concrete from the asserted 1.12°F temperature increase of the concrete due to gamma heating results in a maximum of 0.94 ksi additional compressive stress during operation. The staff confirmed during the audit that the additional compressive stress is acting on the inner steel liner. The staff noted that the applicant’s evaluation is conservative because it did not credit this compressive stress in the fracture mechanics evaluation. The staff also noted that potential concrete temperature increase more than 1.12°F due to gamma heating would result in a larger value of compressive stress which would add to the conservatism.

In SLRA Section 3.5.2.2.2.6 and its Supplements 5 and 8, the applicant discussed the fracture toughness of the ASTM A36 BSW structural steel. In Supplement 8 (Enclosure 03), the applicant provided a lower bound fracture toughness, K_{IC}, value of 32 ksi-in$^{1/2}$ for ASTM A36 steel from industry literature (Gerardo Terán Méndez et al.). The staff confirmed the K_{IC} value of 32 ksi-in$^{1/2}$ (35.6 MPa-m$^{1/2}$) as cited in the source referenced above and noted that:

(1) The KIC value of 32 ksi-in1/2 is the minimum value of the KIC data reported.

(2) The minimum KIC value of 32 ksi-in1/2 was determined at room temperature (20°C = 68°F.

(3) The minimum KIC value of 32 ksi-in1/2 was determined for welding at a simulated water depth of 70 meters.

The staff noted that K_{IC} value of 32 ksi-in$^{1/2}$ for ASTM A36 steel discussed above does not include irradiation and strain rate effects. As concluded in previous SLRA safety evaluations (ML22054A108 and ML23219A003) and the upper bound shift in nil-ductility transition temperature in Figure 3-1 of NUREG-1509, there could be a reduction in fracture toughness of up to 10 ksi-in$^{1/2}$ due to the irradiation exposure level of 2.07 x 10^{-3} dpa at 72 EFPY and strain rate effects. With this 10 ksi-in$^{1/2}$ drop in fracture toughness, the K_{IC} value for ASTM A36 steel could be as low as 22 ksi-in$^{1/2}$. Thus, the SIF value of 21.2 ksi-in$^{1/2}$, due to the applied loads calculated by the applicant (Supplement 8), has little margin from the K_{IC} value of 22 ksi-in$^{1/2}$ for ASTM A36 steel with effects of irradiation and strain rate included. The staff evaluated this small margin below by considering the conservatisms in the fracture toughness and calculated SIF that the applicant used in its fracture mechanics evaluation.

As the staff noted above, the K_{IC} value of 32 ksi-in$^{1/2}$ for ASTM A36 steel is a minimum (i.e., lower bound) value and was determined at room temperature (68°F) and for welding at a simulated water depth of 70 meters. Regarding temperature, the applicant stated in Supplement 5 (Enclosure 03e) that within the BSW annulus cavity the normal operating temperature ranges from 112°F to 141°F, and as stated in Supplement 8 (Enclosure 02b), the steel inner liner fuel mid-core level upper and lower bound temperatures are 140.66°F and 120.94°F, respectively. The staff noted that these temperatures, and in particular that at the inner steel liner at the fuel mid-core level height where maximum dpa exposure level occurs, are greater than the room temperature at which the lower bound fracture toughness of 32 ksi-in$^{1/2}$ was determined; therefore, the fracture toughness of ASTM A36 steel would be greater (Roberto Francisco Di Lorenzo et al.) than 32 ksi-in$^{1/2}$ because fracture toughness of steel increases as temperature increases.

Regarding the simulated welding of ASTM A36 steel at a 70-m water depth, it is explained in the source cited for the ASTM A36 fracture toughness (Gerardo Terán Méndez et al.) that fracture toughness decreased as water depth increased in part, “due to the porosity percentage, microstructure and slag produced in the wet weld beads.” The staff noted that because it is highly unlikely that the weldments of the BSW steel liner were performed underwater, the fracture toughness of ASTM A36 could be significantly higher (Roberto Francisco Di Lorenzo et al.) than the 32 ksi-in$^{1/2}$ value reported for simulated welding at a water depth of 70 m and used for fracture toughness of the BSW steel liner by the applicant.

Lastly, the staff compared the embrittlement of the BSW liner at 72 EFPY with the estimated embrittlement at the approximate current operational period for MNGP at the time of the SLRA submittal, which is approximately 40.3 EFPY (see SLRA Section 4.2.1.1). As discussed above, the K_{IC} value for ASTM A36 steel could be as low as 22 ksi-in$^{1/2}$ due to an irradiation exposure level of 2.07 x 10^{-3} dpa at 72 EFPY. At 40.3 EFPY the K_{IC} value for ASTM A36 steel would only be marginally higher. Thus, had there been effects of embrittlement at the BSW liner to date, it would have been detected and reported as OE under the existing Structures Monitoring AMP. The SLRA review of plant-specific OE of the Structures Monitoring AMP has not identified any OE at the BSW structural steel, which includes the steel liners.

In summary, based on the discussion above, the staff finds the applicant’s fracture mechanics evaluation of the BSW liner acceptable because:

(1) The applicant calculated the limiting SIF due to applied stresses with sufficient conservatisms.

(2) The applicant used a conservative lower bound value for fracture toughness of the BSW structural steel.

(3) There is little difference in embrittlement of the BSW liner at 40.3 EFPY and 72 EFPY in addition to the observation that there has been no plant-specific OE as such identified in the BSW liner.

(4) The Structures Monitoring AMP will manage loss of fracture toughness by monitoring cracking of the BSW steel liner.

<u>Conclusion for Reactor Vessel Support Steel and Biological Shield Structural Steel Irradiation Evaluation</u>

In its review of the reactor vessel support steel and BSW structural steel components, associated with supplemental AMR items in SLRA Supplement 7 related to loss of fracture toughness due to irradiation, the staff finds that the applicant has met the applicable further evaluation criteria from NUREG-1509, and the applicant's proposal to manage the effects of aging due to irradiation embrittlement on the reactor vessel support steel skirt, reactor vessel lateral support seismic restraints and stabilizer structure, and BSW structural steel using the ASME Section XI, Subsection IWF AMP and Structures Monitoring AMP, respectively, is acceptable because:

(1) The applicant justified that irradiation embrittlement of the reactor vessel support steel through 72 EFPY need not be evaluated.

(2) The applicant demonstrated that reduction of fracture toughness of the BSW structural steel through 72 EFPY is acceptable through a conservative fracture mechanics evaluation.

(3) Both the ASME Section XI, Subsection IWF AMP and Structures Monitoring AMP will manage loss of fracture toughness by monitoring for cracking of the steel components discussed above during the subsequent period of extended operation.

<u>Conclusion</u>

Based on the AMPs identified to manage reduction of strength of the BSW and reactor vessel pedestal structural concretes and loss of material and reduction of fracture toughness of the reactor vessel support steel skirt and BSW structural steel, the staff finds that applicant's AMPs and AMRs in the SLRA, as amended by Supplements 5, 7, and 8 are acceptable. Further, the staff finds that the applicant adequately evaluated that a plant-specific program or enhancement(s) to existing AMPs are not needed to manage the effects of aging due to radiation for the MNGP BSW and reactor vessel pedestal structural concretes, as well as for reactor vessel support steel skirt and reactor vessel lateral support seismic restraints and stabilizer structure, and BSW structural steel. Therefore, the applicant's evaluation of the subject components meets the intent of SRP-SLR further evaluation criteria, consistent with the GALL-SLR Report principles. The staff therefore concludes that there is reasonable assurance that the applicant has demonstrated that the effects of aging for the subject components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

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

The following subsections document the staff's review of AMR results listed in SLRA Tables 3.5.2-1 through 3.5.2-18 that are either not consistent with or not addressed in the GALL-SLR Report and 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 SLRA Table 1 item, the subsections are organized by applicable AMR section and then by material and environment combinations.

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

3.5.2.3.1 Primary Containment – Summary of Aging Management Evaluation

<u>Steel Components Exposed to Air – Indoor Uncontrolled Environment</u>.

SLRA Table 3.5.2-1, as amended by Supplement 5 dated August 28, 2023 (ML23240A695) and Supplement 7 dated November 30, 2023 (ML23334A147), states that the loss of fracture toughness aging effect for the BSW carbon steel components (includes columns, beams, liner plates, doors) exposed to air – indoor uncontrolled environment will be managed by the Structures Monitoring AMP. The AMR item cites generic note H, for which the applicant has identified loss of fracture toughness (cracking) due to irradiation embrittlement as an additional aging effect. The AMR item cites plant-specific note 12, which states, "The Structures Monitoring (B.2.3.33) AMP is used to manage loss of fracture toughness. No additional aging management of the BSW structural steel beyond the current Structures Monitoring (B.2.3.33) AMP is necessary for aging effects due to irradiation. Further evaluation is documented in the Biological Shield Structural Steel Evaluation in Section 3.5.2.2.2.6."

The related plant-specific evaluation in SLRA Section 3.5.2.2.2.6, as amended by Supplement 5 (ML23240A695) and Supplement 8 dated January 11, 2024 (ML24012A051), under subsection titled "Biological Shield Structural Steel Evaluation" using the NUREG-1509 fracture mechanics approach and the corresponding staff evaluation in SE Section 3.5.2.2.2.6 concluded that the potential effects of irradiation on the steel elements of the BSW, including welds, are not significant. Because the integrity of the BSW structural steel is reasonably assured, the applicant's evaluation justifies the adequacy of the current visual examinations of the Structures Monitoring Program to assure that there is not a loss of fracture toughness (cracking) of the BSW steel components. The staff finds the applicant's proposal to manage the loss of fracture toughness of the BSW structural steel components using the Structures Monitoring program acceptable as follows:

(1) The staff evaluation in SE Section 3.5.2.2.2.6 of the applicant's plant-specific irradiation evaluation concluded that a plant-specific program is not necessary to manage the aging effect.

(2) Loss of fracture toughness (cracking is included as an aging effect managed within the program scope) (SLRA Table A-3 commitments 36(g) and 36(h) and 36(n)).

(3) The periodic visual examinations, on a 5-year typical frequency, of the accessible portions of the BSW structural steel for irradiation embrittlement (SLRA Table A-3 commitment 36(n)) of the Structures Monitoring AMP (evaluated in SE Section 3.0.3.2.23) are adequate to monitor for cracking as a potential symptom of loss of fracture toughness through the subsequent period of extended operation.

(4) The condition of the accessible liner plates will be used as leading indicators of the condition of the remaining BSW structural components.

3.5.2.3.2 Fire Protection Barriers Commodity Group – Summary of Aging Management Evaluation-SLRA Table 3.5.2-6

Gypsum Rigid Board (Gypsum Walls, etc.) Exposed to Indoor Uncontrolled Air

As supplemented by letter dated June 26, 2023 (ML23177A218), SLRA Table 3.5.2-6 states that change in material properties, cracking, delamination, loss of material, and separation for gypsum rigid board (gypsum walls, etc.) exposed to indoor uncontrolled air will be managed by the Fire Protection AMP. The AMR item cites generic note F, “Material not in NUREG-2191 for this component.” The AMR item cites plant-specific note 1, which states “Gypsum drywall is utilized to provide fire barriers at MNGP. The material is not addressed in NUREG-2191, but aging is managed by the Fire Protection AMP consistent with silicate fire barriers.”

The staff reviewed the associated item in the SLRA and considered whether the aging effects proposed by the applicant constitute all the applicable aging effects for this component, material, and environment description. SLR-ISG-2021-02-MECHANICAL, “Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance” (ML20181A434), states the Fire Protection AMP manages loss of material, cracking/delamination, change in material properties, and separation for silicate fireproofing/fire barriers. In addition, SLR-ISG-2021-02-MECHANICAL states that the aging effects are 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, and those cited by industry as part of SLRA lessons learned activities and public comments on the draft AMR item. Therefore, the staff finds that the applicant has identified all applicable aging effects for this component, material, and environment combination.

The staff finds the applicant’s proposal to manage the effects of aging acceptable because the periodic visual inspections required by the Fire Protection AMP can detect the applicable aging effects before a loss of intended function for the component, material, and environment noted above.

3.5.2.3.3 Hangers and Support Commodity Group – Summary of Aging Management Evaluation

Steel Reactor Vessel Supports and Bolting Exposed to Air – Indoor Uncontrolled Environment

SLRA Table 3.5.2-7, as amended by Supplement 5 dated August 28, 2023 (ML23240A695) and Supplement 7 dated November 30, 2023 (ML23334A147), states that the loss of fracture toughness aging effect for steel ASME Class 1 Supports (includes steel reactor vessel supports and bolting) exposed to air-indoor uncontrolled environment will be managed by the ASME Section XI, Subsection IWF AMP. The AMR item cites generic note H, for which the applicant has identified loss of fracture toughness (cracking) due to irradiation embrittlement as an additional aging effect. The AMR item cites plant-specific note 4, which states, “The ASME Section XI, Subsection IWF (B.2.3.30) AMP is used to manage loss of fracture toughness. No additional aging management of the ASME Class 1 Supports beyond the current IWF (B.2.3.30) AMP is necessary for aging effects due to irradiation. Further evaluation is documented in the reactor vessel Support Steel Irradiation Evaluation in Section 3.5.2.2.2.6.”

The related plant-specific evaluation in SLRA Section 3.5.2.2.2.6, as amended by Supplement 5 dated August 28, 2023 (ML23240A695) and Supplement 8 dated January 11, 2024

(ML24012A051), and the staff evaluation in SE Section 3.5.2.2.2.6 concluded that the 72 EFPY (80 calendar years) fast neutron fluence (E >1 MeV) for the reactor vessel support skirt (top knuckle region) located well below the active fuel (approximately 11 ft), as well as for the lateral supports (includes seismic restraint and stabilizer structural components), located well above the active fuel (approximately 11 ft), is estimated to remain below the 1 x 10^{17} n/cm^2 (E >1 MeV) threshold from 10 CFR 50, Appendix H for loss of fracture toughness of steel due to irradiation embrittlement. Because the integrity of the reactor vessel supports (including bolting) is assured, with fluence below the threshold limit for irradiation embrittlement considering 80 calendar years (72 EFPY) of fluence, the evaluation justifies the continuing adequacy of the current visual examination (VT-3) of the reactor vessel structural steel supports as part of the SLRA B.2.3.30 ASME Section XI, Subsection IWF Program to confirm the absence of or identify any visible evidence of loss of fracture toughness (e.g., cracking). The staff finds the applicant's proposal to manage the loss of fracture toughness due to irradiation embrittlement of the reactor vessel supports using the ASME Section XI, Subsection IWF AMP acceptable as follows:

(1) The staff evaluation in SE Section 3.5.2.2.2.6, as amended, of the applicant's plant-specific fluence evaluation, being less than the embrittlement threshold limit, concluded that a plant-specific program is not necessary to manage the aging effect.

(2) Loss of fracture toughness is included as an aging effect managed within the program scope.

The VT-3 visual examinations of reactor vessel support steel for irradiation embrittlement (SLRA Table A-3 Commitment 33(k)) on a 10-year frequency of the ASME Section XI, Subsection IWF AMP (evaluated in SE Section 3.0.3.2.21) are sufficient to confirm the absence of or monitor for cracking as potential symptom of loss of fracture toughness through the subsequent period of extended operation.

3.6 Aging Management of Electrical and Instrumentation and Controls

3.6.1 Summary of Technical Information in the Application

SLRA Section 3.6, "Aging Management of Electrical and Instrumentation & Controls," provides AMR results for those components the applicant identified in SLRA Section 2.5, "Scoping and Screening Results: Electrical and Instrumentation & Controls," as being subject to an AMR. SLRA Table 3.6-1, "Summary of Aging Management Evaluations for Electrical Commodities," is a summary comparison of the applicant's AMR results with those provided in the GALL-SLR Report for electrical components.

3.6.2 Staff Evaluation

Table 3.6-1 summarizes the staff's evaluation of the component groups listed in SLRA Section 3.6 and addressed in the GALL-SLR Report.

Table 3.6-1. Staff Evaluation for Electrical Components in the GALL-SLR Report

Component Group (SRP-SLR Report Item No.)	Staff Evaluation
3.6.1-001	Consistent with the GALL-SLR Report (See SE Section 3.6.2.2.1)
3.6.1-002	Not applicable to MNGP (See SE Section 3.6.2.1.1 and 3.6.2.3.2)

Component Group (SRP-SLR Report Item No.)	Staff Evaluation
3.6.1-003	Not applicable to MNGP (See SE Section 3.6.2.1.1 and 3.6.2.3.2)
3.6.1-004	Not applicable to MNGP (See SE Section 3.6.2.2.3 and 3.6.2.3.3)
3.6.1-005	Not applicable to MNGP (See SE Section 3.6.2.2.3 and 3.6.2.3.3)
3.6.1-006	Not applicable to MNGP (See SE Section 3.6.2.2.3 and 3.6.2.3.3)
3.6.1-007	Not applicable to MNGP (See SE Section 3.6.2.2.3 and 3.6.2.3.3)
3.6.1-008	Consistent with the GALL-SLR Report
3.6.1-009	Consistent with the GALL-SLR Report
3.6.1-010	Consistent with the GALL-SLR Report
3.6.1-011	Consistent with the GALL-SLR Report
3.6.1-012	Consistent with the GALL-SLR Report
3.6.1-013	Consistent with the GALL-SLR Report
3.6.1-014	Consistent with the GALL-SLR Report
3.6.1-015	Consistent with the GALL-SLR Report
3.6.1-016	Not applicable to MNGP (See SE Sections 3.6.2.1.1 and 3.6.2.3.1)
3.6.1-017	Not applicable to MNGP (See SE Sections 3.6.2.1.1 and 3.6.2.3.1)
3.6.1-018	Not applicable to MNGP (See SE Sections 3.6.2.1.1 and 3.6.2.3.1)
3.6.1-019	Consistent with the GALL-SLR Report
3.6.1-020	Not applicable to BWR (See SE Section 3.6.2.1.1)
3.6.1-021	Not applicable to MNGP (See SE Sections 3.6.2.2.3)
3.6.1-022	Not applicable to MNGP (See SE Sections 3.6.2.1.1 and 3.6.2.3.1)
3.6.1-023	Consistent with the GALL-SLR Report
3.6.1-024	Consistent with the GALL-SLR Report
3.6.1-025	This item number is not used in either the SRP-SLR Report or in the GALL-SLR Report
3.6.1-026	This item number is not used in either the SRP-SLR Report or in the GALL-SLR Report
3.6.1-027	Not applicable to MNGP (See SE Section 3.6.2.1.1)
3.6.1-028	This item number is not used in either the SRP-SLR Report or in the GALL-SLR Report
3.6.1-029	Not applicable to MNGP (See SE Section 3.6.2.2.2)
3.6.1-030	Not applicable to MNGP (See SE Section 3.6.2.2.2)
3.6.1-031	Not applicable to MNGP (See SE Section 3.6.2.2.2)
3.6.1-032	Not applicable to MNGP (See SE Section 3.6.2.2.2)

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 Sections 3.6.2.1 discuss AMR results for components that the applicant states are either not applicable to MNGP or are consistent with the GALL-SLR Report. Section 3.6.2.1.1 summarizes the staff's review of items that are not applicable or not used and documents any RAIs issued and the staff conclusions. The remaining subsections in SE Section 3.6.2.1 document the review of components that required additional information or otherwise require explanation.

(2) SE Section 3.6.2.2 discusses AMR results for which the GALL-SLR Report and SRP-SLR recommend further evaluation.

(3) SE Section 3.6.2.3 discusses AMR results for components that the applicant states are not consistent with, or not addressed in, the GALL-SLR Report. These AMR results are typically identified by generic notes F through J and plant-specific notes in the SLRA.

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

The following subsections document the staff's review of AMR results listed in SLRA Tables 3.6-1 and 3.6.2-1, "Electrical and Instrumentation & Control Commodities – Summary of Aging Management Evaluation," that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat its review of the matters described in the GALL-SLR Report. The staff verified that the material presented in the SLRA was applicable and that the applicant identified the appropriate GALL-SLR Report AMRs. For those AMR items the staff found to be consistent with the GALL-SLR Report, and for which no additional evaluation or request for additional information applies, the staff's review and conclusions as documented in the GALL-SLR Report are considered to be the basis for acceptability of the AMR items. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SE Table 3.6-1 and no separate writeup is required or provided. The staff did not identify any AMR items that required additional review with an associated writeup.

SE Section 3.6.2.1.1 documents the staff's review of AMR items that the applicant determined to be not applicable.

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

For SLRA Table 3.6-1, items 3.6.1-002, 3.6.1-003, 3.6.1-004, 3.6.- 005, 3.6.1-006, 3.6.1-007, 3.6.1-016, 3.6.1-017, 3.6.1-018, 3.6.1-021, 3.6.1-022, 3.6.1- 027, 3.6.1- 029, 3.6.1-030, 3.6.1-031, and 3.6.1-032, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to MNGP. The staff reviewed the SLRA and USAR, independently searched the plant-specific OE and plant-specific inspection results, and confirmed that the applicant's SLRA does not have any AMR results that are applicable for these items.

SLRA Table 3.6-1, item 3.6.1-002 addresses loss of material on metallic connectors due to mechanical wear caused by movement of transmission conductors due to significant wind for high-voltage electrical insulators composed of porcelain; malleable iron; aluminum; galvanized steel; cement, toughened glass; polymers silicone rubber; fiberglass, aluminum alloy exposed to air-outdoor. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable as follows. During the audit (ML23214A232), the staff's independent search of plant-specific OE and plant-specific inspection results did not reveal any evidence that wind-related degradation was occurring on the high-voltage insulators. Furthermore, the installed configuration of the in-scope strain of high-voltage insulators for the relatively short length transmission conductors in the 115 kV system minimizes movement, which reduces mechanical wear of metallic parts within the strain insulators.

SLRA Table 3.6-1, item 3.6.1-003 addresses reduced insulation resistance due to presence of cracks, foreign debris, salt, dust, cooling tower plume or industrial effluent contamination; peeling of silicone rubber sleeves for polymer insulators; or degradation of glazing on porcelain insulators for high-voltage electrical insulators composed of porcelain; malleable iron; aluminum; galvanized steel; cement, toughened glass; polymers silicone rubber; fiberglass, aluminum alloy exposed to air-outdoor. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable as follows. During the audit (ML23214A232), the staff's independent search of plant-specific OE and plant-specific inspection results did not reveal any evidence that that observable loss of material was occurring on the high-voltage insulators. MNGP is located is an area where substantial airborne contaminants are not a concern. The hydrophobicity (i.e., the surface property that causes a water drop to form into a droplet) of the silicone rubber for the polymer high-voltage insulators minimizes the risk of flashover caused by contaminated surfaces and consequentially polymer type of insulators can withstand high levels of contamination minimizing the potential aging effects. MNGP OE has not identified cumulative buildup contamination of high-voltage insulators, issues with surface contamination for polymer high-voltage insulators, and porcelain cracking due to cement growth has not occurred.

SLRA Table 3.6-1, item 3.6.1-016 addresses managing increased electrical resistance of connection due to chemical contamination, corrosion, and oxidation in an air, indoor uncontrolled environment for fuse holders (not part of active equipment): metallic clamps composed of various metals used for electrical connections exposed to air-indoor, uncontrolled. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because based on SLRA Section 3.6.2.3.1, "Fuse Holders:"

(1) The in-scope fuse holders in the turbine and reactor buildings are inside electrical boxes that protect them from chemical contamination and they are not exposed to sources of chemical contamination, corrosion, and oxidation.

(2) The applicant's walkdown confirmed these in-scope fuse holders did not have evidence of moisture intrusion, chemical contamination, oxidation, or corrosion.

SLRA Table 3.6-1, item 3.6.1-017 addresses managing increased electrical resistance of connection due to fatigue from ohmic heating, thermal cycling, electrical transients for fuse holders (not part of active equipment): metallic clamps composed of various metals used for electrical connections exposed to air-indoor, controlled or uncontrolled. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because based on the SLRA, Section 3.6.2.3.1:

(1) The in-scope fuse holders in the turbine and reactor buildings are used in electrical boxes that feed low current control power circuits having no appreciable thermal cycling or ohmic heating.

(2) Electrical transients are mitigated by circuits protective devices at high currents.

SLRA Table 3.6-1, item 3.6.1-018 addresses managing increased electrical resistance of connection due to fatigue caused by frequent fuse removal/manipulation or vibration for fuse holders (not part of active equipment): metallic clamps composed of various metals used for electrical connections exposed to air-indoor, controlled or uncontrolled. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because based on SLRA Section 3.6.2.3.1:

(1) The in-scope fuse holders in the turbine and reactor buildings are not subject to frequent manipulation.

(2) The electrical boxes housing these in-scope fuse holders are mounted with no attached sources of vibration.

For SLRA Table 3.6-1, item 3.6.1-020, the applicant claims that the corresponding AMR item in the GALL-SLR Report are not applicable because the associated items are only applicable to PWRs. The staff reviewed the SRP-SLR, confirmed that these items only apply to PWRs, and finds that these items are not applicable because MNGP is a BWR.

SLRA Table 3.6-1, item 3.6.1-022, as modified by Supplement 2 (ML23177A218) addresses managing reduced electrical insulation resistance due to thermal/thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion for fuse holders (not part of active equipment): insulation material composed of electrical insulation material: Bakelite; phenolic melamine or ceramic; molded polycarbonate, and other, exposed to air-indoor, controlled or uncontrolled. The applicant stated that this item is not applicable. The staff evaluated the applicant’s claim and finds it acceptable as follows: The SLRA, Section 3.6.2.3.1, stated that the insulation materials for the in-scope fuse holders in the turbine and reactor buildings, which are in the same environment as their associated metallic clamps, are not in an adverse localized environment that would cause these aging effects on the insulation materials. During the audit (ML23214A232), the staff’s independent search of plant-specific OE and plant-specific inspection results did not reveal any evidence that the reduced electrical insulation due to the above-mentioned aging mechanisms was occurring on the in-scope fuse holders in the turbine and reactor buildings.

3.6.2.2 Aging Management Review Results for which Further Evaluation Is Recommended by the GALL-SLR Report

In SLRA Section 3.6.2.2, the applicant further evaluates aging management for certain electrical and instrumentation and controls system components as recommended by the GALL-SLR Report and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant’s evaluation of these component groups against the criteria contained in SRP-SLR Section 3.6.2.2. The following subsections document the staff’s review.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

SLRA Section 3.6.2.2.1, associated with SLRA Table 3.6-1 item 3.6.1-001, states that TLAAs are evaluated in accordance with 10 CFR 54.3. The applicant’s evaluation of this TLAA is addressed in Section 4.4. This is consistent with SRP-SLR Section 3.6.2.2.1, which states that TLAAs as defined in 10 CFR 54.3, are evaluated in accordance with 10 CFR 10 54.21(c)(1) and is, therefore, acceptable. The staff’s evaluation of the TLAA for environmental qualification of electrical equipment is documented in SE Section 4.4.

3.6.2.2.2 Reduced Insulation Resistance Due to Age Degradation of Cable Bus Arrangements Caused by Intrusion of Moisture, Dust, Industrial Pollution, Rain, Ice, Photolysis, Ohmic Heating, and Loss of Strength of Support Structures and Louvers of Cable Bus Arrangements Due to General Corrosion and Exposure to Air-Outdoor

SLRA Section 3.6.2.2.2 is associated with SLRA Table 3.6-1 items 3.6.1-029, 3.6.1-030, 3.6.1-031 and 3.6.1-032 and addresses reduced insulation resistance due to age degradation of cable bus arrangements due to intrusion of moisture, dust, industrial pollution, rain, ice, photolysis, ohmic heating and loss of strength of support structures and louvers of cable bus arrangements due to general corrosion and exposure to air-outdoor.

A cable bus is a variation on a metal enclosed bus and is similar in construction to a metal enclosed bus; however, instead of segregated or nonsegregated electrical buses, a cable bus comprises a fully enclosed metal enclosure that uses three-phase insulated power cables installed on insulated support blocks.

The applicant has stated that a cable bus is not applicable as it is not used at MNGP. Accordingly, cable bus is not subject to AMR at MNGP.

Conclusion. Based on its audit and review of the SLRA, the staff concludes that the applicant has met the SRP-SLR Section 3.6.2.2.2 criteria. For SLRA Table 3.6-1 items 3.6.1-027, 3.6.1-029, 3.6.1-030, 3.6.1-031, and 3.6.1-032, the staff finds that the SLRA is consistent with the GALL-SLR Report recommendations and the applicant has demonstrated that the effects of aging will be adequately managed so 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).

3.6.2.2.3 Loss of Material Due to Wind-Induced Abrasion, Loss of Conductor Strength Due to Corrosion, and Increased Resistance of Connection Due to Oxidation or Loss of Preload for Transmission Conductors, Switchyard Bus, and Connections

SLRA Section 3.6.2.2.3 associated with SLRA Table 3.6-1, items 3.6.1-004, 3.6.1-005, 3.6.1-006, 3.6.1-007, and 3.6.1-021, addresses loss of conductor strength due to corrosion, increased resistance of connection due to oxidation or loss of preload, and loss of material due to wind-induced abrasion in transmission conductors, transmission connections, and switchyard buses and connections. The criteria in SRP-SLR Section 3.6.2.2.3 state that the GALL-SLR Report recommends further evaluation of a plant-specific AMP to ensure that the aging effects are adequately managed. Discussions of these AMR items follow.

SLRA Table 3.6-1, item 3.6.1-004 addresses loss of conductor strength due to corrosion for transmission conductors composed of aluminum; steel exposed to air – outdoor. The applicant stated that this item is not applicable. The staff evaluated the applicant’s claim against criteria in SRP-SLR Section 3.6.2.2.3 and Appendix A.1, “Aging Management Review – Generic (Branch Technical Position RLSB-1),” and finds it acceptable for the following reasons:

(1) MNGP is located in a rural area and air quality in the area surrounding the plant contains low concentrations of suspended particles such as sulfur dioxide and salts, which minimizes the corrosion rate and there are no major industries producing chemicals within the immediate vicinity of plant.
(2) The staff’s review of MNGP OE identified no issues with transmission conductor corrosion or unique aging effects for transmission conductors.

SLRA Table 3.6-1, item 3.6.1-005, addresses increased resistance of connection due to oxidation or loss of preload for transmission connectors composed of aluminum; steel exposed to air-outdoor. The applicant stated that this item is not applicable. The staff evaluated the applicant’s claim against criteria in SRP-SLR Section 3.6.2.2.3 and Appendix A.1 and finds it acceptable for the following reasons:

(1) The use of an antioxidant compound on connections to prevent moisture intrusion and the performance of periodic inspections to verify the integrity of switchyard connections at MNGP minimize the potential increase in surface oxidation and consequential increase in connection resistance due to general corrosion of switchyard connection metal surfaces.

(2) The staff's review of MNGP OE confirmed that this aging effect is not significant for MNGP.

SLRA Table 3.6-1, item 3.6.1-006, loss of material due to wing induced abrasion; increased resistance of bus connection due to oxidation or loss of preload for switchyard bus and connections composed of aluminum; copper; bronze; stainless steel; galvanized steel exposed to air-outdoor. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against criteria in SRP-SLR Section 3.6.2.2.3 and Appendix A.1 and finds it acceptable for the following reasons:

(1) The short lengths of conductors between the switchyard bus and switchyard equipment preclude factors that result in loss of material.
(2) The use of antioxidant compound on switchyard connections to prevent moisture intrusion and the performance of periodic inspections to verify the integrity of switchyard connections minimize the potential increase in surface oxidation and consequential increase in connection resistance due to general corrosion of switchyard connection metal surfaces.
(3) The configuration of the bolted connections for switchyard bus using Belleville washers and current maintenance activities, which include periodic infrared inspections to verify integrity of connections, minimize the potential for increased resistance due to loss of preload.

SLRA Table 3.6-1, item 3.6.1-007, addresses loss of material due to wind-induced abrasion for transmission conductors composed of aluminum; steel exposed to air-outdoor. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against criteria in SRP-SLR Section 3.6.2.2.3 and Appendix A.1. and finds it acceptable for the following reasons:

(1) MNGP transmission conductors subject to AMR are relatively short lengths of aluminum conductor steel reinforced (ACSR) circuits associated with the offsite power recovery paths following a station blackout, and this precludes factors that result in loss of material.
(2) During the audit (ML23214A232), the staff's independent search of plant-specific OE and plant-specific inspection results did not identify either any occurrences of loss of material due to wind loading or unique aging effects for transmission conductors.

SLRA Table 3.6-1, item 3.6.1-021, the applicant claims that the corresponding AMR item in the GALL-SLR Report is not applicable. The staff reviewed the SLRA, description of the material and environment associated with this AMR item and has concluded that the applicant's claim is reasonable.

Conclusion. Based on its audit and review of the SLRA, the staff concludes that the applicant has met the SRP-SLR Section 3.6.2.2.3 criteria. For those items that apply to SLRA Section 3.6.2.2.3, the staff finds the SLRA to be consistent with the GALL-SLR Report, and the applicant has demonstrated that the effects of aging will be adequately managed so 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 NRC staff's evaluation of the applicant's QA Program.

3.6.2.2.5 Ongoing Review of Operating Experience

SE Section 3.0.5 documents the NRC staff's evaluation of the applicant's ongoing review of OE.

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

The following subsections document the staff's review of AMR results listed in the SLRA Tables 3.6-1 and 3.6.2-1, that are either not consistent with or not addressed in the GALL-SLR Report and are usually denoted with generic 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 3.6-1 item, the subsections are organized by applicable AMR section and then by material and environment combinations.

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

3.6.2.3.1 *Fuse Holders Metallic Components and Insulation Material Exposed to Air-indoor Controlled or Uncontrolled*

<u>Various Metals Used for Electrical Connections for Fuse Holders (Not Part of Active Equipment): Metallic Clamps Exposed to Air-Outdoor</u>

SLRA Table 3.6.2-1, states that for Various Metals Used for Electrical Connections for Fuse Holders (Not Part of Active Equipment): Metallic Clamps exposed to air-outdoor, there are no aging effects, and no AMP is proposed. Items 3.6.1-016, 3.6.1-017, and 3.6.1-018 cite generic note G. Items 3.6.1-016, 3.6.1-017, and 3.6.1-018 cite plant-specific notes 2–4, which state:

(1) In alignment with GALL-SLR, no AMP is required when fuse holders are not subject to fatigue due to frequent fuse removal/manipulation or removal. See SLRA Section 3.6.2.3.1 for additional information.

(2) In alignment with GALL-SLR, no AMP is required when fuse holders are not subject to fatigue due to ohmic heating, thermal cycling, or electrical transients. See SLRA Section 3.6.2.3.1 for additional information.

(3) In alignment with GALL-SLR, no AMP is required when fuse holders are installed in an environment that does not subject them to environmental aging mechanisms and effects due to chemical contamination, corrosion, and oxidation. See SLRA Section 3.6.2.3.1 for additional information.

The staff reviewed the associated items in the SLRA to confirm that these aging effects/mechanisms are not applicable for this component, material, and environment combination. The staff finds the applicant's proposal acceptable because SLRA Section 3.6.2.3.1 stated that the in-scope fuse holders in the switchyard:

(1) Are installed inside electrical boxes that protect them from sources of chemical contamination, corrosion, and oxidation, and the applicant's walkdown confirmed they have no evidence of moisture intrusion, chemical contamination, oxidation, or corrosion.

(2) Their electrical boxes feed low current control power circuits, which have no appreciable thermal cycling or ohmic heating, and electrical transients are mitigated by circuits protective devices at high currents.

(3) They are not subject to frequent manipulation and their electrical boxes are mounted with no attached sources of vibration.

<u>Electrical insulation: Bakelite; Phenolic Melamine or Ceramic; Molded Polycarbonate, and other for Fuse Holders (Not Part of Active Equipment): Insulation Material Exposed to Air – Outdoor</u>

SLRA Table 3.6.2-1, as modified by Supplement 2 (ML23177A218), states that for Electrical Insulation: Bakelite; phenolic Melamine or Ceramic; Molded Polycarbonate; and Other for Fuse Holders (not part of active equipment): Electrical Insulation exposed to air-outdoor, there is no aging effect, and no AMP is proposed. The item 3.6.1-022 cites generic note G. The AMR item 3.6.1-022 also cites a plant-specific note 1, which states:

Note 1: In alignment with the GALL-SLR Report, no AMP is required when fuse holders are installed in an environment that does not subject them to environmental aging mechanisms. MNGP fuse holders (not in active components) insulation material and environment combination has no aging effects requiring management. See SLRA Section 3.6.2.3.1 for additional information.

The staff reviewed the associated item in the SLRA to confirm that the aging effect of reduced electrical insulation resistance due to thermal/thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion is not applicable for this component, material and environment combination. The staff finds the applicant's proposal acceptable as follows: The SLRA, Section 3.6.2.3.1, stated that the insulation materials for the in-scope fuse holders in the switchyard, which are in the same environment as their associated metallic clamps, are not in an adverse localized environment that would cause these aging effects on the insulation materials. During the audit (ML23214A232), the staff's independent search of plant-specific OE and plant-specific inspection results did not reveal any evidence that the reduced electrical insulation due to the above-mentioned aging mechanisms was occurring on the in-scope fuse holders in the switchyard.

3.6.2.3.2 *Porcelain; Malleable Iron; Aluminum; Galvanized Steel; Cement Toughened Glass; Polymers Silicone Rubber, Fiberglass, Aluminum Alloy for High-Voltage Electrical Insulators Exposed to Air-Outdoor*

SLRA Table 3.6.2-1 states that for high-voltage electrical insulators composed of porcelain; malleable iron; aluminum; galvanized steel; cement toughened glass; polymers silicone rubber; fiberglass, aluminum alloy exposed to air-outdoor, aging effects are not applicable and no AMP is proposed. AMR items 3.6.1-002 and 3.6.1-003 cite generic note I. The AMR items also cite plant-specific notes 5 and 6 which state:

Note 5: Based on MNGP design and a review of OE, loss of material is not an applicable aging effect for MNGP high-voltage electrical insulators. MNGP high-voltage electrical insulators within the scope of license renewal are not subject to mechanical wear or corrosion caused by movement of transmission conductors due to significant wind. See SLRA Section 3.6.2.3.2 for additional information.

Note 6: Based on MNGP design and a review of OE, reduced electrical insulation resistance is not an applicable aging effect for MNGP high-voltage electrical insulators. MNGP high-voltage electrical insulators within the scope of license renewal are not subject to reduced insulation resistance due to the presence of cracks, foreign debris, salt, dust, cooling tower plume, or industrial effluent contamination. See SLRA Section 3.6.2.3.2 for additional information.

The staff reviewed the associated items in the SLRA to confirm that these aging effects are not applicable for this component, material and environment combination. The staff finds the applicant's proposal acceptable as follows. The SLRA states that the level of environmental and industrial pollutants such as salt or sulfur dioxide are not significant to adversely impact porcelain insulators. During the audit (ML23214A232), the staff's independent search of plant-specific OE confirmed that aging effects due to wind related loss of material and reduction in high-voltage insulator properties due to surface contamination are not applicable for this component, material, and environment combination.

3.6.2.3.3 Aluminum; Copper; Bronze; Stainless Steel; and Galvanized Steel for Switchyard Bus and Connections Exposed to Air-Outdoor and Aluminum and Steel for Transmission Connectors and Conductors Exposed to Air-Outdoor

SLRA Table 3.6.2-1 states that for switchyard bus and connections composed of aluminum; copper; bronze; stainless steel; galvanized steel, transmission connectors composed of aluminum; steel, and transmission conductors composed of aluminum; steel exposed to air-outdoor, aging effects are not applicable and no AMP is proposed. Items 3.6.1-004, 3.6.1-005, 3.6.1-006, and 3.6.1-007 cite generic note I. The AMR items cite plant-specific note 7 for switchyard bus and connections, plant-specific note 10 for transmission connectors, and plant-specific notes 8 and 9 for transmission conductors, which state:

Note 7: Based on MNGP design and a review of operating experience (OE), loss of material and increased resistance of connection are not applicable aging effects for MNGP switchyard bus and connections. MNGP switchyard bus and connections within the scope of license renewal are not subject to wind-induced abrasion nor oxidation or loss of preload. See SLRA Section 3.6.2.2.3 for additional information.

Note 8: Based on MNGP design and a review of OE increased resistance of connection is not an applicable aging effect for MNGP transmission connectors. MNGP transmission connectors within the scope of license renewal are not subject to oxidation or loss of preload. See SLRA Section 3.6.2.2.3 for additional information.

Note 9: Based on MNGP design and a review of OE loss of conductor strength is not an applicable aging effect for MNGP ACSR transmission conductors. MNGP ACSR transmission conductors within the scope of license renewal are not subject to loss of conductor strength due to corrosion. See SLRA Section 3.6.2.2.3 for additional information.

Note 10: Based on MNGP design and a review of OE loss of material is not an applicable aging effect for MNGP ACSR transmission conductors. MNGP ACSR transmission conductors within the scope of license renewal are not subject to wind-induced abrasion. There are no AAC or ACAR transmission conductors within the scope of license renewal for MNGP. See SLRA Section 3.6.2.2.3 for additional information.

The staff reviewed the associated items in the SLRA to confirm that these aging effects are not applicable for these components, materials, and environment combinations. The staff finds the applicant's proposal acceptable for the following reasons:

(1) The Ontario Hydroelectric study, which is referenced in the SLRA Section 3.6.2.2.3, showed that there is little evidence of reduced ACSR conductor strength due to corrosion.

(2) The short lengths of in-scope transmission conductors at MNGP minimizes high magnitude vibration and swaying.

(3) Low levels of airborne contaminants around MNGP minimize the surface contamination of switchyard and transmission components.

(4) The applicant's maintenance practices include periodic visual inspections to monitor the condition of these components.

3.7 Conclusion for Aging Management Review Results

The NRC staff reviewed SLRA Section 3, "Aging Management Review Results," and SLRA Appendix B, "Aging Management Programs," as supplemented. Based on its audit and its review of the applicant's AMRs results and AMPs, the staff concludes that the applicant has demonstrated that it will adequately manage the applicable aging effects in a way that maintains intended functions consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicant's applicable USAR supplement program summaries and concludes that, as required by 10 CFR 54.21(d), the USAR supplement adequately describes the AMPs and activities credited for managing aging at MNGP.

With regard to these matters, the NRC staff concludes that actions have been identified and have been or will be taken such that there is reasonable assurance that the activities authorized by subsequent renewed operating licenses for MNGP 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 the NRC's regulations.

SECTION 4 TIME-LIMITED AGING ANALYSES

4.1 Identification of Time-Limited Aging Analyses

This section of the safety evaluation (SE) provides the U.S. Nuclear Regulatory Commission (NRC) staff's evaluation of the applicant's basis for identifying those time-limited aging analyses (TLAAs) and plant-specific exemptions granted pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.12, "Specific exemptions," that need to be identified in the subsequent license renewal application (SLRA).

The regulation in 10 CFR 54.3(a), "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); and

(6) Are contained or incorporated by reference in the CLB [current licensing basis].

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—

(i) The analyses remain valid for the period of extended operation;

(ii) The analyses have been projected to the end of the period of extended operation; or

(iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

In addition, in accordance with 10 CFR 54.21(c)(2), an applicant for subsequent license renewal (SLR) must provide a list of plant-specific exemptions granted under 10 CFR 50.12 which are based on a TLAA and remain in effect for the CLB. For any such exemptions, the rule requires that applicant must also provide an evaluation that justifies the continuation of the exemptions for the period of extended operation.

4.1.1 Summary of Technical Information in the Application

Section 4.1 of the SLRA describes the process used by the applicant to identify the TLAAs within the applicant's CLB and design-basis documentation. The applicant identified the CLB and design-basis documentation that was reviewed and searched to identify potential TLAAs. The applicant states that the document search was performed consistent with the guidance provided in NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants," issued July 2017 (SRP-SLR), and 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."

In addition, the applicant stated that it reviewed the CLB for Monticello Nuclear Generating Plant, Unit 1 (MNGP or Monticello), as required by 10 CFR 54.21(c)(2) to identify all plant-specific exemptions granted under 10 CFR 50.12 that are based on a TLAA and remain in effect. The applicant stated that it identified fatigue waiver exemptions for reactor pressure vessel (RPV) components that are considered a TLAA, which are addressed in SLRA Section 4.3.

4.1.2 Staff Evaluation

The NRC staff reviewed SLRA Section 4.1 in accordance with the guidance provided in SRP-SLR Section 4.1. Specifically, SRP-SLR Section 4.1.1 summarizes the areas of review. In addition, SRP-SLR Section 4.1.2 summarizes the staff's acceptance criteria for performing TLAA and SLRA exemption identification reviews, and Section 4.1.3 summarizes the staff's review procedures for performing the TLAA and SLRA exemption identification reviews.

SRP-SLR Table 4.1-1 gives a sample process for identifying potential TLAAs. SRP-SLR Table 4.1-2 provides a list of generic TLAAs. SRP-SLR Table 4.7-1 contains examples of potential plant-specific TLAAs that have been identified by license renewal applicants. The staff used the guidance and information in these SRP-SLR tables to assist its review in determining whether the applicant identified all applicable calculations and analyses in its CLB as TLAAs in its SLRA.

The SLRA states that the applicant searched the CLB and design-basis documentation to identify potential TLAAs. The documentation that was searched by the applicant included the updated safety analysis report (USAR), technical specifications and their bases, technical requirements manual and its bases, renewed facility operating license, Monticello license renewal application and associated NRC SE, and calculations and design reports referenced in these documents. The applicant also searched the fire protection report, offsite dose calculation manual, inservice testing program plan, inservice inspection program plan, core operating limits report (Cycle 31), pressure-temperature limits report (PTLR), other NRC SEs, and docketed licensing correspondence.

During the onsite audit (as described in the audit report (ML23214A241)), the staff confirmed that the applicant searched its CLB and design-basis documentation to identify potential TLAAs. The staff noted that the applicant used a list of specific key words during this search to identify potential TLAAs. The staff also confirmed that each potential TLAA identified during the applicant's search was reviewed against the six criteria of 10 CFR 54.3(a) and that those potential TLAAs that met all six criteria were identified as TLAAs that require evaluation for the subsequent period of extended operation.

SLRA Section 4.1.4 states, in order to identify exemptions for Monticello that were granted pursuant to 10 CFR 50.12, a keyword search was conducted of the USAR, renewed operating license, technical specifications and their bases, technical requirements manual and its bases, NRC SEs and supplements, the fire protection plan, and NRC ADAMS database. Specifically, the applicant explained that the search criteria used key terms, including “10 CFR 50.12,” “exempt,” “waiver,” “N-415,” “NB-3222.4(d),” “relief request,” “life of,” “60 years,” and “sixty years.”

During its audit, the staff also confirmed that the applicant searched docketed licensing correspondence, the operating license, and the USAR 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 the applicant found that no 10 CFR 50.12 exemptions involve a TLAA as defined in 10 CFR 54.3. However, the applicant stated that it identified fatigue exemptions for RPV components that are considered a TLAA, which are addressed in SLRA Section 4.3. The staff noted that these are not associated with exemptions issued pursuant to 10 CFR 50.12; rather, they are associated with waivers for performing detailed fatigue analysis that were permitted by the design code so long as certain conditions were met. Nevertheless, these fatigue waivers are TLAAs for the Monticello SLRA, and SE Section 4.3 documents the staff’s review.

During its review, the staff performed an independent search of the USAR and a sample of docketed licensing correspondence and NRC SEs to identify potential TLAAs. Based on this independent search, the staff did not identify additional TLAAs that the applicant did not already identify in the SLRA.

4.1.3 Conclusion

Based on its audit, 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), is acceptable. In addition, based on its audit, 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 all TLAAs that were required to be identified in accordance with 10 CFR 54.21(c)(2) were identified.

4.2 <u>Reactor Vessel Neutron Embrittlement Analysis</u>

4.2.1 Neutron Fluence Projections

4.2.1.1 Summary of Technical Information in the Application

The applicant performed fluence projections as inputs to the neutron embrittlement analyses that evaluate the reduction of fracture toughness aging effect resulting from neutron irradiation. These analyses are part of the TLAA for the MNGP 80-year subsequent period of extended operation. The applicant used the TransWare Enterprises RAMA methodology to develop fluence projections for RPV and reactor vessel internal (RVI) components for evaluating TLAAs in SLRA Sections 4.2.2 through 4.2.10.

SLRA Section 4.2.1.1 describes the MNGP TLAA for the reactor vessel neutron fluence analyses. The applicant stated that it dispositioned the TLAA for the reactor vessel in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the analyses have been projected to the end of the subsequent period of extended operation and the effects of aging due to fluence on the intended function will be adequately managed utilizing the Neutron Fluence Monitoring AMP and the Reactor Vessel Material Surveillance AMP.

SLRA Section 4.2.1.2 describes the MNGP TLAA for the RVI neutron fluence analyses. The applicant stated that it dispositioned the TLAA for the RVI in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the analyses have been projected to the end of the subsequent period of extended operation and the effects of aging due to fluence on the intended function will be adequately managed utilizing the Neutron Fluence Monitoring AMP.

4.2.1.2 Staff Evaluation

<u>Reactor Vessel Neutron Fluence Analyses</u>

The staff reviewed the MNGP TLAA for the RPV neutron fluence 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-SLR Section 4.2.3.1.1.3.

The applicant used historical reactor exposure data to the end of Cycle 30 with fluence projections to 72 effective full-power years (EFPY) of reactor operation for the fast neutron fluence. The reactor exposure accumulated at the end of Cycle 30 was determined to be 40.3 EFPY. The neutron fluence projections to 72 EFPY were determined using the operating data for a projection Cycle 31 comprising GE14 and ATRIUM-10XM fuel products and a projection cycle comprising ATRIUM-11 fuel product to end-of-life. The fluence evaluations considered the MNGP historical operating power levels, including power uprates, and the expansion of the MELLLA+ region for the reactor operating domain. The fluence projections serve as an input to the RPV neutron embrittlement analyses for beltline components, including analyses of upper-shelf energy (USE), adjusted reference temperature (ART), pressure-temperature (P-T) limits, circumferential and axial weld failure probability, and RPV reflood thermal shock.

The applicant used the TransWare Enterprises RAMA software code and methodology described in NRC-approved Electric Power Research Institute (EPRI) Boiling Water Reactor Vessel and Internals Project (BWRVIP)-114-A, “RAMA Fluence Methodology Theory Manual,” issued June 2009 (ML092650376, publicly available, and ML092650377, nonpublicly available), as the basis for projecting the neutron fluence for these components to the end of the subsequent period of extended operation (i.e., to 72 EFPY) at rated power (2,004 megawatts thermal). Further, the applicant stated that the combined uncertainty for the MNGP RPV is determined to be 11.6 percent, which is well within the 20 percent criterion established in Regulatory Guide (RG) 1.190, “Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence,” issued March 2001 (ML010890301). Based on the use of the RAMA software for fluence projections and the fact that the MNGP combined uncertainty is below the criterion set by RG 1.190, the applicant stated that it did not find any discernable bias in the computed RPV fluence for the period of Cycle 1 through the end of Cycle 30 for MNGP.

To evaluate fluence in regions outside the immediate, core-adjacent area of the RPV beltline, the applicant used methods identical to those described in NRC-approved BWRVIP-145-A, “Evaluation of Susquehanna Unit 2 Top Guide and Core Shroud Material Samples Using RAMA Fluence Methodology,” issued October 2009 (ML100260948, publicly available, and ML100260955, nonpublicly available). The maximum fast neutron fluence (energy >1.0 megaelectron volts (MeV)) for RPV welds, shell courses, and RPV nozzles and extraction paths are reported. Similarly, the 72-EFPY fluence projections for RPV beltline welds, beltline shell plates, beltline nozzles, and extended beltline elevation ranges are reported.

The NRC staff determined that the applicant has demonstrated that the analysis for the neutron fluence for the reactor vessel and for each beltline and extended beltline material has been projected to the end of the subsequent period of extended operation and the effects of aging due to fluence on the intended function will be adequately managed, as required by 10 CFR 54.21(c)(1)(iii). The analysis meets the acceptance criteria in SRP-SLR Section 4.2.2.1.1 because the methods used to calculate the neutron fluence are consistent with the NRC-approved methodologies (BWRVIP-114-A and BWRVIP-145-A), which adhere to the guidance of NRC RG 1.190, as summarized above. Further, the applicant states that the 72-EFPY fluence projections will be managed for the subsequent period of extended operation by the Neutron Fluence Monitoring Aging Management Program (AMP) and the Reactor Vessel Material Surveillance AMP (as described in SLRA Sections B.2.2.2 and B.2.3.19). For these reasons, the NRC staff finds the MNGP RPV beltline and extended beltline area component fluence projections through the subsequent period of extended operation for the neutron embrittlement TLAA evaluations to be acceptable.

Reactor Vessel Internals Neutron Fluence Analyses

The staff reviewed the applicant's TLAA for the RVI neutron fluence 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-SLR Section 4.2.3.1.1.3.

The staff noted that the TLAA in SLRA Section 4.2.1.2 only applies to the 80-year neutron fluence bases for specific RVIs, where the 80-year neutron fluence values serve as inputs for the RVI components, including the core shroud, jet pump, top guide, core support plate, and in-core instrumentation tubes. The fluence projections are also used to determine when specified fluence threshold values may be exceeded for aging management requirements, such as inspections.

The applicant used the TransWare Enterprises RAMA software code and methodology described in EPRI BWRVIP-114-A as the basis for projecting the neutron fluence for the RVI components to the end of the subsequent period of extended operation. The SE for the BWRVIP-114-A report discusses the appropriate methods to perform the transport calculations required to estimate the fluence within the RPV. However, in the SE, the NRC staff noted that the report did not quantify the bias and uncertainty required for qualification of the methodology for determining the fluence for specific RVIs as part of licensing applications. The NRC staff stated that the methods in BWRVIP-114-A could be applied to boiling-water reactor (BWR) RVI locations if an applicant desiring to use the RAMA methodology benchmarks the use of RAMA for the RVI locations.

The applicant referenced benchmarks performed for core top guide and core shroud material samples for Susquehanna Steam Electric Station, Unit 2, in BWRVIP-145-A for its use of the BWRVIP-114-A methodology to develop RVI fluence projections documented in the SLRA. The SE issued by the NRC for BWRVIP-145-A stated that the RAMA methodology can be used in determining fast neutron fluence values in the core shroud and top guide for applications such as irradiation-assisted stress corrosion cracking (IASCC) crack propagation rates and weldability determinations. The BWRVIP-145-A SE specifically noted that in order to use the methodology in a licensing action, sufficient justification must be provided that the computed fluence for the core shroud and top guide internal components is conservative.

In a supplement dated July 11, 2023 (ML23193B026, publicly available, and ML23193B027, nonpublicly available), the applicant provided justifications for its use of the benchmarking performed in BWRVIP-145-A for the RAMA fluence methodology to develop RVI fluence projections for MNGP. The supplement provided details of the computational fluence method and the fluence models for each of the components modeled for the MNGP core. The NRC staff reviewed BWRVIP-145-A and the information in the supplement to determine whether a suitable technical basis is provided to expand the benchmarking for Susquehanna to the RVI components at MNGP.

The applicant stated in the supplement that the computational fluence models constructed for the Monticello reactor follow a similar RAMA methodology to that used to model the Susquehanna Unit 2 core shroud and top guide benchmarks. The calculations performed in the supplement show that the applicant used geometry and material representations for the central and upper core shroud shells, top guide plates, fuel structures, upper shroud plenums, and coolant water densities. The comparisons to the measured values for the Susquehanna Unit 2 core shroud and top guide components in BWRVIP-145-A showed that the RAMA fluence methodology over-predicted the activity measurements. In addition, the applicant detailed several modeling conservatisms applied to the MNGP fluence model to ensure the determination of conservative fluence. The maximum fast neutron fluence (energy >1.0 MeV) is specifically reported for the core shroud welds, jet pumps, top guide, core support plate and rim bolts, core spray spargers, and in-core instrumentation tools. The primary concern with the application of specified fluence values to different aging effects is whether the fluence value includes neutrons from the whole energy spectrum of interest for the given aging effect. The TLAA evaluations described in the SLRA for RVI components are all based on assumed fast fluence (energy >1.0 MeV) values, which is consistent with the fluence predictions for MNGP using the RAMA methodology. As a result, the staff finds the given fluence predictions to be acceptable because the neutron energy spectrum considered is consistent with the fluences used to support the TLAA evaluations. The applicant stated that the effects of aging due to fluence on the intended function will be adequately managed for the subsequent period of extended operation using the Neutron Fluence Monitoring AMP (described in SLRA Section B.2.2.2), in accordance with 10 CFR 54.21(c)(1)(iii).

Therefore, based on the similarities between the Susquehanna benchmarking model in BWRVIP-145-A and the MNGP fluence model, combined with the modeling conservatisms detailed in the SLRA and the supplement, the NRC staff finds the applicant’s neutron fluence methodology for projecting the neutron fluence values specified for the RVI components at 72 EPFYs to be acceptable.

4.2.1.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.2.1 provides the USAR supplement summarizing the neutron fluence projections. The staff reviewed SLRA Section A.3.2.1 consistent with the review procedures in SRP-SLR Section 4.2.3.2.

Based on its review of the USAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the reactor vessel and the vessel internals neutron fluence, as required by 10 CFR 54.21(d).

4.2.1.4 Conclusion

The NRC staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the analyses for the RPV and RVI neutron fluence have been projected to the end of the subsequent period of extended operation and the effects of aging due to fluence on the intended function will be adequately managed utilizing the Neutron Fluence Monitoring AMP and the Reactor Vessel Material Surveillance AMP. The analyses performed by the applicant meet the acceptance criteria in SRP-SLR Section 4.2.2.1.1.3 since the updated calculations are provided and projected to 80 years (72 EFPY) to address the fluence effects during the subsequent period of extended operation. The evaluation was performed in accordance with a methodology that has been approved by the NRC. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.2 Reactor Pressure Vessel Materials Upper-Shelf Energy Reduction Due to Neutron Embrittlement

4.2.2.1 Summary of Technical Information in the Application

SLRA Section 4.2.2, as amended by letter dated July 18, 2023 (ML23199A154), describes the applicant's TLAA for USE reduction in RPV materials due to neutron embrittlement. The applicant dispositioned the TLAA for the USE of the 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 subsequent period of extended operation.

4.2.2.2 Staff Evaluation

The staff reviewed the applicant's TLAA, as modified by letter dated July 18, 2023, for the USE reduction due to neutron embrittlement for 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-SLR Section 4.2.3.1.2.2.

The applicant explained that values for unirradiated (initial) USE exist only for the surveillance materials (i.e., plate material with heat No. C2220 and weld materials) and are not available for the RPV materials that are not in the surveillance capsules; thus, an equivalent margin analysis was performed for the RPV materials that lack initial USE values. The staff's review for each of these groups of RPV materials is discussed separately below:

<u>Reactor Pressure Vessel Materials with Initial Upper-Shelf Energy Values</u>

During its audit (as described in the audit report, ML23214A241) and review, the staff assessed the material property values (e.g., initial USE and weight-percent copper) for the RPV materials contained in SLRA Table 4.2.2-1 to confirm (1) these values are consistent with the CLB or (2) revisions to the CLB values are justified and appropriate. Based on its review, the staff confirmed that the material property values are consistent with the applicant's CLB (e.g., USAR, PTLR, and other relevant license amendments) and are therefore appropriate for use in determining USE values for the end of the subsequent period of extended operation.

During its audit, the staff noted that the applicant assessed relevant surveillance data to determine their credibility, in accordance with the criteria in RG 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," issued May 1988 (ML003740284), and for potential consideration as to whether it is appropriate to use the surveillance data when calculating USE values. Specifically, the staff noted during its audit that BWRVIP-135, Revision 4, “Integrated Surveillance Program (ISP) Data Source Book and Plant Evaluations,” provides the applicant’s assessment of surveillance data from the Monticello 30° and 300° surveillance capsules. By letter dated July 18, 2023 (ML23199A154), the applicant revised SLRA Section 4.2.2 to indicate that the measured USE reduction for the surveillance plate material was obtained for the 30°, 120°, and 300° surveillance capsules.

Based on its review of (1) BWRVIP-347, “Testing and Evaluation of the Monticello 120° ISP(E) Surveillance Capsule,” issued October 2022 (ML22304A093), (2) the applicant’s letter dated July 18, 2023, and (3) activities during its audit, the staff verified the applicant’s use and assessment of its credible surveillance data for the evaluation of USE values as appropriate and consistent with Position 2.2 of RG 1.99, Revision 2, for the lower/intermediate shell I-14 and I-15 (Course 2) with heat Nos. C2220-1 and C2220-2, respectively.

The staff reviewed SLRA Table 4.2.2-1, as supplemented by letter dated July 18, 2023, to determine whether the projected drop in USE for the following RPV materials was performed consistent with RG 1.99, Revision 2:

- lower/intermediate shell I-14 and lower/intermediate shell I-15 (Course 2) based on available surveillance data (i.e., Position 2.2. of RG 1.99, Revision 2)
- the bounding N-2 nozzle, and the horizontal and axial RPV welds based on Position 1.2 of RG 1.99, Revision 2

Based on its review, the staff finds that the applicant’s assessment of the projected drop in USE for the RPV materials identified above, including those that took into consideration credible surveillance data, is consistent with RG 1.99, Revision 2. As such, the staff finds that the resultant projected Charpy USE values for these RPV materials are greater than the screening criterion of 50 foot-pounds (ft-lb), in accordance with Appendix G, “Fracture Toughness Requirements,” to 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities,” through the subsequent period of extended operation.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for RPV materials with initial USE values have been projected to the end of the subsequent period of extended operation. Additionally, this TLAA meets the acceptance criteria in SRP-SLR Section 4.2.2.1.2.2 because the USE analyses were reevaluated consistent with RG 1.99, Revision 2, when considering the neutron fluence values for 80 years (i.e., 72 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 in accordance with Appendix G to 10 CFR Part 50 was met.

<u>Reactor Pressure Vessel Materials Without Initial Upper-Shelf Energy Values</u>

The staff noted that for RPV shell materials without initial USE values, it is not possible to demonstrate whether the screening criterion of 50 ft-lb in Appendix G to 10 CFR Part 50 can be met. Thus, in accordance with Appendix G to 10 CFR Part 50, the applicant performed equivalent margin analyses to demonstrate that these reactor vessel materials provide margins of safety against fracture equivalent to those required by Appendix G to Section XI of the American Society for Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code).

SLRA Table 4.2.2-1, as supplemented by letter dated July 18, 2023, indicates that an equivalent margin analysis is necessary for the following RPV materials:

- upper/intermediate shell I-12 (Course 3) (heat No. C2089-1)
- upper/intermediate shell I-13 (Course 3) (heat No. C2613-1)
- lower shell I-16 (Course 1) (heat No. A0946-1)
- lower shell I-17 (Course 1) (heat No. C2193-1)

The staff noted that SLRA Tables 4.2.2-2 through 4.2.2-5 contain the applicant's results for its equivalent margin analyses for the RPV materials that do not have initial USE values. Specifically, SLRA Section 4.2.2, as supplemented by letter dated July 18, 2023, indicates that equivalent margin analyses were performed to evaluate the impact of revised fluence projections and available surveillance data on USE reductions through 72 EFPY. The applicant explained that its equivalent margin analyses were compared against the USE limits calculated for 54 EFPY as defined in Appendix B to BWRVIP-74-A, "BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal," issued June 2003 (ML031710354), even though the percent reduction in USE for the applicant's site increased due to the 80-year projected neutron fluence.

The staff noted that Appendix B to BWRVIP-74-A presents equivalent margin analyses that were performed to establish the minimum Charpy USE limits for RPV plate materials and welds in all domestic BWR plants for 54 EFPY. Although these equivalent margin analyses were performed for 54 EFPY, the staff noted that the results from these analyses remain applicable as long as the prescribed minimum Charpy USE limits in this report are met. This is true regardless of EFPY or projected neutron fluence for the BWR plant being assessed. The applicant explained that the resultant equivalent margin analyses for its RPV materials (without unirradiated USE values) when considering 80 years of operation (i.e., 72 EFPY) continue to remain within the prescribed limits defined in Appendix B to BWRVIP-74-A.

The staff reviewed the applicant's assessment of percent decrease in USE through 72 EFPY for RPV materials without initial USE values contained in SLRA Tables 4.2.2-2 through 4.2.2-5. Based on its review, the staff verified that the applicant calculated the projected USE values for these materials in accordance with RG 1.99, Revision 2, and these values are within the defined limits established in Appendix B to BWRVIP-74-A for vessel plate materials for BWR-3 designs (i.e., the design of MNGP). As such, the staff finds that the resultant percent drops in USE for 72 EFPY remain bounded by the results of the equivalent margin analyses presented in BWRVIP-74-A.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for RPV materials without initial USE values have been projected to the end of the subsequent period of extended operation through equivalent margin analyses. Additionally, this TLAA meets the acceptance criteria in SRP-SLR Section 4.2.2.1.2.2 because the applicant demonstrated, as described above, that these RPV materials have values of Charpy USE that provide margins of safety against fracture that are equivalent to those required by Appendix G to Section XI of the ASME Code, in accordance with Appendix G to 10 CFR Part 50, through the subsequent period of extended operation.

4.2.2.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.2.2 provides the USAR supplement summarizing the USE reduction in RPV materials due to neutron embrittlement. The staff reviewed SLRA Section A.3.2.2 consistent with the review procedures in SRP-SLR Section 4.2.3.2.

Based on its review, the staff finds that the USAR supplement, as supplemented by letter dated July 18, 2023, meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address 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 analysis for the USE reduction in RPV materials due to neutron embrittlement has been projected to the end of the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.3 Adjusted Reference Temperature for Reactor Pressure Vessel Materials Due to Neutron Embrittlement

4.2.3.1 Summary of Technical Information in the Application

SLRA Section 4.2.3 describes the applicant’s TLAA for the change in ART for RPV materials due to neutron embrittlement. The applicant dispositioned the TLAA for the change in ART for 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 subsequent period of extended operation.

4.2.3.2 Staff Evaluation

The staff reviewed the applicant’s TLAA, as modified by letters dated April 3, 2023 (ML23094A136), and July 18, 2023 (ML23199A154), for the change in ART for RPV materials due to neutron embrittlement and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.7.3.1.2.

During its audit (as described in the audit report, ML23214A241) and review, the staff assessed the material property values (e.g., initial reference temperature for nil ductility transition (RT_{NDT}), weight-percent copper, weight-percent nickel) for the RPV materials in SLRA Tables 4.2.3-1 and 4.2.3-2, as amended by letters dated April 3, 2023, and July 18, 2023, to confirm (1) these values are consistent with the CLB or (2) revisions to the CLB values are justified and appropriate. Based on its review, the staff confirmed that the material property values are consistent with the applicant’s CLB and therefore appropriate for use in determining ART values at the 0 T (inside surface) and 1/4 T (T = the wall thickness of the RPV beltline region) locations through the end of the subsequent period of extended operation. Additionally, based on this confirmation, the staff finds that the applicant applied the appropriate margin values consistent with RG 1.99, Revision 2, for each RPV material for the purposes of addressing ART.

During its audit, the staff noted that the applicant assessed relevant surveillance data to determine their credibility in accordance with the criteria in RG 1.99, Revision 2, and potential consideration as to whether it is appropriate to use the surveillance data when calculating ART values. Specifically, the staff noted during its audit that BWRVIP-135, Revision 4, provides an assessment of surveillance data from the Monticello 30° and 300° surveillance capsules. During its audit, the staff verified that the applicant's assessment of surveillance data from the Monticello 30° and 300° capsule was performed in accordance with RG 1.99, Revision 2, for the lower/intermediate shell I-14 and I-15 (Course 2) with heat Nos. C2220-1 and C2220-2, respectively. In particular, the staff verified the applicant's use of applicable surveillance data is credible in accordance with RG 1.99, Revision 2, for these RPV materials, and the associated chemistry factor and margin values are reflected in the applicant's letter dated April 3, 2023.

SLRA Section 4.2.3, as amended by letter dated July 18, 2023, states that the surveillance data used for ART evaluation are provided in BWRVIP-135, Revision 4, which addresses the 30° and 300° capsules, and BWRVIP-347, which addresses the 120° capsule. Furthermore, the applicant stated that the limiting conditions for lower/intermediate shells I-14 and I-15 (Course 2) with heat Nos. C2220-1 and C2220-2, respectively, are determined based on review of the data from these capsules.

The staff noted that the chemistry factor of 180 degrees Fahrenheit (°F) for heat Nos. C2220-1 and C2220-2 identified in SLRA Tables 4.2.3-1 and 4.2.3-2, as amended by the letter dated April 3, 2023, was based on the 30° and 300° capsules. The staff reviewed BWRVIP-347 to determine the impacts of the surveillance data from the 120° capsule on this chemistry factor. Based on its review of surveillance data from the 30°, 300°, and, 120° surveillance capsules, the staff determined that the surveillance data from the 120° capsule are credible in accordance with RG 1.99, Revision 2, and that their inclusion with the surveillance data from the 30° and 300° capsules would result in a chemistry factor less than 180°F for heat Nos. C2220-1 and C2220-2. The staff finds the use of the higher chemistry factor (i.e., 180°F) based on two surveillance capsules (i.e., 30° and 300° capsules) for determining the ART value for heat Nos. C2220-1 and C2220-2 to be acceptable because the applicant assessed all relevant surveillance data (i.e., 30°, 120°, and 300° capsules) and is using a conservative (i.e., higher) chemistry factor of 180°F.

Based on its review of BWRVIP-347 and letters dated April 3, 2023, and July 18, 2023, and the activities during its audit, the staff verified that the applicant's use and assessment of credible surveillance data for the evaluation of ART values are conservative and consistent with Position 2.2 of RG 1.99, Revision 2, for the lower/intermediate shell I-14 and I-15 (Course 2) with heat Nos. C2220-1 and C2220-2, respectively.

The staff also verified that the projected ART values, as amended by letters dated April 3, 2023, and July 18, 2023, were calculated in accordance with RG 1.99, Revision 2, and as such, the staff finds the ART values at 72 EFPY identified by the applicant at the time of the SLRA 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 period of extended operation. Additionally, the TLAA meets the acceptance criteria in SRP-LR Section 4.7.2.1.2 because the ART analyses were reevaluated consistent with RG 1.99, Revision 2, when considering the neutron fluence values for 80 years (72 EFPY). The staff noted that ART values of the RPV materials are used to adjust the P-T limit curves to account for irradiation effects, which are evaluated in SE Section 4.2.4.

4.2.3.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.2.3 provides the USAR supplement summarizing the TLAA for the change in ART for RPV materials due to neutron embrittlement. The staff reviewed SLRA Section A.3.2.3 consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the staff finds that the USAR supplement meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the TLAA for 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 subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.4 Reactor Pressure Vessel Thermal Limit Analysis: Operating Pressure-Temperature Limits

4.2.4.1 Summary of Technical Information in the Application

SLRA Section 4.2.4, as amended by letter dated June 26, 2023 (ML23177A218), describes the applicant’s TLAA for the RPV thermal limit analysis for operating P-T limits. The applicant dispositioned the TLAA for the RPV thermal limit analysis for operating P-T limits in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of neutron embrittlement on the intended functions of the RPV will be adequately managed by the Reactor Vessel Material Surveillance Program (see SLRA Section B.2.3.19), which ensures that P-T limits will be updated and submitted to the NRC prior to exceeding the current terms of applicability and during the subsequent period of extended operation.

4.2.4.2 Staff Evaluation

The staff reviewed the applicant’s TLAA, as modified by letter dated June 26, 2023, for the RPV thermal limit analysis for operating 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-SLR Section 4.2.3.1.4.3.

The staff noted that the NRC issued operating license Amendment No. 172 by letter dated February 27, 2013 (ML13025A155), approving a revision to the technical specifications such that P-T limits are developed based on a methodology documented in SIR-05-044-A, “Pressure-Temperature Limits Report Methodology for Boiling Water Reactors,” issued April 2007, by Structural Integrity Associates, Inc., and relocated the revised P-T limits from the technical specification to the MNGP PTLR. The staff noted that Technical Specification Limiting Condition for Operation 3.4.9 contains provisions that the reactor coolant system pressure, temperature, heat-up and cooldown rates, and recirculation pump starting temperature shall be limited in accordance with the limit specified in the PTLR. Additionally, Section 5.6.5 of the technical specifications identifies the approved analytical methods that must be used to determine the reactor coolant system P-T limits. The technical specifications also contain administrative controls that require submittal of the PTLR to the NRC upon issuance for each period of applicability (i.e., EFPY) and for any revision or supplements. The current P-T limits for Unit 1 are contained in Revision 1 of the PTLR, issued August 2014 (ML14246A206), which has a period of applicability through 54 EFPY.

The applicant indicated that its Reactor Vessel Material Surveillance Program will be used to manage the effects of neutron embrittlement of the RPV. The staff noted that this is a condition monitoring program that measures the increase in the Charpy V-notch 30 ft-lb transition temperature and the drop in USE as a function of neutron fluence and irradiation temperature. Furthermore, the staff noted that this is accomplished by the withdrawal and testing of specimens contained within surveillance capsules, and the test data from the surveillance capsules are incorporated in the neutron irradiation embrittlement TLAAs (e.g., USE, P-T limits evaluations), as appropriate. SE Section 3.0.3.2.15 documents the staff's evaluation of the Reactor Vessel Material Surveillance Program, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects of neutron embrittlement of the reactor vessel materials.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of neutron embrittlement on the intended functions of the RPV and the respective thermal limit analysis for operating P-T limits will be adequately managed for the subsequent period of extended operation. Additionally, the staff finds that the TLAA meets the acceptance criteria in SRP-SLR Section 4.2.2.1.4.3 because, as discussed above, the P-T limits will be updated and submitted to the NRC in accordance with the administrative controls process for the PTLR described in Technical Specification 5.6.5 prior to the expiration of the period of applicability for the P-T limits, and the Reactor Vessel Material Surveillance Program ensures that the P-T limits in the PTLR are updated based on surveillance capsule data, as appropriate.

4.2.4.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.2.4, as amended by letter dated June 26, 2023, provides the USAR supplement summarizing the applicant's TLAA for the operating P-T limits for the RPV. The staff reviewed SLRA Section A.3.2.4 consistent with the review procedures in SRP-SLR Section 4.2.3.2.

As described in SLRA Section A.3.2.4, the applicant determined that, based on its CLB, an update to its P-T limit curves will necessitate a PTLR change request that will be submitted for NRC approval prior to exceeding the current 54 EFPY limit.

Based on its review, the staff finds that the USAR supplement, as amended by letter dated June 26, 2023, meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the operating P-T limits for 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 (1) the effects of neutron embrittlement on the intended functions of the RPV will be adequately managed by the Reactor Vessel Material Surveillance Program for the subsequent period of extended operation, and (2) the P-T limits will be updated and submitted to the NRC for approval prior to exceeding the current terms of applicability through the administrative controls process for the PTLR as described in Technical Specification 5.6.5. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.5 Reactor Pressure Vessel Circumferential Weld Examination Relief

4.2.5.1 Summary of Technical Information in the Application

SLRA Section 4.2.5 describes the applicant's TLAA evaluation for RPV circumferential weld examination relief from the requirements of ASME Code, Section XI in accordance with 10 CFR 50.55a. The applicant stated that plant-specific RPV dimensions and material chemistry were evaluated for the applicability criteria in BWRVIP-329-A, "Updated Probabilistic Fracture Mechanics Analyses for BWR RPV Welds to Address Extended Operations," issued December 2021 (ML21343A410), which provides the NRC-approved technical basis for reductions in the Section XI examination requirements.

The applicant dispositioned the TLAA for elimination of examinations of RPV circumferential welds in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of reactor vessel circumferential weld failure probability on the intended functions will be adequately dispositioned during the subsequent period of extended operation through a reapplication for relief under the process in 10 CFR 50.55a, "Codes and standards."

4.2.5.2 Staff Evaluation

The staff reviewed the applicant's TLAA, as supplemented by letter dated June 26, 2023 (ML23177A218), for RPV circumferential weld examination relief and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.2.3.1.5.

During its audit (as described in audit report, ML23214A241) and review, the staff assessed the plant-specific RPV dimensions and the plant-specific end-of-interval maximum reference temperature (RT_{MAX}) values to verify the applicant's RPV is within the envelope of limiting RT_{MAX} values established in 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-percent copper, weight-percent nickel, chemistry factor) based on 72 EFPY.

During its audit, the staff verified the following:

- The plant-specific dimensions of the applicant's RPV are enveloped by the RPV dimensions assessed in BWRVIP-329-A.
- The plant-specific end-of-interval RT_{MAX} values for the limiting plate and limiting circumferential weld were calculated based on plant-specific material properties of the reactor vessel based on 72 EFPY. (SE Section 4.2.3 documents the staff's review of plant-specific material properties of the reactor vessel.)
- The plant-specific end-of-interval RT_{MAX} values were calculated consistent with BWRVIP-329-A. The staff noted the applicant conservatively included an additional margin term to its plant-specific end-of-interval RT_{MAX} values.
- The plant-specific end-of-interval RT_{MAX} values for the limiting plate and limiting circumferential weld, including the respective conservative margin term, were less than

corresponding limiting RT_{MAX} values for plates and circumferential welds in BWRVIP-329-1.

The staff noted that this analysis provides the supporting technical basis should the applicant decide to pursue an alternative under 10 CFR 50.55a(z)(1) from the required ASME Code, Section XI, examinations for RPV circumferential welds during the subsequent period of extended operation, consistent with NRC staff conclusions documented in Sections 5.0 and 6.0 of its approval of BWRVIP-329-A.

Based on its review and audit activities, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of embrittlement on the integrity of the RPV circumferential welds will be adequately managed for the subsequent period of operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.2.2.1.5 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 demonstrated that the NRC regulatory safety goals defined in BWRVIP-329-A are satisfied for the postulated transient, and (3) identified that this analysis and the circumferential weld inspection will be managed by the 10 CFR 50.55a process for alternatives to the ASME Code, Section XI, requirements.

4.2.5.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.2.5 provides the USAR supplement summarizing the TLAA related to the elimination of RPV circumferential weld examinations. The staff reviewed SLRA Section A.3.2.5 consistent with the review procedures in SRP-SLR Section 4.2.3.2.

Based on its review, the staff finds that the USAR supplement, as amended by letter dated June 26, 2023, meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the plant-specific applicability of BWRVIP-329-A and manage the effects of aging of the RPV circumferential welds in accordance with the 10 CFR 50.55a process, as required by 10 CFR 54.21(d).

4.2.5.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of aging on the integrity of the RPV circumferential welds will be adequately managed in accordance with the evaluation in BWRVIP-329-A for the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.6 Reactor Pressure Vessel Axial Weld Failure Probability

4.2.6.1 Summary of Technical Information in the Application

SLRA Section 4.2.6 describes the applicant’s TLAA evaluation for RPV axial weld failure probability. The applicant stated that the plant-specific RPV dimensions and material chemistry were evaluated for the applicability criteria in BWRVIP-329-A, which provides the NRC-approved technical basis for demonstrating axial weld integrity.

The applicant dispositioned the TLAA for RPV axial weld failure probability in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analyses have been projected to the end of the subsequent period of extended operation.

4.2.6.2 Staff Evaluation

The staff reviewed the applicant's TLAA for RPV axial weld failure probability and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.2.3.1.6.

During its audit (as described in the audit report, ML23214A241) 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 limiting RT_{MAX} values established in BWRVIP-321-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-percent copper, weight-percent nickel, chemistry factor) based on 72 EFPY.

During its audit, the staff verified the following:

- The plant-specific dimensions of the applicant's RPV are enveloped by the RPV dimensions assessed in BWRVIP-329-A.
- The plant-specific end-of-interval RT_{MAX} values for the limiting plate and limiting axial weld were calculated based on the plant-specific material properties of the reactor vessel based on 72 EFPY. (SE Section 4.2.3 documents the staff's review of plant-specific material properties of the reactor vessel.)
- The plant-specific end-of-interval RT_{MAX} values were calculated consistent with BWRVIP-329-A. The staff noted the applicant conservatively included an additional margin term to its plant-specific end-of-interval RT_{MAX} values.
- The plant-specific end-of-interval RT_{MAX} values for the limiting plate and limiting axial weld, including the respective conservative margin term, were less than the corresponding limiting RT_{MAX} values for plates and axial welds in BWRVIP-329-A.

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 axial weld failure probability have been projected to the end of the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.2.2.1.6 because the applicant met the applicability criteria of NRC-approved BWRVIP-329-A and provided plant-specific calculations to evaluate the safety significance of a postulated, low-temperature isothermal transient in BWR RPVs and demonstrated that the NRC regulatory safety goals defined in BWRVIP-329-A are satisfied for the postulated transient through the subsequent period of extended operation.

4.2.6.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.2.6 provides the USAR supplement summarizing the TLAA related to the RPV axial weld failure probability. The staff reviewed SLRA Section A.3.2.6 consistent with the review procedures in SRP-SLR Section 4.2.3.2.

Based on its review, the staff finds that the USAR supplement meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the plant-specific applicability of BWRVIP-329-A and to project the analyses for the RPV axial weld failure probability through the subsequent period of extended operation, 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 effects of aging on the integrity of the RPV axial welds have been projected to the end of the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.7 Reflood Thermal Shock Analysis of the Reactor Pressure Vessel

4.2.7.1 Summary of Technical Information in the Application

SLRA Section 4.2.7 describes the applicant's TLAA for analysis of adequate margin against nonductile 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 subsequent period of extended operation.

4.2.7.2 Staff Evaluation

The staff reviewed the applicant's TLAA, as supplemented by letter dated June 26, 2023 (ML23177A218), 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-SLR Section 4.7.3.1.2.

The TLAA extends a General Electric analysis of mid-core RPV embrittlement due to neutron irradiation from 60 years of reactor life (54 EFPY) to 80 years of reactor life (72 EFPY). The analysis considers the bounding loss-of-coolant accident (LOCA), a main steam line break. The General Electric report evaluated embrittlement in the RPV shell and N2 nozzle. The applicant considered each separately, as discussed below.

The TLAA for the RPV refined the maximum stress intensity factor during a LOCA and revised the estimated embrittlement of the RPV material to reflect operation to 80 years. The applicant updated its maximum stress intensity factor, $K_{Iapplied}$, for the RPV shell experiencing a main steam line break from 103 ksi√in 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 ART at the vessel inside surface (0 T ART) for the ductile-to-brittle transition temperature was also updated based on neutron fluence experienced through 80 years of plant operation to be 197.8°F for the shell. The staff finds the use of the 0 T 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 1/4 T location. SE Section 4.2.3 documents the staff's evaluation of this ART value. The staff noted that the ASME Code limits the maximum stress intensity factor experienced during a LOCA to $K_{IC}/\sqrt{2}$. Furthermore, the applicant set the upper-shelf value of fracture toughness, K_{IC}, of the reactor vessel shell material at 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 of the ASME Code, the minimum reactor vessel temperature during the transient and the limiting ART at 0 T at 72 EFPY. The applicant demonstrated a margin of a factor of 1.35 when comparing the maximum stress intensity factor of 105 ksi√in from the transient with the ASME-allowed value of 141 ksi√in.

The applicant also analyzed the maximum stress intensity factor applied to the N2 nozzle in the postulated LOCA to be 13.7 ksi√in with an 0 T ART value of 123.9°F. Additionally, the staff finds the use of the 0 T ART value to be conservative because the applicant is considering a more embrittled condition (due to higher neutron fluence) of the reactor vessel material when compared to the condition at the location of the postulated flaw at the 1/4 T location. SE Section 4.2.3 documents the staff's evaluation of this ART value. The applicant demonstrated a margin of a factor of 10.32 when comparing the maximum stress intensity factor of 13.7 ksi√in from the transient with the ASME-allowed value of 141 ksi√in.

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 June 26, 2023, has been projected to the end of the subsequent period of extended operation. Additionally, the analysis meets the acceptance criteria in SRP-SLR Section 4.7.2.1.2 because the ART calculations were updated for 72 EFPY, and the applicant has demonstrated that the maximum stress intensity factor, $K_{Iapplied}$, for the main steam line break transient on the RPV materials (i.e., RPV shell and N2 nozzle) is less the ASME Code limit.

4.2.7.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.2.7 provides the USAR supplement summarizing the analysis of adequate margin against nonductile failure of the RPV following a reflood event. The staff reviewed SLRA Section A.3.2.7 consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the staff finds that the USAR supplement, as amended by letter dated June 26, 2023, meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address nonductile failure of the RPV following a reflood event, as required by 10 CFR 54.21(d).

4.2.7.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis for reflood thermal shock analysis of the RPV has been projected to the end of the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.8 Reflood Thermal Shock Analysis of the Reactor Pressure Vessel Core Shroud

4.2.8.1 Summary of Technical Information in the Application

SLRA Section 4.2.8 describes the applicant's TLAA for analysis of adequate margin against nonductile failure of the RPV core shroud following a reflood event. The applicant dispositioned the TLAA for the reactor core shroud in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the subsequent period of extended operation.

4.2.8.2 Staff Evaluation

The staff reviewed the applicant's TLAA, as supplemented by letter dated June 26, 2023 (ML23177A218), for the RPV core shroud and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.7.3.1.2.

The applicant updated the fluence calculations for the reactor core shroud to determine whether the shroud would experience an unacceptable level of strain during a low-pressure coolant injection (LPCI) reflood thermal shock transient. The applicant used a bounding fluence value of 8×10^{21} neutrons per square centimeter (n/cm^2) for the determination of acceptable strain at the zone of highest neutron radiation (shroud midpoint). The staff noted that the maximum irradiation for the core shroud at 80 years of operation, as supplemented by letter dated June 26, 2023, was calculated to be 3.68×10^{21} n/cm^2, which is consistent with the neutron fluence values reported for the core shroud welds in SLRA Table 4.2.1.2-1. SE Section 4.2.1 documents the staff's review of the projected neutron fluence values for the RVIs.

The staff noted that fracture toughness property measurements for stainless steel weld material irradiated at higher fluence have confirmed high toughness properties, as discussed in BWRVIP-66, "Review of Test Data for Irradiated Stainless Steel Components," issued March 1999 (ML20137A923). Specifically, the applicant indicated that strains of at least 4 percent elongation of the stainless steel weld metal at an operating temperature of 567°F were measured at a neutron fluence of 8×10^{21} n/cm^2. The applicant also stated that the core shroud was modeled to experience a maximum thermal shock strain of 0.57 percent in the region of highest fluence of 3.68×10^{21} n/cm^2. Since the maximum neutron fluence expected for the core shroud and maximum strain are both well below the observed data, the applicant determined that the thermal shock strain was acceptable through 80 years of operation.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis for the RPV core shroud, as modified by letter dated June 26, 2023, has been projected to the end of the subsequent period of extended operation. Additionally, the analysis meets the acceptance criteria in SRP-SLR Section 4.7.2.1.2 because neutron fluence calculations were updated for 72 EFPY (using conservative estimates of projected fluence of the core shroud), and the postulated strain during the transient does not exceed the ductility of the core shroud.

4.2.8.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.2.8 provides the USAR supplement summarizing the analysis of adequate margin against nonductile failure of the RPV core shroud following a reflood event. The staff reviewed SLRA Section A.3.2.8 consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the staff finds that the USAR supplement, as amended by letter dated June 26, 2023, meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address nonductile failure of the RPV following a reflood event, as required by 10 CFR 54.21(d).

4.2.8.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis for the reflood thermal shock analysis of the RPV core shroud has been projected to the end of the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.9 Loss of Preload for Core Plate Rim Holddown Bolts

4.2.9.1 Summary of Technical Information in the Application

SLRA Section 4.2.9 describes the applicant’s TLAA for loss of preload for core plate rim holddown bolts. The applicant dispositioned the TLAA for the core plate rim holddown bolts in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis for loss of preload has been projected to the end of the subsequent period of extended operation.

4.2.9.2 Staff Evaluation

The staff reviewed the applicant’s TLAA and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.7.3.1.2.

The applicant stated that a generic assessment can be performed regarding stress relaxation of fasteners relative to retained preload in operation. Specifically, the BWRVIP conducted analyses to justify the elimination of core plate bolt examinations due to the inaccessibility of these components often making it difficult for inspections. The staff noted that BWRVIP-25, Revision 1-A, “BWR Core Plate Inspection and Flaw Evaluation Guidelines,” issued September 2020 (ML20290A786), contains these analyses, including guidance on the elimination of these inspections and the management of aging of these components. Appendix I to BWRVIP-25, Revision 1-A, contains specific steps to be taken by a licensee to determine whether the guidelines in that report are applicable for justifying that inspections of core plate bolts are no longer required.

The applicant stated it performed an evaluation that determined that the criteria of Appendix I to BWRVIP-25, Revision 1-A, to justify the elimination of core plate bolt inspections at its site are satisfied. During the audit (as described in the audit report, ML23214A241), the staff verified through its review of the USAR, plant-specific procedures, drawings, calculations, and basis documents that the applicant adequately addressed all the steps in Appendix I to BWRVIP-25, Revision 1-A, to determine application of the analysis results from BWRVIP-25, Revision 1-A, for its plant. This included verification that the plant-specific characteristics of the applicant’s site with respect to loading and neutron fluence were bounded by the analyses in Appendix I to BWRVIP-25, Revision 1-A.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis for the loss of preload on the core plate rim holddown bolts has been projected to the end of the subsequent period of extended operation. Additionally, the analysis meets the acceptance criteria in SRP-SLR Section 4.7.2.1.2 because the staff verified that the applicant’s plant-specific assessment of core plate rim holddown bolts demonstrated, in accordance with Appendix I to BWRVIP-25, Revision 1-A, that inspections of core plate bolts are not required through the subsequent period of extended operation.

4.2.9.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.2.9 provides the USAR supplement summarizing the TLAA associated with loss of preload for the core plate holddown bolts. The staff reviewed SLRA Section A.3.2.9 consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the staff finds that the USAR supplement meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address loss of preload for the core plate holddown bolts as required by 10 CFR 54.21(d).

4.2.9.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis for loss of preload for the core plate holddown bolts has been projected to the end of the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.10 Susceptibility to Irradiation-Assisted Stress Corrosion Cracking

4.2.10.1 Summary of Technical Information in the Application

SLRA Section 4.2.10 describes the applicant’s TLAA for susceptibility of the RVIs to IASCC. The applicant dispositioned the TLAA for susceptibility of the RVIs to IASCC in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of IASCC on the intended functions will be adequately managed by the BWR Vessel Internals Program for the subsequent period of extended operation.

4.2.10.2 Staff Evaluation

The staff reviewed the applicant’s TLAA, as modified by letter dated July 18, 2023 (ML23199A154), for the core shroud, top guide, and jet pump assembly 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-SLR Section 4.7.3.1.3.

During its audit (as described in the audit report, ML23214A241) and review, the staff noted that the 80-year projected neutron fluence values for the instrument dry tubes, instrument guide tubes, and core support plate exceed the threshold for susceptibility to IASCC (i.e., 5.0×10^{20} n/cm^2) for 80 years of plant operation. However, the applicant did not identify these components as part of this TLAA. The staff addresses these components separately below.

By letter dated July 18, 2023, the applicant revised SLRA Section 4.2.10 to state that the neutron fluence values for the instrument dry tubes and instrument guide tubes are projected to exceed the threshold of 5.0×10^{20} n/cm^2 before the end of the subsequent period of extended operation. Although the neutron fluence values of the instrument dry tubes and instrument guide tubes exceed the threshold of 5.0×10^{20} n/cm^2, the staff noted that an analysis based on time-limited assumptions relevant in making a safety determination, or one that provides the basis for conclusions related to the capability of these components to perform their intended functions, does not exist. Thus, the staff finds that the instrument dry tubes and instrument guide tubes do not need to be addressed as part of this TLAA for susceptibility to IASCC, since they do not meet all six criteria for a TLAA in 10 CFR 54.3. In addition, the staff noted that the instrument dry tubes and instrument guide tubes are subject to aging management review and are addressed in SLRA Table 3.1.2-2. Specifically, the effects of aging (e.g., cracking) are addressed by the BWR Vessel Internals Program and Water Chemistry Program consistent with the recommendations of NUREG-2191, “Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report,” issued July 2017 (ML16274A389). SE Sections 3.0.3.2.5 and 3.0.3.2.3 document the staff’s evaluation of the BWR Vessel Internals Program and Water Chemistry Program, respectively.

By letter dated July 18, 2023, the applicant revised SLRA Section 4.2.10 to state that the neutron fluence values for the core support plate are projected to exceed the threshold of $5.0x10^{20}$ n/cm^2 before the end of the subsequent period of extended operation. Additionally, the applicant explained that conclusions from the safety assessments and the bases that support the conclusions from the degradation assessment of the core support plate are not time dependent. Although the projected neutron fluence of the core plate exceeded the threshold of $5.0x10^{20}$ n/cm^2, the staff noted that an analysis involving time-limited assumptions defined by the current operating term does not exist. Thus, the staff finds that the core support plate does not need to be addressed as part of this TLAA for susceptibility to IASCC since it does not meet all six criteria for a TLAA in 10 CFR 54.3. In addition, the staff noted that the core support plate is subject to aging management review and is addressed in SLRA Table 3.1.2-2. Specifically, the BWR Vessel Internals Program and Water Chemistry Program address the effects of aging (e.g., cracking) consistent with the recommendations of the GALL-SLR Report. SE Sections 3.0.3.2.5 and 3.0.3.2.3 contain the staff’s evaluation of the BWR Vessel Internals Program and Water Chemistry Program, respectively.

With respect to IASCC on the core shroud, top guide, and jet pump assembly components, the applicant stated that its BWR Vessel Internals Program will manage the effects of aging during the subsequent period of extended operation. The staff noted that the BWR Vessel Internals Program is an existing condition monitoring and mitigative program that includes inspections and flaw evaluations in conformance with the guidelines of applicable NRC staff-approved BWRVIP documents for BWR vessel internal components that are fabricated of nickel alloy and stainless steel. Additionally, the program specifies the type (e.g., VT-1 and EVT-1 examinations, VT-3 examinations, and volumetric examination) and location of examinations required for each component, as well as the basis for the examination. The staff noted that indications or flaws identified by examination are evaluated consistent with the applicable and approved BWRVIP guideline or ASME Code, Section XI, as appropriate for the affected component. SE Section 3.0.3.2.5 documents the staff’s evaluation of the BWR Vessel Internals Program.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of IASCC on the intended functions of the core shroud, top guide, and jet assembly components will be adequately managed for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.7.2.1.3 because the applicant credits the BWR Vessel Internals Program that performs periodic inspections of the RVIs, which include the core shroud, top guide, and jet assembly components, and incorporates guidelines to evaluate indications or flaws should any be detected during the inspections.

4.2.10.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.2.10 provides the USAR supplement summarizing the TLAA for susceptibility of RVIs to IASCC. The staff reviewed SLRA Section A.3.2.10 consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the staff finds that the USAR supplement, as amended by letter dated July 18, 2023, meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address susceptibility to IASCC of the core shroud, top guide, and jet assembly components, as required by 10 CFR 54.21(d).

4.2.10.4 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 IASCC on the intended functions of the core shroud, top guide, and jet assembly components will be adequately managed by the BWR Vessel Internals Program for the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3 Metal Fatigue

4.3.1 80-Year Transient Cycle Projections

4.3.1.1 Summary of Technical Information in the Application

SLRA Section 4.3.1, as supplemented by letters dated July 18, 2023 (ML23199A154), and August 15, 2023 (ML23227A175), describes the applicant's 80-year transient cycle projections. The applicant performed linear cycle projections based on the actual cycles observed during the most recent 10 years of plant operation (up to May 31, 2021). These 80-year projected cycles are used as inputs to the fatigue TLAAs described in SLRA Sections 4.3.2 through 4.3.7. The applicant determined that the 80-year cycle projection is not a TLAA because the projected cycles are used as inputs to fatigue TLAAs, and the specific dispositions of the fatigue TLAAs are separately addressed in SLRA Sections 4.3.2 through 4.3.7.

4.3.1.2 Staff Evaluation

The staff noted that SLRA Section 4.3.1 only addresses the 80-year cycle projections for design transients. The related fatigue TLAAs, which use these transient cycle projections, are separately addressed in SLRA Sections 4.3.2 (fatigue waiver analysis), 4.3.3 (RPV fatigue analysis), 4.3.4 (RVI fatigue analysis), 4.3.5 (Class 1 fatigue analysis), 4.3.6 (non-Class-1 fatigue analysis) and 4.3.7 (environmentally assisted fatigue (EAF) analysis).

The staff finds that the applicant's evaluation that the 80-year cycle projections are used as inputs to fatigue TLAAs but are not fatigue TLAAs by themselves is acceptable. Accordingly, this section documents the staff's evaluation of the adequacy of 80-year transient cycle projections.

The applicant explained that it reviewed the actual cycle data to trend the cumulative transient cycles for the most recent 10 years up to May 31, 2021. The applicant also indicated that linear cycle projections are performed based on the actual cycle data. The applicant further explained that the most recent 10-year period is a sufficient timeframe to calculate cycle accumulation rates that provide reasonable assurance that they are representative of future cycle accumulation rates. The applicant stated that this is particularly true since the timeframe of the actual cycle data is entirely within the period of extended operation (i.e., 40 to 60 years of operation).

The staff finds that the cycle projection approach using the most recent 10 years of transient cycle data is acceptable because (1) the cycle projections are based on the actual cycle data and (2) the cycle data from the most recent 10-year period, which is entirely within the period of extended operation (40 to 60 years of operation), are sufficient to represent the current operating characteristics of the plant and the cycle accumulation projections for the subsequent period of extended operation. SE Sections 4.3.2 through 4.3.7 document the staff's evaluations of the fatigue TLAAs and associated TLAA dispositions.

4.3.1.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.3.1 provides the USAR supplement summarizing the 80-year transient cycle projections. The staff reviewed SLRA Section A.3.3.1, consistent with the review procedures in SRP-SLR Section 4.3.3.2. Based on its review of the USAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. The staff also finds that the applicant provided an adequate summary description to address the transient cycle projections for 80 years of operation, as required by 10 CFR 54.21(d).

4.3.1.4 Conclusion

Based on of its review, the staff concludes that the applicant's 80-year projected cycles are based on actual transient cycle data and, therefore, the projected cycles are reasonable to be used in the fatigue analyses for the subsequent period of extended operation.

4.3.2 ASME Code, Section III, Class 1 Fatigue Waivers

4.3.2.1 Summary of Technical Information in the Application

SLRA Section 4.3.2, as supplemented by letters dated June 26, July 18, August 15, and September 5, 2023 (ML23177A218, ML23199A154, ML23227A175, and ML23248A474), describes the applicant's fatigue TLAA on ASME Code, Section III, Class 1 fatigue waivers. The design stress reports include fatigue waivers that determined that some RPV components did not require explicit fatigue analyses in accordance with the provisions in ASME Code, Section III, paragraph N-415.1 or NB-3222.4(d).

The applicant dispositioned the fatigue waiver TLAA in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of cumulative fatigue damage on the intended functions of the Class 1 components subject to the fatigue waiver will be adequately managed by the Fatigue Monitoring AMP for the subsequent period of extended operation. The Fatigue Monitoring AMP will be used to ensure that the fatigue waiver analysis remains valid for the subsequent period of extended operation.

4.3.2.2 Staff Evaluation

The staff reviewed the applicant's fatigue waiver TLAA for ASME Code, Section III, Class 1 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-SLR Section 4.3.3.1.1.3.

The applicant explained that ASME Code, Section III, paragraph N-415.1 or NB-3222.4(d), describes the provisions for a waiver from fatigue analysis. The applicant indicated that paragraph N-415.1 was renumbered to NB-3222.4(d) in the 1971 Edition of the ASME Code and later editions but was otherwise unchanged. The applicant also explained that the design stress reports for MNGP determined that some RPV components did not require explicit fatigue analyses in accordance with the provisions in ASME Code, Section III, paragraph N-415.1 or NB-3222.4(d).

In the fatigue waiver TLAA for 80 years of operation, the applicant used the 80-year projected transient cycles for the following RPV components: (1) main closure flange, (2) intermediate range monitor/source range monitor dry tube, (3) power range detector assembly, and (4) in-core detector assembly. The applicant demonstrated that these components meet the fatigue waiver provisions in ASME Code, Section III, paragraph NB-3222.4(d), based on the 80-year projected cycles. In addition, the applicant proposed to use the Fatigue Monitoring AMP (SLRA Section B.2.2.1) to ensure that the fatigue waiver analysis remains valid for the subsequent period of extended operation by monitoring the transients used in the TLAA.

In its response (ML23227A175) to Request for Additional Information (RAI) 4.3.2-1, the applicant provided information on the existing fatigue waiver analysis for the head cooling spray and instrumentation nozzles and vent nozzle. The staff finds the applicant's evaluation acceptable because the applicant clarified the following:

- The existing fatigue waiver analysis for these nozzles is based on the design transient cycles listed in SLRA Table 4.3.1-1 that are bounding for the 80-year projected cycles.
- Accordingly, there is reasonable assurance that the existing fatigue waiver analysis for these nozzles remains valid for 80 years of operation in accordance with ASME Code, Section III, paragraph NB-3222.4(d).

In SLRA Section 4.3.2, the applicant also dispositioned the fatigue wavier TLAA in accordance with 10 CFR 54.21(c)(1)(iii) and proposed to use the Fatigue Monitoring AMP to ensure that the fatigue waiver TLAA remains valid for the subsequent period of extended operation by using cycle monitoring.

The staff noted that the Fatigue Monitoring AMP (SLRA Section B.2.2.1) monitors the actual transient cycles to ensure that the actual cycles do not exceed the number of transient cycles used as inputs to the fatigue waiver TLAA. The staff finds that the applicant's use of the Fatigue Monitoring AMP is adequate to manage the effect of cumulative fatigue damage associated with the fatigue waiver TLAA because the program monitors the actual transient cycles to ensure that the TLAA remains valid, consistent with the guidance in GALL-SLR AMP X.M1, "Fatigue Monitoring," and SRP-SLR Section 4.3.2.1.1.3.

For the ASME Code, Section III, Class 1 components subject to the fatigue waiver 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 components will be adequately managed for the subsequent period of extended operation. Additionally, the applicant meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3 because it proposed to use the Fatigue Monitoring AMP for managing the effects of cumulative fatigue damage and ensuring that the fatigue waiver analysis remains valid for the subsequent period of extended operation, consistent with the guidance in SRP-SLR Section 4.3.2.1.1.3. SE Section 3.0.3.2.1 documents the staff's evaluation of the Fatigue Monitoring AMP.

4.3.2.3 Updated Safety Analysis Report Supplement

SLRA Section A.4.3.2 provides the USAR supplement summarizing the fatigue waiver TLAA for the ASME Code, Section III, Class 1 components. The staff reviewed SLRA Section A.4.3.2, consistent with the review procedures in SRP-SLR Section 4.3.3.2. Based on its review of the USAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. The staff also finds that the applicant provided an adequate summary description to address the fatigue waiver TLAA for ASME Code, Section III, Class 1 components, as required by 10 CFR 54.21(d).

4.3.2.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of cumulative fatigue damage on the intended functions of the ASME Code, Section III, Class 1 components subject to fatigue waiver analysis will be adequately managed by the Fatigue Monitoring AMP for the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.3 Reactor Pressure Vessel Fatigue Analysis

4.3.3.1 Summary of Technical Information in the Application

SLRA Section 4.3.3 describes the applicant's TLAA for fatigue of the RPV. The applicant explained that RPV fatigue analyses, which evaluated explicit numbers and types of transients, were performed for the following locations:

- recirculation inlet and outlet, steam outlet, feedwater and core spray nozzles
- core support structure
- bottom head and support skirt
- control rod drive penetrations
- vessel head bolts
- refueling bellows skirt

The applicant dispositioned the TLAA for the fatigue of the RPV in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of fatigue on the intended functions of the RPV will be adequately managed by the Fatigue Monitoring AMP for the subsequent period of extended operation.

4.3.3.2 Staff Evaluation

The staff reviewed the applicant’s TLAA addressing fatigue for the RPV and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.3.3.1.1.3.

The staff noted that the RPV fatigue analyses used the 80-year projected cycles (transients) presented in SLRA Table 4.3.1-1. SE Section 4.3.1.2 documents the staff’s evaluation of the applicant’s methodology for assessing transient projections through the subsequent period of extended operation, including the margin these projections have compared to the USAR cycle limits.

In particular, the staff noted that the Fatigue Monitoring AMP monitors and tracks the number of critical thermal, pressure, and seismic transients to ensure that the cumulative usage factor (CUF) and environmental cumulative usage factor (CUF_{en}) for each analyzed component do not exceed the applicable limit through the subsequent period of extended operation. The staff found that this program verifies that the number of occurrences of each design transient remains within the limits of the component fatigue analyses to ensure the continued acceptability of existing analyses, which is accomplished through manual cycle counting. Furthermore, the staff noted that should the transient occurrences approach the limits of the component fatigue analyses, appropriate corrective actions (e.g., component reevaluation, enhanced inspection, repair, or replacement) are taken to demonstrate that the fatigue design limit will not be exceeded during the subsequent period of extended operation. SE Section 3.0.3.2.1 documents the staff’s evaluation of the Fatigue Monitoring AMP, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects of fatigue.

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 RPV will be adequately managed for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3 because the applicant’s use of the Fatigue Monitoring AMP is consistent with the SRP-SLR, this program continually monitors the occurrence of transient cycles and ensures the validity of this TLAA, and this program will trigger corrective actions before analyses become invalid during the subsequent period of extended operation.

4.3.3.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.3.3 provides the USAR supplement summarizing the TLAA associated with fatigue of the RPV. The staff reviewed SLRA Section A.3.3.3 consistent with the review procedures in SRP-SLR Section 4.3.3.2.

Based on its review, the staff finds that the USAR supplement meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address fatigue of the RPV, as required by 10 CFR 54.21(d).

4.3.3.4 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 fatigue on the intended functions of the RPV will be adequately managed by the Fatigue Monitoring AMP for the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.4 Fatigue Analysis of Reactor Pressure Vessel Internals

4.3.4.1 Summary of Technical Information in the Application

SLRA Section 4.3.4, as supplemented by letter dated June 26, 2023 (ML23177A218), describes the applicant's fatigue TLAA on RPV internals. The most significant fatigue loading occurs at the jet pump diffuser to baffle plate weld location. This location is bounding for all other components in the RPV internals in the fatigue analysis. The 60-year CUF is calculated to be approximately 0.5, as discussed in USAR Appendix K. The limiting CUF value is based on the design-basis accident (DBA) involving LPCI. The DBA assumed in the limiting CUF calculation has not occurred at MNGP, and one event of the DBA is bounding for the 80 years of operation. Accordingly, the applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(i) to demonstrate that the analysis remains valid for the subsequent period of extended operation.

4.3.4.2 Staff Evaluation

The staff reviewed the applicant's fatigue TLAA for RPV internals and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR Section 4.3.3.1.1.1.

The applicant explained that the most significant fatigue loading occurs at the jet pump diffuser to baffle plate weld location. The applicant also explained that the maximum strain at the limiting location occurs after a postulated accident event of recirculation line break. This pipe break causes the RPV water level to drop and subsequently exposes the jet pump assembly to steam. This event also involves a concurrent pressure drop, which results in LPCI.

In addition, the applicant explained that the jet pump diffuser to baffle plate weld location under the DBA condition discussed above is bounding for all other RPV internals in the fatigue analysis. The applicant indicated that the 60-year CUF for the limiting RPV internal location is estimated to be approximately 0.5 in the existing fatigue analysis, as discussed in USAR Appendix K. Given that the postulated DBA is not expected to occur during the actual operation of the plant, one cycle of the DBA is still bounding for 80 years of operation. The applicant further explained that the transient load sets without the DBA do not contribute to the CUF.

In its review, the staff finds that the fatigue TLAA for the RPV internals is acceptable because (1) the limiting CUF value of the RPV internals for 80 years of operation is conservatively calculated based on the postulated DBA involving recirculation line break and subsequent LPCI, (2) one cycle of the DBA continues to be bounding for 80 years of operation based on the conservative nature of the postulated DBA, and (3) the limiting CUF value based on the DBA (i.e., 0.5) is less than the fatigue design limit (1.0).

As discussed above, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the fatigue analysis for the RPV internals remains valid for the subsequent period of extended operation. Additionally, the analysis meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.1 because the postulated DBA, which represents the most limiting loading conditions for the RPV internals, has not occurred during the plant operation and is not expected to occur for the subsequent period of operation so that the one cycle of the DBA postulated in the fatigue analysis is bounding for 80 years of operation.

4.3.4.3 Updated Safety Analysis Report Supplement

SLRA Section A.4.3.4 provides the USAR supplement summarizing the fatigue TLAA for the RPV internals. The staff reviewed SLRA Section A.4.3.4, consistent with the review procedures in SRP-SLR Section 4.3.3.2. Based on its review of the USAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. The staff also finds that the applicant provided an adequate summary description to address the metal fatigue TLAA for the RPV internals, 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)(i), that the fatigue analysis for the RPV internals remains valid for the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.5 ASME Code, Section III, Class 1

4.3.5.1 Summary of Technical Information in the Application

SLRA Section 4.3.5, as supplemented by letter dated June 26, 2023 (ML23177A218), describes the applicant’s fatigue TLAA for ASME Code, Section III, Class 1 piping systems. The piping systems evaluated in the fatigue analysis include recirculation, residual heat removal (RHR), and core spray piping. The fatigue analysis for 80 years of operation indicates that the 80-year projected CUF values for the ASME Code, Section III, Class 1 piping systems do not exceed the fatigue design limit (i.e., 1.0).

The applicant dispositioned the fatigue TLAA in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of cumulative fatigue damage on the intended functions of the Class 1 piping systems will be adequately managed by the Fatigue Monitoring AMP for the subsequent period of extended operation. The Fatigue Monitoring AMP will be used to ensure that the CUFs for the Class 1 piping systems do not exceed the design limit of 1.0.

4.3.5.2 Staff Evaluation

The staff reviewed the applicant’s fatigue TLAA for ASME Code, Section III, Class 1 piping systems and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.3.3.1.1.3.

The applicant indicated that the recirculation and RHR piping systems were reanalyzed in 2005 through 2006. The applicant also explained that the recirculation piping was replaced in 1985, including inlet nozzle safe ends and RHR supply and return lines to the containment penetrations. The applicant reanalyzed the CUF values of the recirculation and RHR piping systems for 80 years of operation. In the reanalysis, the applicant considered the cycles adjusted to remove the cycles accumulated before the piping replacement discussed above. The reanalysis estimated the 80-year bounding CUF at the RHR supply branch location to be 0.399.

In addition, the applicant calculated the 80-year CUF values for the core spray line and RHR intertie piping line to be 0.436 and 0.900, respectively. The staff finds that these 80-year projected CUF values meet the fatigue design limit of 1.0 and, therefore, are acceptable.

The applicant 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. The staff noted that the Fatigue Monitoring AMP monitors the actual transient cycles to ensure that the actual cycles do not exceed the transient cycles, which are used as the inputs to the CUF analysis, such that the CUF values will not exceed the design limit of 1.0 (SE Section 3.0.3.2.1). The staff finds that the applicant's use of the Fatigue Monitoring AMP is adequate to manage the effects of 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-SLR AMP X.M1. In its review, the staff found that the fatigue TLAA for the ASME Code, Section III, Class 1 piping systems is acceptable because (1) the 80-year projected CUF values are less than the design limit of 1.0, and (2) the Fatigue Monitoring AMP will monitor the actual transient cycles to ensure that the CUF values continue to meet the design limit of 1.0 by 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 will be adequately managed for the subsequent period of extended operation. Additionally, the applicant meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3 because it proposed to use the Fatigue Monitoring AMP for managing the effects of cumulative fatigue damage, consistent with the guidance in SRP-SLR Section 4.3.2.1.1.3. As previously noted, SE Section 3.0.3.2.1 documents the staff's evaluation of the Fatigue Monitoring AMP.

4.3.5.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.3.5 provides the USAR supplement summarizing the fatigue analysis of the Class 1 piping systems. The staff reviewed SLRA Section A.3.3.5, consistent with the review procedures in SRP-SLR Section 4.3.3.2. Based on its review of the USAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. The staff also finds that the applicant provided an adequate summary description to address the metal fatigue TLAA for the ASME Code, Section III, Class 1 piping systems, as required by 10 CFR 54.21(d).

4.3.5.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of cumulative fatigue damage on the intended functions of the ASME Code, Section III, Class 1 piping systems will be adequately managed by the Fatigue Monitoring AMP for the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.6 ASME Code, Section III, Class 2 and 3 and ANSI B31.1 Fatigue Analysis

4.3.6.1 Summary of Technical Information in the Application

SLRA Section 4.3.6, as supplemented by letters dated June 26, 2023 (ML23177A218), and August 15, 2023 (ML23227A175), describes the applicant's fatigue TLAA for ASME Code, Section III, Class 2 and 3 and American National Standards Institute (ANSI) B31.1 piping systems (also called non-Class-1 piping systems). The non-Class-1 piping systems are not required to have an explicit analysis of cumulative fatigue usage (i.e., CUF), but the design process considers cyclic loading in a simplified manner. The conservatively estimated equivalent full-temperature cycles in SLRA Table 4.3.6-1, which are bounding for 80 years of operation, indicate that the non-Class-1 piping systems will not exceed 7,000 cycles for 80 years of operation, which means that no stress reduction factor is required in the stress analysis for these piping systems.

The applicant dispositioned the fatigue TLAA for the non-Class-1 piping systems in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analysis remains valid for the subsequent period of extended operation.

4.3.6.2 Staff Evaluation

The staff reviewed the applicant's 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-SLR Section 4.3.3.1.1.1.

The applicant indicated that the transient cycle qualification for the non-Class-1 piping systems is performed in accordance with the provisions of ASME Code, Section III, Class 2 and 3, or ANSI B31.1, "Power Piping." The non-Class-1 piping systems are not required to have an explicit fatigue analysis that involves calculations of CUF values. Instead, implicit fatigue analyses are performed based on the number of equivalent full-temperature cycles (also called temperature cycles) and corresponding stress range reduction factors.

If the total number of temperature cycles is 7,000 or less, a stress range reduction factor of 1.0 is applied to the allowable stress range, which means the allowable stress range does not need to be reduced due to the effects of cyclic loading. If the total number of temperature cycles is greater than 7,000 cycles, a stress range reduction factor less than 1.0 is applied to the allowable stress range depending on the temperature cycles.

SLRA Table 4.3.6-1 describes the conservative transient cycle estimates that are bounding for 80 years of operation for the non-Class-1 piping systems. The applicant estimated the bounding cycles based on component specifications, design transient cycles, piping design information, test requirements, specific system-level knowledge, and USAR information.

In its review, the staff found that the cycle estimates are acceptable because the applicant conservatively used the relevant cycle information such as test requirements, component specifications, design cycles, piping design information, specific system-level knowledge, and USAR information. The staff also noted that the bounding temperature cycle estimates for the non-Class-1 piping systems are significantly less than 7,000 cycles, as shown in SLRA Table 4.3.6-1. Therefore, the staff finds that there is no need to reduce the allowable stress range for thermal expansion.

In its review, the staff also noted that the implicit fatigue analyses for non-Class-1 piping systems that involve a stress range reduction factor less than 1.0 may have a potential impact on the high-energy line break (HELB) location postulation.

Specifically, USAR Appendix I, Section I.3.1, indicates that the postulation of HELB locations is, in part, based on the allowable stress range for expansion stress (S_A), consistent with Branch Technical Position MEB 3-1, Revision 2, “Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment,” issued June 1987 (ML19137A335). S_A may need to be adjusted by a stress range reduction factor based on the number of transient cycles that are evaluated in the implicit fatigue analysis for the non-Class-1 piping systems. However, SLRA Section 4.3.6 does not identify the HELB analysis as a TLAA based on the HELB location postulation that involves S_A and the associated cycle-dependent stress range reduction factor.

In its supplement dated June 26, 2023, the applicant revised SLRA Section 4.3.6 to identify the HELB analysis, which involves the time-dependent aspect of the HELB location postulation based on the S_A value, as a TLAA for the non-Class-1 piping systems. In the supplement, the applicant also dispositioned the HELB TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the determination that the 80-year projected temperature cycles do not exceed 7,000 cycles.

As discussed above, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the fatigue analysis for the non-Class-1 piping systems, including the allowable stress evaluation and HELB location postulation, remains valid for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.1 because the applicant demonstrated that the existing fatigue analysis remains valid for the subsequent period of extended operation.

4.3.6.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.3.6 provides the USAR supplement summarizing the fatigue analysis of the non-Class-1 ping systems. The staff reviewed SLRA Section A.3.3.6, consistent with the review procedures in SRP-SLR Section 4.3.3.2. Based on its review of the USAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. The staff also finds that the applicant provided an adequate summary description to address the fatigue TLAA for non-Class-1 piping systems, as required by 10 CFR 54.21(d).

4.3.6.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the fatigue analysis for non-Class-1 piping systems remains valid for the subsequent period of extended operation. In addition, the staff concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.7 Environmentally Assisted Fatigue

4.3.7.1 Summary of Technical Information in the Application

SLRA Section 4.3.7, as supplemented by letters dated July 18, 2023 (ML23199A154), and August 15, 2023 (ML23227A175), describes the applicant’s TLAA on the EAF of reactor coolant pressure boundary components and piping. The EAF analysis also considers the leading EAF locations described in NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components," issued February 1995 (ML031480219), and additional plant-specific locations that could be more limiting than the NUREG/CR-6260 locations. In the analysis, the CUF_{en} value is calculated in accordance with NUREG/CR-6909, Revision 1, "Effect of LWR Water Environments on the Fatigue Life of Reactor Materials," issued May 2018 (ML16319A004).

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 (SLRA Section B.2.2.1).

4.3.7.2 Staff Evaluation

The staff reviewed the EAF TLAA and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.3.3.1.2.3.

As addressed in SLRA 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: (1) reactor vessel shell and lower head, (2) reactor vessel feedwater nozzle, (3) recirculation piping, (4) core spray nozzle, (5) RHR piping, and (6) feedwater piping.

In its response (ML23227A175) to RAI 4.3.7-3, the applicant clarified the EAF evaluation of the reactor recirculation outlet nozzle and the adjacent piping, for which the applicant noted that the EAF screening evaluation included only the safe-end to pipe weld, rather than the nozzle body. The staff finds the screening approach to be acceptable because the applicant demonstrated that the reactor recirculation outlet nozzle is bounded by the outlet nozzle safe-end and adjacent piping because the environmental fatigue correction factor (F_{en}) values for these components are comparable and the piping location adjacent to the outlet nozzle safe-end has a CUF value greater than that for the outlet nozzle by a factor of 3.

As discussed above, the staff finds that the applicant adequately included the NUREG/CR-6260 locations in the evaluation for EAF, consistent with the guidance in SRP-SLR Section 4.3.2.1.2, by performing 80-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 1, consistent with SRP-SLR Section 4.3.2.1.2.

The applicant also performed an EAF screening evaluation to identify additional plant-specific locations that may be more limiting than the NUREG/CR-6260 locations in terms of CUF_{en}. The screening process evaluated the reactor coolant pressure boundary component and piping locations, and SLRA Table 4.3.7-1 gives the screening results for the limiting (also called sentinel) locations.

In its response to RAI 4.3.7-4 (ML23227A175), the applicant discussed the screening evaluation that was performed to identify additional limiting locations. The staff finds the applicant used an adequate screening approach as follows:

- A thermal zone evaluated in the screening process is defined as a collection of vessel or piping components (or both) that experience the same group of thermal transients during plant operation such that the comparison of the CUF_{en} values in each thermal zone can result in relevant and comprehensive selections of limiting EAF locations.

- If the thermal zone contains multiple material types, the limiting location is determined for each material type so that both CUF and F_{en} values for each material type are considered in determining CUF_{en} values.
- Within each material type in a thermal zone, the location with the highest bounding CUF_{en} is selected as the limiting location.

As discussed above, the staff finds that the applicant adequately considered each material type in a thermal zone as well as the CUF and CUF_{en} values for each material type in the determination of the limiting EAF locations. The staff also noted that the screening CUF_{en} values are calculated in accordance with the guidance in NUREG-6909, Revision 1, consistent with the guidance in SRP-SLR Section 4.3.2.1.2.

In its response to RAI 4.3.7-2 (ML23227A175), the applicant provided additional information regarding how the bounding F_{en} values are conservatively calculated in the screening evaluation for EAF. The staff finds the calculation methodology to be adequate to determine the bounding F_{en} values as follows: (1) the lowest (bounding) strain rate value described in NUREG/CR-6909, Revision 1, was used for each material type, and (2) the maximum (bounding) value of the sulfur content parameter (S*) described in NUREG/CR-6909, Revision 1, was used for the components fabricated with carbon or low-alloy steel.

The applicant also performed the more detailed EAF analysis in accordance with NUREG/CR-6909, Revision 1. In the detailed EAF analysis, the applicant refined the CUF_{en} calculations as further discussed below. The approach to refine the CUF_{en} values was used in the CUF_{en} calculations for the plant-specific EAF locations and NUREG/CR-6260 locations.

In its response to RAI 4.3.7-1 (ML23227A175), the applicant explained how the CUF_{en} values were refined. The staff finds the applicant used adequate approaches in the refinement of CUF_{en} values as follows:

- The refined F_{en} values were calculated in accordance with NUREG/CR-6909, Revision 1, which is approved in SRP-SLR Section 4.3.2.1.2 and RG 1.207, Revision 1, “Guidelines for Evaluating the Effects of Light-Water Reactor Water Environments in Fatigue Analyses of Metal Components,” issued June 2018 (ML16315A130).
- In some cases, the specific temperatures or strain rates of transient load sets (or both) were used in place of the maximum service temperature and bounding (lowest) strain rate for the component.
- The use of the fatigue design curves in NUREG/CR-6909, Revision 1, in place of ASME Code fatigue design curves resulted in a decrease in CUF_{en} values for carbon and low-alloy steel components.

In its review, the staff finds the detailed EAF analysis is acceptable because (1) the detailed analysis uses the guidance in NREG/CR-6909, Revision 1, consistent with SRP-SLR Section 4.3.2.1.2 and (2) the CUF_{en} calculations are refined based on the more realistic temperatures and strain rates of specific transients.

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 (SLRA Section B.2.2.1). The staff noted that the Fatigue Monitoring AMP monitors the actual transient cycles to ensure that the actual cycles do not exceed the transient cycles, which are used as the inputs to the EAF analysis, such that the CUF_{en} values will not exceed the design limit of 1.0 (SE Section 3.0.3.2.1). The staff finds that the applicant's use of the Fatigue Monitoring AMP is adequate to manage the effects of EAF because the program monitors the transient cycles to ensure that the CUF_{en} values meet the design limit (1.0), consistent with the guidance in GALL-SLR AMP X.M1 and SRP-SLR Section 4.3.2.1.2.3.

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 subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.3.2.1.2.3 because the applicant proposed to use the Fatigue Monitoring AMP to manage the effects of EAF, consistent with the guidance in SRP-SLR Section 4.3.2.1.2.3.

4.3.7.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.3.7 provides the USAR supplement summarizing the EAF analysis of the reactor coolant pressure boundary components and piping. The staff reviewed SLRA Section A.3.3.7, consistent with the review procedures in SRP-SLR Section 4.3.3.2. Based on its review of the USAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. The staff also finds that the applicant provided an adequate summary description to address the EAF TLAA for the reactor coolant pressure boundary components and piping, as required by 10 CFR 54.21(d).

4.3.7.4 Conclusion

Based its review, the staff concludes the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of EAF on the intended functions of the reactor coolant pressure boundary components and piping will be adequately managed by the Fatigue Monitoring AMP for the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.4 Environmental Qualification of Electrical Equipment

4.4.1 Summary of Technical Information in the Application

SLRA Section 4.4 describes the applicant's TLAA for evaluation of environmental qualification (EQ) of electric equipment for the subsequent period of extended operation. Thermal, radiation, and cyclical aging analyses of plant electric and instrumentation components located in harsh environments, developed to meet the requirements of 10 CFR 50.49, "Environmental qualification of electric equipment important to safety for nuclear power plants," have been identified as TLAAs. The applicant dispositioned the TLAA for the EQ of electric equipment in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of EQ of electric components on the intended functions will be adequately managed by the EQ of Electric Equipment AMP for the subsequent period of extended operation.

4.4.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the EQ of electric equipment and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.4.3.1.3.

The EQ requirements established by 10 CFR 50.49 require each applicant to establish a program to qualify electric equipment so that such equipment, in its end-of-life condition, will meet its performance specifications during and following DBAs. The EQ of electric equipment important to safety, in accordance with the requirements of 10 CFR 50.49, is considered an adequate AMP for the purposes of license renewal. Electric and instrumentation components in the applicant's EQ program identified as having a qualified life equal to, or greater than, the current operating term (i.e., 60 years) are considered a TLAA for SLR. The applicant's EQ program manages the effects of thermal, radiation, and cyclic aging using aging evaluation based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49(e)(5), EQ components are refurbished or replaced or their qualification is extended prior to reaching the aging limit established in the evaluation.

The staff reviewed SLRA 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 in accordance with the requirements of 10 CFR 54.21(c)(1)(iii) to show that components examined under the applicant's TLAA evaluation are adequately managed during the subsequent period of extended operation. The staff reviewed the applicant's EQ program, including the management of aging effects, to confirm that electric equipment requiring EQ will continue to operate consistent with the CLB during the subsequent period of extended operation.

The staff also conducted an audit (as described in the audit report, ML23214A241) of the information provided in SLRA Section B.2.2.3 and the program basis documents, including reports reviewed by the staff during the audit. Based on the staff review of SLRA Section B.2.2.3 and the results of the audit, the staff concludes that applicant's EQ program elements are consistent with GALL-SLR AMP X.E1 "Environmental Qualification of Electrical Equipment" and are therefore acceptable. SE Section 3.0.3.2.26 documents the staff's evaluation of the applicant's EQ of Electric Equipment AMP.

The staff also reviewed the applicant's EQ program reanalysis attributes evaluation and concludes that it is consistent with SRP-SLR Section 4.4.3.1.3 and SRP-SLR Table 4.4-1. Reanalysis of an aging evaluation addresses attributes of analytical methods, data collection and reduction method, underlying assumptions, acceptance criteria, ongoing qualification, and corrective action (if acceptance criteria are not met). The applicant noted that EQ components not qualified for the current license term are to be refurbished or 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 electric and instrumentation components located in harsh environments, qualified to meet 10 CFR 50.49 requirements on the intended functions of the EQ electric equipment, will be adequately managed for the subsequent period of extended operation.

Additionally, the applicant meets the acceptance criteria in SRP-SLR Section 4.4.2.1.3 because the EQ program is capable of programmatically managing the qualified life of components within the scope of the program for license renewal and because the continued implementation of the EQ program provides assurance that the aging effects will be managed and that EQ electric components will continue to perform their intended functions for the subsequent period of extended operation, consistent with the requirements of 10 CFR 54.21(c)(1)(iii).

4.4.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.4 provides the USAR supplement summarizing the EQ of electric equipment. The staff reviewed SLRA Section A.3.4 consistent with the review procedures in SRP-SLR Section 4.4.3.2.

Based on its review, the staff finds that the USAR supplement meets the acceptance criteria in SRP-SLR Section 4.4.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the EQ of electric equipment, as required by 10 CFR 54.21(d).

4.4.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of thermal, radiation, and cyclic aging on the intended functions of environmentally qualified electric equipment will be adequately managed by the EQ of Electric Equipment AMP for the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.5 Containment Liner Plate, Metal Containments, and Penetrations Fatigue

The applicant stated that the MNGP primary containment was designed in accordance with the ASME Code, Section III, 1965 Edition, up to and including 1965 Winter Addenda.

SLRA Section 4.5 provides the applicant’s analyses for fatigue of following areas:

- fatigue analysis of the suppression chamber vents, downcomers, and torus shell
- fatigue analysis of the safety relief valve (SRV) discharge piping inside the suppression chamber
- fatigue analysis of suppression chamber external piping and penetrations, including ring header
- drywell-to-suppression chamber vent line bellows fatigue analysis
- primary containment process penetration bellows fatigue analysis

4.5.1 Fatigue Analysis of the Suppression Chamber Vents, Downcomers, and Torus Shell

4.5.1.1 Summary of Technical Information in the Application

SLRA Section 4.5.1, as supplemented by letter dated July 18, 2023 (ML23199A154), describes the applicant’s TLAA for fatigue of the suppression chamber vents, downcomers, and torus shell. The applicant dispositioned the TLAAs for the suppression chamber vents, downcomers, and torus shell 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 Fatigue Monitoring AMP for the subsequent period of extended operation.

4.5.1.2 Staff Evaluation

The staff reviewed the applicant's TLAA, as amended, for fatigue of the suppression chamber vents, downcomers, and torus shell and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.6.3.1.1.3.

The staff noted from the SLRA, as amended, that the fatigue usage for the suppression chamber vents, downcomers, and torus shell was reevaluated for the subsequent period of extended operation, in accordance with the ASME Code, Section III, 1980 Edition with Addenda through Summer 1982, specifically using 80-year cycle projections. The staff noted that the limiting fatigue location for the suppression chamber vents system occurred in the vent header at the downcomer-vent header intersection. For this location, the fatigue usage was recalculated for 80 years based on 699 projected SRV discharges under normal operating condition (NOC), 74 discharges (including a 47 percent increase for extended power uprate (EPU) per CLB) under a small break accident (SBA) condition, and 1,000 operating basis earthquake (OBE) cycles. This resulted in a cumulative fatigue usage of 0.63, which is less than 1.0 and is therefore acceptable. For the suppression chamber or torus shell, the fatigue usage was recalculated based on 80-year projected transients under NOC and SBA conditions (including EPU) to be 0.788, which is less than 1.0 and therefore acceptable. During the audit (as described in the audit report, ML23214A241), the staff reviewed Calculation 22-014, Revision 0, "80-Year Fatigue Analysis of Selected Suppression Chamber Components," and noted it revised the existing fatigue analyses of the suppression chamber vents, downcomers, and torus shell to incorporate EPU and 80-year fatigue usage. The staff also verified from review of this calculation the projected fatigue usage results for 80 years presented in SLRA Section 4.5.1 (and summarized in SLRA Table 4.5-1) for the suppression chamber vents, downcomers, and torus shell.

The staff also noted from the SLRA that the projected cumulative fatigue usage for the suppression chamber vents, downcomers, and torus shell will be managed by the Fatigue Monitoring AMP, which will track the SRV cycles (for NOC and SBA conditions, including OBE) on the plant surveillance schedule for annual performance. The staff further noted that the Fatigue Monitoring AMP, which will be consistent with enhancements to GALL-SLR AMP X.M1, will track transient cycles in SLRA Table 4.3.1-1, which includes SRV lifts and OBE primarily applicable to this TLAA. This provides reasonable assurance that corrective action is taken prior to potentially exceeding design fatigue cycles for the suppression chamber vents, downcomers, and torus shell. SE Section 3.0.3.2.1 documents the staff evaluation of the Fatigue Monitoring AMP. In accordance with the SRP-SLR acceptance criteria, GALL-SLR AMP XI.M1 provides one program that may be used as the basis for accepting this TLAA in accordance with 10 CFR 54.21(c)(1)(iii). The staff thus concludes that the applicant has identified an acceptable AMP to adequately manage cumulative fatigue damage of the suppression chamber vents, downcomers, and torus shell that supports the TLAA disposition in accordance with 10 CFR 54.21(c)(1)(iii).

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 suppression chamber vents, downcomers, and torus shell will be adequately managed for the subsequent period of extended operation. Additionally, the applicant's TLAA, as amended, for fatigue of the suppression chamber vents, downcomers, and torus shell meets the acceptance criteria in SRP-SLR Section 4.6.2.1.1.3 because, consistent with the TLAA acceptance criterion in 10 CFR 54.21(c)(1)(iii), the applicant has proposed the Fatigue Monitoring AMP (described as an existing program with enhancements that will be consistent with GALL-SLR AMP X.M1) to manage the effects of cumulative fatigue damage due to cyclic loading on the intended functions of the suppression chamber vents, downcomers, and torus shell during the subsequent period of extended operation.

4.5.1.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.5.1 provides the USAR supplement summarizing the fatigue evaluation for suppression chamber (torus shell), vents, and downcomers. The staff reviewed SLRA Section A.3.5.1 consistent with the review procedures in SRP-SLR Section 4.6.3.2.

Based on its review, the staff finds that the USAR supplement meets the acceptance criteria in SRP-SLR Section 4.6.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address cumulative fatigue damage of the suppression chamber (torus shell), vents, and downcomers, 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 on the intended functions of the suppression chamber vents, downcomers, and torus shell will be adequately managed by the Fatigue Monitoring AMP for the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.5.2 Fatigue Analysis of the Safety Relief Valve Discharge Piping Inside the Suppression Chamber

4.5.2.1 Summary of Technical Information in the Application

SLRA Section 4.5.2, as supplemented by letter dated July 18, 2023, describes the applicant’s TLAA for fatigue of the SRV discharge piping inside the suppression chamber. The applicant dispositioned the TLAA for the SRV discharge piping inside the suppression chamber 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 Fatigue Monitoring AMP for the subsequent period of extended operation.

4.5.2.2 Staff Evaluation

The staff reviewed the applicant’s TLAA, as amended, for fatigue of the SRV discharge piping inside the suppression chamber and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.6.3.1.1.3.

The staff noted from the SLRA that the existing SRV piping fatigue usage of 0.309 was calculated for NOC plus DBA and NOC plus small/intermediate break accident (SBA/IBA) with 50 SRV actions postulated during accidents (SBA/IBA) and 934 SRV actuations postulated during NOC for a total of 984 postulated SRV actuations. The fatigue usage was calculated in accordance with ASME Code, Section III, 1980 Edition with Addenda through Summer 1982. The staff further noted that, since projected SRV actuations during normal operation for 80 years (699 from SLRA Table 4.3.1-1) are less than the 934 postulated during NOC, the existing fatigue usage was conservatively increased by a factor of 1.47 (i.e., 47 percent increase in cycles determined for EPU in the CLB) to account for EPU for 80 years to arrive at a fatigue usage of 0.454, which is less than the acceptance limit of 1.0 and therefore acceptable. The staff also noted from the SLRA that to ensure the fatigue usage remains bounding during the subsequent period of extended operation, it will be managed by the Fatigue Monitoring AMP, which will track the SRV cycles (for NOC plus DBA and NOC plus SBA/IBA on the plant surveillance schedule for annual performance). During the audit (as described in the audit report, ML23214A241), the staff reviewed Calculation 22-014, Revision 0, and noted it revised the existing fatigue analyses of the suppression chamber to incorporate EPU and 80-year fatigue usage. The staff also verified, from review of this calculation, the fatigue usage result presented in SLRA Section 4.5.2 and summarized in SLRA Table 4.5-1 for the SRV discharge piping inside the suppression chamber.

The staff further noted that the Fatigue Monitoring AMP, which will be consistent with enhancements to GALL-SLR AMP X.M1, will track transient cycles in SLRA Table 4.3.1-1, which includes SRV lifts and OBE primarily applicable to this TLAA. This provides reasonable assurance that corrective action will be taken prior to potentially exceeding design fatigue cycles for the SRV discharge piping inside the suppression chamber. SE Section 3.0.3.2.1 documents the staff evaluation of the Fatigue Monitoring AMP. In accordance with the SRP-SLR acceptance criteria, GALL-SLR AMP XI.M1 provides one AMP that may be used as the basis for accepting this TLAA in accordance with 10 CFR 54.21(c)(1)(iii). The staff thus concludes that the applicant has identified an acceptable AMP to adequately manage cumulative fatigue damage of the SRV discharge piping inside the suppression chamber that supports the TLAA disposition in accordance with 10 CFR 54.21(c)(1)(iii).

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 SRV discharge piping inside the suppression chamber will be adequately managed for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.6.2.1.1.3 because, consistent with the TLAA acceptance criterion in 10 CFR 54.21(c)(1)(iii), the applicant has proposed the Fatigue Monitoring AMP (described as an existing program with enhancements that will be consistent with GALL-SLR AMP X.M1) to manage the effects of cumulative fatigue damage on the intended functions of the SRV discharge piping inside the suppression chamber during the subsequent period of extended operation.

4.5.2.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.5.2 provides the USAR supplement summarizing the fatigue evaluation of the SRV discharge piping inside the suppression chamber. The staff reviewed SLRA Section A.3.5.2 consistent with the review procedures in SRP-SLR Section 4.6.3.2.

Based on its review, the staff finds that the USAR supplement meets the acceptance criteria in SRP-SLR Section 4.6.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address cumulative fatigue damage of the SRV discharge piping inside the suppression chamber, 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 on the intended functions of the SRV discharge piping inside the suppression chamber will be adequately managed by the Fatigue Monitoring AMP for the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.5.3 Fatigue Analysis of Suppression Chamber External Piping and Penetrations, Including Ring Header

4.5.3.1 Summary of Technical Information in the Application

SLRA Section 4.5.3, as supplemented by letter dated July 18, 2023 (ML23199A154), describes the applicant’s TLAA for fatigue of the suppression chamber external piping and penetrations, including ring header. The applicant dispositioned the TLAAs for the suppression chamber external piping and penetrations, including ring header, 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 Fatigue Monitoring AMP for the subsequent period of extended operation.

4.5.3.2 Staff Evaluation

The staff reviewed the applicant’s TLAAs, as amended, for fatigue of the suppression chamber external piping and penetrations, including ring header, and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.6.3.1.1.3.

The staff noted from the SLRA, as amended, that the analyses included large-bore and small-bore torus attached piping, suppression chamber penetrations, and the emergency core cooling system suction header. As the SRV discharge piping evaluated in SE Section 4.5.2 was limiting or bounding, the large-bore and small-bore torus attached piping are not further evaluated in this section. The staff noted that the applicant reevaluated, in accordance with the ASME Code, Section III, 1980 edition with addenda through summer 1982, the suppression chamber (torus attached) penetrations fatigue usage using 699 projected 80-year SRV cycles during NOC, 1,000 OBE cycles, and 1 postulated accident for 80 years, including a 47 percent increase in cycles due to EPU. The staff also confirmed from SLRA Table 4.3.1-1 that 699 SRV actuations are projected to occur for 80 years of operation. The staff also noted that the recalculated fatigue usage for the suppression chamber penetrations for 80 years is 0.8853, which is below the acceptance limit of 1.0 and therefore acceptable. The staff further noted that for the ring header fatigue usage of the controlling component, using the above cycles, including a 47 percent increase for EPU, the recalculated cumulative fatigue usage for 80 years was 0.154, which is less than the acceptance limit of 1.0 and is therefore acceptable. During the audit (as described in the audit report, ML23214A241), the staff reviewed Calculation 22-014, Revision 0, and noted it revised the existing fatigue analyses of the suppression chamber components to incorporate EPU and 80-year fatigue usage. The staff also verified from review of this calculation the fatigue usage results presented in SLRA Section 4.5.3 and summarized in SLRA Table 4.5-1 for the suppression chamber external piping penetrations and ring header.

The staff also noted from the SLRA that cumulative fatigue usage for the suppression chamber piping penetrations and the ring header will be managed by the Fatigue Monitoring AMP, which will track the SRV cycles (for NOC, OBE, and accident loading conditions) on the plant surveillance schedule for annual performance. The staff further noted that the Fatigue Monitoring AMP, which will be consistent with enhancements to GALL-SLR AMP X.M1, will track transient cycles in SLRA Table 4.3.1-1, which includes SRV lifts and OBE primarily applicable to this TLAA. This provides reasonable assurance that corrective action is taken prior to potentially exceeding design fatigue cycles for the suppression chamber external piping penetrations and ring header. SE Section 3.0.3.2.1 documents the staff evaluation of the Fatigue Monitoring AMP. In accordance with the SRP-SLR acceptance criteria, GALL-SLR AMP XI.M1 provides one AMP that may be used as the basis for accepting this TLAA in accordance with 10 CFR 54.21(c)(1)(iii). The staff thus concludes that the applicant has identified an acceptable AMP to adequately manage cumulative fatigue damage of the suppression chamber external piping penetrations and ring header, which supports the TLAA disposition in accordance with 10 CFR 54.21(c)(1)(iii).

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 suppression chamber external piping and penetrations, including ring header, will be adequately managed for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.6.2.1.1.3 because, consistent with the TLAA acceptance criterion in 10 CFR 54.21(c)(1)(iii), the applicant has proposed the Fatigue Monitoring AMP (described as an existing program with enhancements that will be consistent with GALL-SLR AMP X.M1) to manage the effects of cumulative fatigue damage on the intended functions of the suppression chamber external piping and penetrations, including ring header, during the subsequent period of extended operation.

4.5.3.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.5.3 provides the USAR supplement summarizing the fatigue evaluation of the suppression chamber external piping and penetrations, including ring header. The staff reviewed SLRA Section A.3.5.3 consistent with the review procedures in SRP-SLR Section 4.6.3.2.

Based on its review, the staff finds that the USAR supplement meets the acceptance criteria in SRP-SLR Section 4.6.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address cumulative fatigue damage of the suppression chamber external piping and penetrations, including ring header, 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 on the intended functions of the suppression chamber external piping and penetrations, including ring header, will be adequately managed by the Fatigue Monitoring AMP for the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.5.4 Drywell-to-Suppression Chamber Vent Line Bellows Fatigue Analysis

4.5.4.1 Summary of Technical Information in the Application

SLRA Section 4.5.4 describes the applicant's TLAA for fatigue of the drywell-to-suppression chamber vent line bellows. The applicant dispositioned the TLAA for the drywell-to-suppression chamber vent line bellows in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analysis remains valid for the subsequent period of extended operation.

4.5.4.2 Staff Evaluation

The staff reviewed the applicant's TLAA in SLRA Section 4.5.4 for fatigue of the drywell-to-suppression chamber vent line bellows and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR Section 4.6.3.1.1.1.

The staff reviewed SLRA Section 4.5.4 and noted that the applicant's drywell-to-suppression chamber vent line bellows fatigue analysis calculated a fatigue usage of 0.10, conservatively considering 300 startup/shutdown cycles and 1 cycle of postulated accident conditions, which is significantly higher than the 203 startup/shutdown cycles projected for 80 years of operation. Therefore, the applicant concluded that the existing analysis is conservative and remains valid for 80 years. The staff reviewed SLRA Table 4.3.1-1 and confirmed that the number of startup/shutdown cycles projected to 80 years is 203 cycles and an accident has not occurred to date. During the audit (as described in the audit report, ML23214A241), the staff reviewed Calculation 22-014, Revision 0, and verified the transient cycles, fatigue usage, and related information stated in SLRA Section 4.5.4 for the drywell-to-suppression chamber vent line bellows. The staff's comparison above of the number of projected startup/shutdown cycles with the number considered in the existing fatigue analysis of the drywell-to-suppression chamber vent line bellows confirms that the number of occurrences and severities of cyclic loadings in the existing fatigue parameter evaluations will not be exceeded during the subsequent period of extended operation.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the analysis for fatigue of the MNGP drywell-to-suppression chamber vent line bellows remains valid for the subsequent period of extended operation. Additionally, the analyses meet the acceptance criteria in SRP-SLR Section 4.6.2.1.1.1 because the number of occurrences and severities of assumed cyclic loads are not projected to be exceeded during the subsequent period of extended operation.

4.5.4.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.5.4 provides the USAR supplement summarizing the fatigue evaluation for the MNGP drywell-to-suppression chamber vent line bellows. The staff reviewed SLRA Section A.3.5.4 consistent with the review procedures in SRP-SLR Section 4.6.3.2.

Based on its review, the staff finds that the USAR supplement meets the acceptance criteria in SRP-SLR Section 4.6.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address fatigue of the MNGP drywell-to-suppression chamber vent line bellows, as required by 10 CFR 54.21(d).

4.5.4.4 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 analysis of the effects of cumulative fatigue damage on the intended functions of the MNGP drywell-to-suppression chamber vent line bellows remains valid for the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluations, as required by 10 CFR 54.21(d).

4.5.5 Primary Containment Process Penetration Bellows Fatigue Analysis

4.5.5.1 Summary of Technical Information in the Application

SLRA Section 4.5.5 (by reference to SLRA Section 4.3.6), as amended by letter dated June 26, 2023 (ML23177A218), describes the applicant's TLAA for fatigue of the primary containment process penetration bellows. The applicant dispositioned the TLAA for the primary containment process penetration bellows in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analysis remains valid for the subsequent period of extended operation.

4.5.5.2 Staff Evaluation

The staff reviewed the applicant's TLAA in SLRA Section 4.5.5 for fatigue of the primary containment process penetration bellows and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR Section 4.6.3.1.1.1.

The staff reviewed SLRA Section 4.5.5, as amended, and noted that the applicant's evaluation for the primary containment process penetration bellows was performed as part of the ASME Code, Section III, Class 2 and 3 and ANSI B31.1 piping systems fatigue TLAA described in SLRA Section 4.3.6, as amended. The staff noted from the SLRA that the primary containment process penetration bellows has been implicitly designed for a maximum of 7,000 full-range operating thermal cycles. The staff also noted that the transient cycles on the bellows are composed of thermal cycles experienced by the associated piping. The staff further noted from SLRA Table 4.3.6-1 that the maximum projected number of full-range thermal cycles for 80 years of operation is 3,000 cycles (for feedwater piping with process penetration bellows). This is significantly less than the 7,000 thermal cycles for which the primary containment process penetration bellows was originally designed. Therefore, the applicant concluded, and the staff verified, the thermal cycles for which the primary containment process penetration bellows was implicitly designed are not projected to be exceeded for the subsequent period of extended operation.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the analysis for fatigue of the primary containment process penetration bellows remains valid for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.6.2.1.1.1 because the number of occurrences and severities of thermal cycles for which the primary containment process penetration bellows was implicitly designed is not projected to be exceeded during the subsequent period of extended operation.

4.5.5.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.5.5, as amended by letter dated August 28, 2023 (ML23240A695), provides the USAR supplement summarizing the fatigue evaluation for the MNGP primary containment process penetration bellows. The staff reviewed SLRA Section A.3.5.5 consistent with the review procedures in SRP-SLR Section 4.6.3.2.

Based on its review of the SLRA, as amended, the staff finds that the USAR supplement meets the acceptance criteria in SRP-SLR Section 4.6.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address fatigue of the MNGP primary containment process penetration bellows, as required by 10 CFR 54.21(d).

4.5.5.4 Conclusion

Based on its review, the staff concludes that the applicant has acceptably 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 MNGP primary containment process penetration bellows remains valid for the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluations, as required by 10 CFR 54.21(d).

4.6 Other Plant-Specific Time-Limited Aging Analyses

SLRA Section 4.6 provides the applicant's analyses of following areas:

- fatigue of cranes
- fatigue of high-pressure coolant injection (HPCI) and reactor core isolation cooling (RCIC) turbine exhaust penetrations
- fatigue of condensate backwash receiving tank

4.6.1 Fatigue of Cranes

4.6.1.1 Summary of Technical Information in the Application

SLRA Section 4.6.1, as amended by letter dated June 26, 2023 (ML23177A218), describes the applicant's TLAAs for crane load cycle limits. The applicant dispositioned the TLAAs for the reactor building crane and turbine building crane in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analyses have been projected to the end of the subsequent period of extended operation.

4.6.1.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the subject cranes and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.7.3.1.2.

Reactor Building Crane

The applicant projected 4,032 lifts of the reactor building crane for the subsequent period of extended operation in SLRA Table 4.6.1-1 and Report No. XCELMO000017-REPT-091, Revision 0, “MNGP SLR TLAA and Exemption Evaluation.” The staff reviewed the basis for the estimated number of lifts for each heavy load type in the table and finds the estimates for the expected number of lifts over the plant life to the end of the subsequent period of extended operation are reasonable and conservative. Therefore, this confirms the applicant’s conservative projection of 4,032 lifts remains well below the CLB load cycle limit of 20,000 provided for service Class D in Crane Manufacturers Association of America Specification 70, “Specifications for Electric Overhead Traveling Cranes,” issued 1975 (CMAA-70).

Turbine Building Crane

The applicant projected 2,460 lifts of the turbine building crane for the subsequent period of extended operation in SLRA Table 4.6.1-2 SLRA and Report No. XCELMO000017-REPT-091, Revision 0. The staff reviewed the basis for the estimated number of lifts for each heavy load type in the table and finds the estimates for the expected number of lifts over the plant life to the end of subsequent period of extended operation are reasonable and conservative. Therefore, this confirms the applicant’s conservative projection of 2,460 lifts remains well below the CLB load cycle limit of 20,000 provided for service Class D in CMAA-70.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for the reactor building crane and turbine building crane have been projected to the end of the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-LR Section 4.7.2.1.2 because the applicant has demonstrated that the crane load cycle analyses remain below the bounds of the CMAA-70 allowable load cycles and, therefore, are acceptable for the subsequent period of extended operation.

4.6.1.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.6.1 provides the USAR supplement summarizing the TLAA for the crane load cycle limits, including the cranes’ number of expected lifts for the subsequent period of extended operation, as well as the limiting number of lifts. The staff reviewed SLRA Section A.3.6.1 consistent with the review procedures in SRP-LR Section 4.7.3.2.

Based on its review, the staff finds that the USAR supplement meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the crane load cycle 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 to10 CFR 54.21(c)(1)(ii), that the analyses for the crane load cycle limits have been projected to the end of the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6.2 Fatigue of High-Pressure Coolant Injection and Reactor Core Isolation Cooling Turbine Exhaust Penetrations

4.6.2.1 Summary of Technical Information in the Application

SLRA Section 4.6.2, as amended by letter dated July 18, 2023 (ML23199A154), describes the applicant's TLAAs for fatigue of the MNGP HPCI and RCIC turbine exhaust penetrations (which are torus penetrations). The applicant dispositioned the TLAAs for the HPCI and RCIC turbine exhaust penetrations in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses for the HPCI and RCIC turbine exhaust penetrations have been projected to the end of the subsequent period of extended operation.

4.6.2.2 Staff Evaluation

The staff reviewed the applicant's TLAAs in SLRA Section 4.6.2, as amended, for fatigue of the carbon steel MNGP HPCI and RCIC turbine exhaust penetrations (torus penetrations) and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.6.3.1.1.2.

The staff noted from the SLRA that the original analysis for 40 years of operation calculated fatigue usage factors of 0.111 and 0.343, respectively, for the HPCI and RCIC turbine exhaust penetrations. The staff also noted that the existing fatigue usage was primarily based on pressure and thermal cycles under NOC load combinations plus DBA with OBE condition load combinations. The staff further noted that the 40-year fatigue usage factors were conservatively multiplied by a factor of 2 (80 years/40 years) to obtain fatigue usage factors for 80 years of operation. Accordingly, the calculated fatigue usage factors for the subsequent period of extended operation were 0.222 and 0.686 for the HPCI and RCIC turbine exhaust penetrations, respectively, which are both below the acceptance criteria of 1.0. During the audit (as described in the audit report, ML23214A241), the staff reviewed Calculation 22-009, Revision 0, "80-Year Fatigue Analysis of Selected Suppression Chamber Components," and verified that the applicant appropriately calculated and projected fatigue usage factors for the HPCI and RCIC turbine exhaust penetrations that are bounding for the subsequent period of extended operation, including EPU, as stated in SLRA Section 4.6.2.

Based on the above review of the SLRA, as amended, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the existing fatigue parameter evaluations for the HPCI and RCIC turbine exhaust penetrations have been projected for the subsequent period of extended operation and shown to meet the acceptance criteria.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the existing analyses for fatigue of the MNGP HPCI and RCIC turbine exhaust penetrations have been projected to the end of the subsequent period of extended operation. Additionally, the analyses meet the acceptance criteria in SRP-SLR Section 4.6.2.1.1.2 because the projected fatigue usage factors for the subsequent period of extended operation are within acceptable limits.

4.6.2.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.6.2, as amended, provides the USAR supplement summarizing the fatigue evaluation for the MNGP HPCI and RCIC turbine exhaust penetrations. The staff reviewed SLRA Section A.3.6.2 consistent with the review procedures in SRP-SLR Section 4.6.3.2.

Based on its review, the staff finds that the USAR supplement meets the acceptance criteria in SRP-SLR Section 4.6.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address fatigue of the MNGP HPCI and RCIC turbine exhaust penetrations, 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 effects of cumulative fatigue damage on the intended functions of the MNGP HPCI and RCIC turbine exhaust penetrations have been projected to the end of the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluations, as required by 10 CFR 54.21(d).

4.6.3 Fatigue of Condensate Backwash Receiving Tank

4.6.3.1 Summary of Technical Information in the Application

SLRA Section 4.6.3, as supplemented by letter on November 30, 2023 (ML23334A147), describes the applicant’s fatigue TLAA for the condensate backwash receiving (CBR) tank in the liquid waste management system. The internal pressure in the CBR tank was increased in support of the extended power uprate (EPU) in 2011 and a fatigue evaluation was performed to consider the effect of backwash airburst cycles since the modification for the EPU. In the fatigue evaluation, the number of airburst cycles throughout the subsequent period of extended operation was stated to be conservatively estimated to be 24000 cycles and the corresponding cumulative usage factor (CUF) is 0.58, which is less than the design fatigue limit (1.0).

The applicant dispositioned the fatigue TLAA for the on the metal fatigue for the CBR tank in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the subsequent period of extended operation.

4.6.3.2 Staff Evaluation

The staff reviewed the applicant’s fatigue TLAA for the CBR tank and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.3.3.1.1.2.

SLRA Section 4.6.3 addresses the fatigue analysis for the CBR tank in the liquid waste management system. As described in USAR Section 9.2.2.1, the condensate demineralizers in the liquid waste management system generate liquid and wet solid waste. The backwashed sludge from the condensate demineralizers is collected in the CBR tank.

The applicant stated that the CBR tank is not an ASME Code, Section III Class 1, 2 or 3 component. Therefore, no fatigue analysis is required for the tank by the ASME Code, Section III that is incorporated by reference in 10 CFR 50.55a, “Codes and standards.” The applicant also stated that the original design for the tank did not contain a fatigue analysis. In addition, the staff’s safety evaluation for the initial license renewal of MNGP Unit 1 did not identify any fatigue analysis on the CBR tank as part of the TLAA evaluation (ML063050414).

The applicant further explained that, before the EPU modification implemented in 2011, there was no significant effect of fatigue on the CBR tank. The EPU modification increased the internal pressure in the tank, which caused periodic cyclic stresses. Therefore, the applicant performed a fatigue analysis to consider the effect of airburst cycles accumulating since the EPU modification.

The applicant stated that each condensate demineralizer involves 15 backwash processes per year. Considering that one backwash process includes 8 airburst cycles and there are 5 condensate demineralizers, the total number of airburst cycles per year for the CBR tank was estimated to be 600 cycles (15 x 8 x 5 cycles). Considering the time period of 40 years from the beginning of 2011 to the end of 2050, the applicant estimated 24000 airburst cycles throughout the subsequent period of extended operation (40 x 600 cycles). Based on these cycles, the applicant determined the cumulative usage factor (CUF) for the CBR tank is 0.58 throughout the subsequent period of extended operation.

The staff finds the applicant's fatigue analysis acceptable because (1) the applicant estimated the airburst cycles based on the operating data for the condensate demineralizers, (2) the applicant determined the CUF value by appropriately using the design fatigue curve (Figure 5-110.1) of the ASME Code, Section VIII, Division 2, 1977 Edition with the adequate correction of the typographical error in the ordinate axis unit label from ksi to psi for the allowable amplitude of alternating stresses and (3) the projected CUF (0.58) is less than the fatigue design limit (1.0).

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 CBR tank has been projected to the end of the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.2 because the applicant demonstrated that the CUF value based on the projected cycles meets the fatigue design limit (1.0) for the subsequent period of extended operation.

4.6.3.3 Updated Safety Analysis Report Supplement

SLRA Section A.3.6.3 provides the USAR supplement summarizing the fatigue analysis for the CBR tank. The staff reviewed the SLRA section for USAR supplement, consistent with the review procedures in SRP-SLR Section 4.3.3.2. Based on its review of the USAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR Section 4.3.2.2, and is, therefore, acceptable. The staff also finds that the applicant provided an adequate summary description to address the fatigue TLAA for the CBR tank, as required by 10 CFR 54.21(d).

4.6.3.4 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)(ii), that the fatigue analysis for the CBR tank has been projected to the end of the subsequent period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7 Conclusion for Time-Limited Aging Analyses

The NRC staff reviewed SLRA Section 4 on TLAAs. Based on its review, the staff concludes that the applicant provided a sufficient list of TLAAs, as defined in 10 CFR 54.3, and that it demonstrated that (1) the TLAAs remain valid for the subsequent period of extended operation, as required by 10 CFR 54.21(c)(1)(i), (2) the TLAAs have been projected to the end of the subsequent period of extended operation, as required by 10 CFR 54.21(c)(1)(ii), or (3) the effects of aging on the intended function(s) will be adequately managed for the subsequent period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff also reviewed the USAR supplements for the TLAAs and finds that they contain summary descriptions of the TLAAs sufficient to satisfy the requirements of 10 CFR 54.21(d). In addition, the staff concludes, as required by 10 CFR 54.21(c)(2), that no plant-specific, TLAA-based exemptions are in effect.

The NRC staff concludes that there is reasonable assurance that the activities authorized by the subsequent renewed licenses will continue to be conducted in accordance with the CLB, and that any changes made to the CLB in order to comply with 10 CFR 54.29(a) are in accordance with the Atomic Energy Act of 1954, as amended, and the NRC's regulations.

SECTION 5 REVIEW BY THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

In accordance with Title 10 of the *Code of Federal Regulations* 54.25, “Report of the Advisory Committee on Reactor Safeguards,” the subsequent license renewal application (SLRA) for the Monticello Nuclear Generating 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 SLRA. The applicant and the staff will attend a meeting of the full committee of the ACRS to discuss issues associated with the SLRA. After the ACRS completes its review of the SLRA and the SE, it will issue a report discussing the results of its review.

SECTION 6 CONCLUSION

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed the subsequent license renewal application (SLRA) for the Monticello Nuclear Generating Plant, Unit 1 (MNGP) in accordance with the NRC's regulations and the guidance in NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" (ML17188A158) (SRP-SLR) and NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report" (ML17187A031 and ML17187A204). Title 10 of the *Code of Federal Regulations* (10 CFR) Section 54.29, "Standards for issuance of a renewed license," sets the standards for issuance of subsequent renewed licenses. In accordance with 10 CFR 54.29, the Commission may issue a subsequent renewed license if it finds, among other things, that: (a) actions have been identified and have been or will be taken, such that there is reasonable assurance that the activities authorized by the subsequent renewed license will continue to be conducted in accordance with the current licensing basis and (b) any applicable requirements of Subpart A, "National Environmental Policy Act—Regulations Implementing Section 102(2)," of 10 CFR Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions" (addressing environmental review), have been satisfied.

Based on its review of the SLRA, the NRC staff determined that the applicant has met the requirements of 10 CFR 54.29(a). Specifically, actions have been identified and have been taken or will be taken with respect to: (1) managing the effects of aging during the subsequent period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21(a)(1) and (2) time-limited aging analyses that have been identified to require review under 10 CFR 54.21(c).

Concerning 10 CFR 54.29(b), the NRC staff's environmental review under the requirements of 10 CFR Part 51, Subpart A, is ongoing. The staff will publish its environmental review findings separately from this report.

APPENDIX A

LICENSE RENEWAL COMMITMENTS

A. License Renewal Commitments

During the U.S. Nuclear Regulatory Commission (NRC) staff's review of the Monticello Nuclear Generating Plant, Unit 1 (MNGP) subsequent license renewal application, Northern States Power Company, (NSPM or the applicant) made commitments related to the aging management programs (AMPs) used to manage aging effects for structures and components. The following table lists these commitments along with the implementation schedules and sources for each commitment. The subsequent period of extended operation (SPEO) for MNGP begins on September 8, 2030.

Table A-1. Monticello Unit 1 Subsequent License Renewal Commitments

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
1	Fatigue Monitoring (A.2.1.1)	X.M1	The Fatigue Monitoring AMP is an existing program that will be enhanced to: a) Update plant procedures to require periodic validation of chemistry parameters that are used as inputs to determine F_{en} factors; b) Update plant procedures to identify and require monitoring of the 80-year plant design cycles, or projected cycles that are utilized as inputs to component CUF_{en} calculations, as applicable, including SRV actuations; c) Update plant procedures to identify the corrective action options to take if the values assumed for fatigue parameters are approached, transient severities exceed the design or assumed severities, transient counts exceed the design or assumed quantities, transient definitions have changed, unanticipated new fatigue loading events are discovered, or the geometries of components are modified; d) Update plant procedures to require trending be performed to ensure that the fatigue parameter limits will not be exceeded during the SPEO; e) Update plant procedures to specify that acceptable corrective actions include repair of the component, replacement of the component, and a more rigorous analysis of the component to demonstrate that the design limit will not be exceeded during the SPEO. For CUF_{en} analyses, scope expansion includes consideration of other locations with the highest expected CUF_{en} values.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354 Supplement 4 ML23199A154

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
2	Neutron Fluence Monitoring (A.2.1.2)	X.M2	The Neutron Fluence Monitoring AMP is an existing program that is credited.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354
3	Environmental Qualification of Electric Equipment (A.2.1.3)	X.E1	The Environmental Qualification of Electric Equipment AMP is an existing program that will be enhanced to: a) Visually inspect accessible, passive EQ equipment at least once every 10 years with the first periodic visual inspection being performed prior to the SPEO. b) Document within the visual inspections that accessible passive EQ equipment is free from unacceptable surface abnormalities that may indicate age degradation. c) Evaluate and take appropriate corrective actions, which may include changes to qualified life, when an unexpected ALE or condition is identified during operational or maintenance activities that affect the qualification of electrical equipment.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354
4	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (A.2.2.1)	XI.M1	The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP is an existing program that is credited.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354
5	Water Chemistry (A.2.2.2)	XI.M2	The MNGP Water Chemistry AMP is an existing program that is credited.	No later than 6 months prior to the SPEO, or no later than the last refueling outage	SLRA ML23009A354

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
				prior to the SPEO	
6	Reactor Head Closure Stud Bolting (A.2.2.3)	XI.M3	The MNGP Reactor Head Closure Stud Bolting AMP is an existing program that will be enhanced to: a) Revise the procurement requirements for reactor head closure stud material to assure that the maximum yield strength of newly procured material is limited to a measured yield strength less than 150 ksi.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354
7	BWR Vessel ID Attachment Welds (A.2.2.4)	XI.M4	The BWR Vessel ID Attachment Welds AMP is an existing program that is credited.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354
8	BWR Stress Corrosion Cracking (A.2.2.5)	XI.M7	The BWR Stress Corrosion Cracking AMP is an existing program that is credited.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354
9	BWR Penetrations (A.2.2.6)	XI.M8	The BWR Penetrations AMP is an existing program that is credited.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354
10	BWR Vessel Internals (A.2.2.7)	XI.M9	The BWR Vessel Internals AMP is an existing program that will be enhanced to:	No later than 6 months prior to the SPEO, or no	SLRA ML23009A354

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			a) Include implementation of BWRVIPs -26-A, -41-R4-A, -47-A, and -183-A as indicated in BWRVIP-315. b) Implement BWRVIP-315-A and subsequent revisions approved by the NRC for MNGP to use during SPEO.	later than the last refueling outage prior to the SPEO	Supplement 2 ML23177A218
11	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) (A.2.2.8)	XI.M12	The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) AMP will be implemented as a new program. The program will provide reasonable assurance that reactor coolant pressure boundary CASS components potentially susceptible to thermal aging embrittlement maintain their intended function(s).	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354
12	Flow-Accelerated Corrosion (A.2.2.9)	XI.M17	The Flow-Accelerated Corrosion AMP is an existing program that will be enhanced to: a) Perform a re-assessment of piping systems that have been excluded from wall thickness monitoring due to operation less than 2 percent of plant operating time (as allowed by NSAC-202L-R4) to ensure that adequate bases exist to justify this exclusion for the SPEO. b) Provide guidance to evaluate inspection results to determine if assumptions in the extent of condition review remain valid. If degradation is associated with infrequent operational alignments, such as surveillances or pump starts/stops, then trending activities should consider the number or duration of these occurrences. c) Provide guidance consistent with the erosion remaining service life safety factor provided in EPRI 3002023786 for known erosion mechanisms and changes from the recommended safety factor of 2.0 will be documented in the FAC program as required by EPRI 3002023786.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354 Supplement 2 ML23177A218

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
13	Bolting Integrity (A.2.2.10)	XI.M18	The Bolting Integrity AMP is an existing program that will be enhanced to: a) Ensure references to EPRI Reports 1015336 and 1015337 are added and recommendations for bolt replacement as well as the guidance for materials selection and use of lubricants and sealants incorporated, as appropriate. b) All lubricants containing sulfur will be prohibited from use on pressure-retaining closure bolting. c) Ensure that the maximum yield strength of newly procured pressure-retaining bolting material will be limited to an actual yield strength less than 150 ksi. d) Ensure that closure bolting where leakage is difficult to detect (e.g., on pressure-retaining components in piping systems that are submerged or that contain air or gas) is inspected for cracking and/or loss of material as applicable for the material and environment combination. In addition, the inspections will confirm that the bolted connections are leak tight by applying alternative inspection techniques such as soap bubble testing, thermography, acoustic testing, or verifying the closure bolting is hand tight. A representative sample of the population (defined as the same material and environment combination) of bolt heads and threads will be inspected over each 10-year period of the SPEO. The representative sample will be 20 percent of the population (up to a maximum of 25 items). Opportunistic inspections during maintenance activities may be credited during the same 10-year period. e) Ensure that bolted joints not readily visible during plant operations and refueling outages will be inspected when they are made accessible and at such intervals that would provide	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			reasonable assurance the components' intended functions are maintained. f) Ensure that closure bolting greater than 2 in. in diameter with actual yield strength greater than or equal to 150 ksi or yield strength is unknown will require volumetric examination in accordance to that of ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1. g) Project, where practical, identified degradation until the next scheduled inspection. Results will be evaluated against acceptance criteria to confirm that the timing of subsequent inspections will maintain the components' intended functions throughout the SPEO based on the projected rate of degradation. For sampling-based inspections, results will be evaluated against acceptance criteria to confirm that the sampling bases will maintain the components' intended functions throughout the SPEO based on the projected rate and extent of degradation. Adverse results will be evaluated to determine if an increased sample size or inspection frequency is required. h) Include the guidance for corrective action as described in NUREG-2191, Chapter XI.M18, Element 7.		
14	Open-Cycle Cooling Water System (A.2.2.11)	XI.M20	The Open-Cycle Cooling Water System AMP is an existing program that will be enhanced to: a) Update procedures to monitor for internal cracking. b) Ensure Non-ASME Code tests and inspections follow site procedures that include requirements for items such as lighting, distance, offset, surface coverage, presence of protective coatings, and cleaning processes.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			c) Clarify that inspection results are trended to evaluate the adequacy of surveillance frequencies so that proper intended function is maintained between surveillances. d) Clarify that if fouling is identified, the overall effect is evaluated for reduction of heat transfer capability (if applicable), flow blockage, loss of material, and chemical treatment effectiveness. e) Include trending of wall thickness measurements at locations susceptible to ongoing degradation and adjustment of the monitoring frequency and number of inspection locations based on the trending. f) Clarify that if the cause of the aging effect for each applicable material and environment is not corrected by repair or replacement for all components constructed of the same material and exposed to the same environment, additional inspections are conducted if one of the inspections does not meet acceptance criteria. The relevant primary program procedure will also be updated to state that the number of inspections will be increased in accordance with the CAP; however, no fewer than 5 additional inspections are conducted for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging effect combination is inspected, whichever is less.		
15	Closed Treated Water Systems (A.2.2.12)	XI.M21A	The Closed Treated Water Systems AMP is an existing program that will be enhanced to: a) Include the Heating and Ventilation (HTV) Cooling System as a closed treated water system. b) Ensure visual inspections evaluate the visual appearance of surfaces for evidence of loss of material. Include acceptance criteria for the results of visual inspection of surfaces exposed to	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			the closed treated water environment. Any detectable loss of material, cracking, or fouling (of heat transfer surfaces) will be evaluated in the CAP. Perform visual inspections to determine surface cleanliness, or functional testing to verify that design heat removal rates are maintained as applicable. c) Ensure surface or volumetric examinations results are evaluated for surface discontinuities indicative of cracking. d) Visually inspect surfaces exposed to the closed treated water environment for evidence of loss of material, cracking, or fouling (of heat transfer surfaces) whenever the system boundary is opened. At a minimum, in each 10-year period during the SPEO, a representative sample (20 percent of the population, up to a maximum of 25 components) of piping and components will be inspected using techniques capable of detecting loss of material, cracking, and fouling, as appropriate. The 20 percent minimum is surface area inspected unless the component is measured in linear feet, such as piping. In that case, any combination of 1-foot length sections and components can be used to meet the recommended extent of 25 inspections. The representative sample will be selected based on likelihood of corrosion or cracking. Inspections will be conducted in accordance with applicable ASME code requirements. If there are no ASME code requirements, inspections will be conducted in accordance with site procedures, which will include requirements for items such as lighting, distance, offset, surface coverage, presence of protective coatings, and cleaning processes. e) Include corrective actions if the results of visual inspection of surfaces exposed to the closed treated water environment do not meet acceptance criteria. If fouling of heat transfer surfaces		

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			is identified, the overall effect will be evaluated for reduction of heat transfer, flow blockage, and loss of material. If the cause of the aging effect for each applicable material and environment is not corrected by repair or replacement for all components constructed of the same material and exposed to the same environment, additional inspections are conducted if one of the inspections does not meet acceptance criteria. The number of increased inspections will be determined in accordance with the CAP; however, there will be no fewer than 5 additional inspections for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging affect inspected, whichever is less. If subsequent inspections do not meet acceptance criteria, an extent of condition and extent of cause analysis will be conducted to determine the further extent of condition. Additional samples will be inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes.		
16	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (A.2.2.13)	XI.M23	The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP is an existing program that will be enhanced to: a) Update program procedures to state their respective visual inspection frequencies required by ASME B30.2 or other appropriate standards of the ASME B30 series. b) Update program procedures to replace obsolete references to NP-5067 and EPRI TR-104213 with reference to EPRI Reports 1015336 and 1015337. c) Update program procedures to state load handling system visual inspections are performed by personnel qualified in accordance with plant-specific procedures and processes.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			d) Update program procedures to inspect the Reactor Building crane trolley and bridge runway rail web and flange for damage or cracks. e) Update program procedures to generate a corrective action to evaluate any non-conforming conditions. f) Update program procedures to state that any visual indication of loss of material, deformation, or cracking, and any visual sign of loss of bolting preload is evaluated according to ASME B30.2 or other applicable industry standard in the ASME B30 series. g) Update program procedures to state that repairs made to NUREG-0612 load handling systems are performed as specified in ASME B30.2 or other applicable industry standard in the ASME B30 series.		
17	Compressed Air Monitoring (A.2.2.14)	XI.M24	The Compressed Air Monitoring AMP is an existing program that will be enhanced to: a) Incorporate the air quality provisions provided in the guidance of EPRI TR-108147 and the related guidance in ASME OM-2012, Division 2, Part 28. b) Perform opportunistic visual inspections of accessible internal surfaces for signs of corrosion and abnormal corrosion products that might indicate a loss of material within the system. Acceptance criteria for visual inspection of internal surfaces will include no signs of corrosion (general, pitting, and crevice) that could indicate that the potential loss of function of the component, and the inspections and tests will be performed by qualified personnel.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			c) Trend the routine dew point temperature measurements. d) Include monitoring and trending guidance from ASME OM-2012, Division 2, Part 28 as applicable. e) Update procedures to take appropriate corrective actions when corrosion is discovered on internal system surfaces.		
18	Fire Protection (A.2.2.15)	XI.M26	The Fire Protection AMP is an existing program that will be enhanced to: a) Update the fire damper assemblies inspection procedure(s) to inspect for corrosion and cracking on all in-scope fire damper assemblies. Include “no signs of corrosion, cracking or degradation that could result in loss of fire protection capability due to loss of material” as acceptance criteria for fire damper assemblies. b) Trend the inspection results on fire barrier penetration seals, fire barriers, fire damper assemblies, halon suppression system, and fire doors for timely detection of aging effects so that appropriate corrective actions can be taken. Trend the periodic test results of the halon suppression system for timely detection of aging effects so that appropriate corrective action can be taken. Where practical, identified degradation is projected until the next scheduled inspection. c) Specify that for sampling-based inspections, results will be evaluated against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the components’ intended functions throughout the SPEO based on the projected rate and extent of degradation.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354 RAI Response Set 2 and Supplement 6 ML23248A474

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			d) Require an assessment for additional inspections to be conducted if one of the inspections does not meet acceptance criteria due to current or projected degradation. e) Update Fire Protection AMP documents to include "no separation of layers of material" and "no ruptures or punctures" as acceptance criteria for fire barrier penetration seals. Remove “Cracks greater than 0.25 inches wide,” from the list of criteria to consider during fire barrier inspections with the exception of thermal mastic materials used in fire barrier penetration seals as allowed by design. f) Indicate that, for fire barrier penetration seals, if degradation that could result in loss of fire protection capability is detected within the inspection sample of penetration seals, that the scope of the inspection is expanded to include additional seals in accordance with the MNGPs Fire Protection AMP. If any projected inspection results will not meet acceptance criteria prior to the next scheduled inspection, inspection frequencies are adjusted as determined by the site’s CAP.		
19	Fire Water System (A.2.2.16)	XI.M27	The Fire Water System AMP is an existing program that will be enhanced as stated in SLRA Section B.2.3.16, and in accordance with associated additional details provided in NUREG-2191, Table XI.M27-1, which are based on NFPA 25, 2011 Edition, as well as to: a) Clarify that when visual inspections are used to detect loss of material, the inspection technique must be capable of detecting surface irregularities that could indicate an unexpected level of degradation due to corrosion and corrosion product deposition. Where such irregularities are detected, follow-up volumetric wall thickness examinations are performed.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO Implement the AMP and start the pre-SPEO inspections and tests no earlier than 5 years	SLRA ML23009A354 Supplement 2 ML23177A218 RAI Response Set 3 ML23265A158

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			b) Perform volumetric wall thickness inspections on the portions of the water-based fire protection system components that are periodically subjected to flow but are normally dry as follows: In each 5-year interval of the SPEO, 20 percent of the length of piping segments that cannot be drained or piping segments that allow water to collect is subject to volumetric wall thickness inspections. Measurement points are obtained to the extent that each potential degraded condition can be identified (e.g., general corrosion, MIC). The 20 percent of piping that is inspected in each 5-year interval is in different locations than previously inspected piping. If the results of a 100-percent internal visual inspection are acceptable, and the segment is not subsequently wetted, no further augmented tests or inspections are necessary. c) Incorporate the surveillance requirements stated in NUREG-2191, Section XI.M27, Element 4 and Table XI.M27-1, which are based on NFPA 25, 2011 edition, with an exception to main drain testing as stated in A.2.2.16. This includes testing or replacement of fast-response and traditional sprinkler heads that have been in service for 20 or 50 years, respectively, in accordance with NFPA 25. d) Clarify that, where practical, degradation identified will be projected until the next scheduled inspection. Results will be evaluated against acceptance criteria to confirm that the timing of subsequent inspections will maintain the components' intended functions throughout the SPEO based on the projected rate of degradation. Results of flow testing (e.g., buried and underground piping, fire mains, and sprinklers/spray nozzles), flushes, and wall thickness measurements will be monitored and trended per the instructions of the specific test/inspection	prior to the SPEO.	

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			procedure. For inspections and testing, the inspection and testing results data will be documented and accessible for future use or trending, regardless of whether the trend is positive, negative, or neutral (e.g., attached to the completed work order). However, if a trend is negative, a CAP item is initiated to evaluate the trend and determine any follow-up corrective actions. Degradation identified by flow testing, flushes, and inspections will be evaluated. If the condition of the piping/component does not meet acceptance criteria, then the issue will be entered into the corrective action program, and the component will be evaluated for cleaning, recoating, repair, or replacement. For sampling-based inspections, results will be evaluated against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the components' intended functions throughout the SPEO based on the projected rate and extent of degradation. e) Update spray and sprinkler system flushing procedures to document and trend deposits (scale or foreign material). Incorporate acceptance criteria that no loose fouling products can exist in the systems that could cause flow blockage in the sprinklers or deluge nozzles. Include steps in flushing procedures to compare the amount of deposits to the previous inspections' results, and if the trend shows increasing deposits, then the CAP will be utilized to drive improvement. Additionally, identified deposits will be evaluated for potential impact on downstream components, such as sprinkler heads or spray nozzles. For inspections and testing, the inspection and testing results data will be documented and accessible for future use or trending, regardless of whether the trend is positive, negative, or neutral (e.g., attached to the		

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			completed work order). However, if a trend is negative, a CAP item is initiated to evaluate the trend and determine any follow-up corrective actions. f) Clarify that identified wall loss greater than the manufacturer's tolerance will be entered into the CAP for engineering evaluation and trending to determine when minimum wall thickness will be reached and what corrective actions are required. For inspections and testing, the inspection and testing results data will be documented and accessible for future use or trending, regardless of whether the trend is positive, negative, or neutral (e.g., attached to the completed work order). However, if a trend is negative, a CAP item is initiated to evaluate the trend and determine any follow-up corrective actions. g) Update pipe inspection procedures to state that if an obstruction inside piping or sprinklers is detected during pipe inspections, the material is removed, and the inspection results are entered into the CAP for further evaluation. An evaluation is conducted to determine if deposits need to be removed to determine if loss of material has occurred. When loose fouling products that could cause flow blockage in the sprinklers is detected, a flush is conducted in accordance with the guidance in NFPA 25 Annex D.5, "Flushing Procedures." If any projected inspection results will not meet acceptance criteria prior to the next scheduled inspection, inspection frequencies are adjusted as determined by the CAP. h) Update procedures to state that if a flow test or a main drain test does not meet acceptance criteria due to current or projected degradation, then additional tests will be conducted. The number of increased tests is determined in accordance with the CAP;		

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			however, there are no fewer than two additional tests for each test that did not meet acceptance criteria. The additional inspections are completed within the interval (i.e., 5 years, annual) in which the original test was conducted. If subsequent tests do not meet acceptance criteria, an extent-of-condition and extent-of-cause analysis will be conducted to determine the further extent of tests. i) Clarify that for ongoing degradation mechanisms such as MIC or recurring internal corrosion, the frequency and extent of wall thickness inspections are increased commensurate with the significance of the degradation. The number of increased inspections is determined in accordance with the CAP; however, no fewer than 5 additional inspections are conducted for each inspection that did not meet acceptance criteria, or 20% of each applicable material, environment, and aging effect combination is inspected, whichever is less. The additional inspections will occur at least every 24 months until the rate of recurring internal corrosion occurrences no longer meets the criteria for “loss of material due to recurring internal corrosion” as defined in NUREG 2192. The selected inspection locations will be periodically reviewed to validate their relevance and usefulness and adjusted as appropriate. Evaluation of the inspection results will include (1) a comparison to the nominal wall thickness or previous wall thickness measurements to determine rate of corrosion degradation; (2) a comparison to the design minimum allowable wall thickness to determine the acceptability of the component for continued use; and (3) a determination of reinspection interval. If a failure occurs (e.g., a through-wall leak or blockage impacting operability), the failure mechanism shall be identified and used to determine the most susceptible system locations for additional inspections as driven by the corrective		

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			action program. When piping is replaced prior to failure, due to concerns with wall thinning or blockage, inspections are considered for similar areas of the system to determine the presence and extent of degradation.		
20	Outdoor and Large Atmospheric Metallic Storage Tanks (A.2.2.17)	XI.M29	The Outdoor and Large Atmospheric Metallic Storage Tanks AMP will be implemented as a new program. The program will manage the aging effects on the external and internal surfaces of in-scope outdoor metallic aboveground tanks constructed on concrete.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO Implement and start the 10-year interval of the volumetric inspections of the CST tank bottoms, and the visual inspections of the tank internals exposed to air and condensation environment no earlier than 10 years prior to the SPEO.	SLRA ML23009A354
21	Fuel Oil Chemistry (A.2.2.18)	XI.M30	The MNGP Fuel Oil Chemistry AMP is an existing program that will be enhanced to:	No later than 6 months prior to the SPEO, or no later than the last	SLRA ML23009A354

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			a) Periodically check for and remove water accumulation in the Diesel Fire Pump Day Tank. b) Include sampling of the day tanks and base tanks, in addition to the samples taken from the Diesel Oil Storage Tank, subject to the same standards. Ensure that the sampling of all diesel oil storage tanks specifically monitors the following parameters for trending purposes: water content, sediment content, biological activity, and total particulate concentration. c) Include the following monitoring and trending features for visual and volumetric inspection methodology: o Project identified degradation until the next scheduled inspection, where practical. o Evaluate results against acceptance criteria to confirm that the timing of subsequent inspections will maintain the components' intended functions throughout the SPEO based on the projected rate of degradation. d) Include the following acceptance criteria for visual and volumetric inspection procedures: o Corrective actions are taken if microbiological activity is detected. o Report and evaluate any degradation of tank internal surfaces using the CAP. o Evaluate thickness measurements of the diesel oil storage tank bottoms against the design thickness and corrosion allowance. e) Include the addition of biocide to the fuel oil when the presence of biological activity is confirmed, or if there is evidence of MIC.	refueling outage prior to the SPEO Start the 10-year interval inspections no earlier than 10 years prior to the SPEO.	

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
22	Reactor Vessel Material Surveillance (A.2.2.19)	XI.M31	The Reactor Vessel Material Surveillance AMP is an existing program that will be enhanced to: a) Implement BWRVIP-321-A and subsequent NRC approved revisions upon obtaining NRC approval for MNGP to use BWRVIP-321-A to maintain compliance with 10 CFR Part 50, Appendix H.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354
23	One Time inspection (A.2.2.20)	XI.M32	The One-Time Inspection AMP will be implemented as a new program. The program will verify: • The system-wide effectiveness of AMPs that are designed to prevent or minimize aging to the extent that it will not cause the loss of intended function during the SPEO, • The insignificance of an aging effect, and • That long-term loss of material will not cause a loss of intended function for steel components exposed to environments that do not include corrosion inhibitors as a preventive action.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO Implement the AMP and start the one-time inspections no earlier than 10 years prior to the SPEO.	SLRA ML23009A354
24	Selective Leaching (A.2.2.21)	XI.M33	The Selective Leaching AMP is an existing program that will be enhanced to: a) Include inspection of susceptible components exposed to treated water, Closed-Cycle Cooling Water, and waste water, or buried in soil. b) Perform one-time inspections of a representative sample of each population (material/environment combination) for components exposed to closed-cycle cooling water or treated water. In the	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO Perform the one-time inspections	SLRA ML23009A354

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			10-year period prior to the SPEO, a sample of 3 percent of the population or a maximum of 10 components per population will be visually and mechanically (for gray cast iron and ductile iron components) inspected. Inspections, where possible, will focus on the bounding or lead components most susceptible to aging based on time-in-service and severity of operating conditions for each population. c) Perform periodic inspections for components exposed to raw water, waste water, or soil. For raw water and waste water environments, the populations may be combined as long as an evaluation is conducted to determine the more severe environment and the inspections and examinations are conducted on components in the most severe environment, with one inspection being conducted in the less severe environment. Periodic inspections will be conducted in the 10-year period prior to the SPEO and in each 10-year period during the SPEO. In these periodic inspections, a sample of 3 percent of the population or a maximum of 10 components per population will be visually and mechanically (for gray cast iron and ductile iron components) inspected. When inspections are performed on piping, a 1-foot axial length section will be considered as one inspection. In addition, for sample populations with greater than 35 susceptible components, two destructive examinations will be performed in each material and environment population in each 10-year period. When there are less than 35 susceptible components in a sample population, one destructive examination will be performed for that population. Otherwise, a technical justification of the methodology and sample size used for selecting components for inspection will be included as part of the program's documentation. The number of visual and mechanical inspections may be reduced by two for each component that is destructively examined beyond the minimum number of destructive examinations recommended in each 10-	no earlier than 10 years prior to the SPEO and no later than 6 months prior to the SPEO.	

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			year interval. Inspections, where possible, will focus on the bounding or lead components most susceptible to aging based on time-in-service and severity of operating conditions for each population. Opportunistic inspections may be credited as periodic inspections as long as the inspection locations selection criteria are met. d) Include guidance on inspection parameters such as lighting, distance, offset, surface coverage, presence of protective coatings, and cleaning processes. e) Include the following guidance regarding Monitoring and Trending: o Where practical, identified degradation is projected until the next scheduled inspection. o Results are evaluated against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the components' intended functions throughout the SPEO based on the projected rate and extent of degradation. f) Include the following acceptance criteria: o For copper-based alloys, no noticeable change in color from the normal yellow color to the reddish copper color or green copper oxide; o For gray cast iron and ductile iron, the absence of a surface layer that can be easily removed by chipping or scraping or identified in the destructive examinations;		

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			o The presence of no more than a superficial layer of dealloying, as determined by removal of the dealloyed material by mechanical removal while not taking credit for the material properties of the dealloyed portion of the component as part of the determination; and o The components meet system design requirements such as minimum wall thickness, when extended to the end of the SPEO. g) Include the following guidance regarding Corrective Actions: o When the acceptance criteria are not met such that it is determined that the affected component should be replaced prior to the end of the SPEO, additional inspections are performed if the cause of the aging effect for each applicable material and environment is not corrected by repair or replacement for all components constructed of the same material and exposed to the same environment. The number of additional inspections is equal to the number of failed inspections for each material and environment population with a minimum of 5 additional visual and mechanical inspections when visual and mechanical inspections(s) did not meet acceptance criteria, or 20 percent of each applicable material and environment combination is inspected, whichever is less, and a minimum of one additional destructive examination when destruction examination(s) did not meet acceptance criteria. If subsequent inspections do not meet acceptance criteria, an extent of condition and extent of cause analysis is conducted to determine the further extent of inspections. The timing of the additional inspections is based on the severity of the degradation		

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			identified and is commensurate with the potential for loss of intended function. However, in all cases, the additional inspections are completed within the interval in which the original inspection was conducted or, if identified in the latter half of the current inspection interval, within the next refueling outage interval. These additional inspections conducted in the next inspection interval cannot also be credited towards the number of inspections in the latter interval. Additional samples are inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. h) Require the removal of interferences to access or remove components most susceptible to selective leaching having difficult-to-access surfaces (e.g., heat exchanger shell interiors, exterior of heat exchanger tubes) if unacceptable inspection findings occur within the same material and environment population.		
25	ASME Code Class 1 Small-Bore Piping (A.2.2.22)	XI.M35	The ASME Code Class 1 Small-Bore Piping AMP will be implemented as a new program. The program will manage the effects of SCC and cracking due to thermal or vibratory fatigue loading for certain ASME Code Class 1 small-bore piping through volumetric or destructive testing.	Complete all inspections no later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO Implement AMP and complete inspections within 6 years	SLRA ML23009A354

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				prior to the SPEO.	
26	External Surfaces Monitoring of Mechanical Components (A.2.2.23)	XI.M36	The External Surfaces Monitoring of Mechanical Components AMP is an existing program that will be enhanced to: a) Revise procedures to inspect heat exchanger surfaces exposed to air for evidence of reduction of heat transfer due to fouling. b) Revise procedures to ensure areas that are frequently wetted are inspected. c) Specify in procedures that situations where the similarity of the internal and external environments are such that the external surface condition is representative of the internal surface condition, external inspections of components may be credited for managing: • loss of material and cracking of internal surfaces for metallic components, • loss of material and cracking of internal surfaces for polymeric components, and • hardening or loss of strength of internal surfaces for elastomeric components. • When credited, the program provides the basis to establish that the external and internal surface condition and environment are sufficiently similar. d) Revise procedures to add the following inspection parameters for metallic components: • Corrosion stains on thermal insulation	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO Perform commitment p inspections no later than May 2033.	SLRA ML23009A354 Supplement 8 ML24012A051

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			• Blistering of protective coatings • Accumulation of debris on heat exchanger tube surfaces and air-side heat exchanger surfaces. e) Revise procedures to include inspection for elastomeric and polymeric components and its methodology. The sample size for manipulation is at least 10 percent of available surface area. The inspection parameters for elastomers and polymers shall include the following: • Surface cracking, crazing, scuffing, and dimensional change (e.g., “ballooning” and “necking”) • Loss of thickness • Exposure of internal reinforcement for reinforced elastomers • Hardening as evidenced by a loss of suppleness during manipulation where the component and material are appropriate to manipulation f) Revise procedures to specify that inspections are to be performed by personnel qualified in accordance with site procedures and programs to perform the specified task, and when required by the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code). g) Revise procedures to ensure non-ASME Code inspections and tests include inspection parameters for items such as lighting, distance offset, surface coverage, and presence of protective coatings. Surfaces that are not readily visible during plant		

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			operations and refueling outages should be inspected when they are made accessible and at such intervals that would ensure the components' intended functions are maintained. h) Revise procedures to specify that, when inspecting to manage cracking of a component's material, either surface examinations conducted in accordance with plant-specific procedures or ASME Code Section XI VT-1 inspections (including those inspections conducted on non-ASME Code components) are conducted on each component inspected. An inspection requires that at least 20 percent of the surface area of the component is inspected, unless the component is measured in linear feet, such as piping. Any combination of 1-foot length sections and components can be used to meet the recommended extent of 20 percent of the population of materials and environment combinations, with a maximum of 25 inspections required in each population. An inspection of a component in a more severe environment may be credited as an inspection for the specified environment and for the same material and aging effects in a less severe environment. i) Revise procedures to specify alternative methods for detecting moisture inside piping insulation to be used for inspecting piping jacketing that is not installed in accordance with plant-specific procedures. j) Revise procedures to include the following information: • Component surfaces that are insulated and exposed to condensation, and insulated outdoor components, are periodically inspected every 10 years during the SPEO. • For all outdoor components and any indoor components exposed to condensation (because the in-scope		

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			component is operated below the dew point), inspections are conducted of each material type (e.g., steel, stainless steel, copper alloy, aluminum) and environment (e.g., air outdoor, air accompanied by leakage) where condensation or moisture on the surfaces of the component could occur routinely or seasonally. In some instances, significant moisture can accumulate under insulation during high humidity seasons, even in conditioned air. A minimum of 20 percent of the in-scope piping length, or 20 percent of the surface area for components whose configuration does not conform to a 1-foot axial length determination (e.g., valve, accumulator, tank) is inspected after the insulation is removed. Alternatively, any combination of a minimum of 25 1-foot axial length sections and components for each material type is inspected. Inspection locations should focus on the bounding or lead components most susceptible to aging because of time in service, severity of operating conditions (e.g., amount of time that condensate would be present on the external surfaces of the component), and lowest design margin. k) Revise procedures to specify that: • Visual inspection will identify direct indicators of loss of material due to wear to include dimension change, scuffing, and, for flexible polymeric materials with internal reinforcement, the exposure of reinforcing fibers, mesh, or underlying metal. • Visual inspection of elastomers and flexible polymers will identify indirect indicators of elastomer and flexible polymer hardening or loss of strength, including the		

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			presence of surface cracking, crazing, discoloration, and, for elastomers with internal reinforcement, the exposure of reinforcing fibers, mesh, or underlying metal. • Visual inspections will cover 100 percent of accessible component surfaces. • Manual or physical manipulation can be used to augment visual inspection to confirm the absence of hardening or loss of strength for elastomers and flexible polymeric materials where appropriate, and the sample size for manipulation is at least 10 percent of available surface area. l) Revise procedures to formalize sampling-based inspections. The results of sampling-based inspections will be evaluated against acceptance criteria to confirm that the sampling bases will maintain intended functions of the components throughout the SPEO based on the projected rate and extent of degradation. m) Revise procedures to add an evaluation to project the degree of observed degradation to the end of the SPEO or the next scheduled inspection, whichever is shorter. n) Revise procedures to specify, where practical, acceptance criteria are quantitative. o) Revise procedures to specify that if any projected inspection results will not meet acceptance criteria prior to the next scheduled inspection, inspection frequencies are adjusted as determined by the CAP.		

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			p) Revise procedures to require a sample of the below-grade pipes within the scope of the External Surfaces Monitoring of Mechanical Components AMP that are located in the seismic gap space between the reactor and turbine buildings to be inspected 10 years following the initial inspection that was performed prior to the SPEO. The sample will include the piping located in at least two of the six below-grade piping penetrations between the reactor and turbine buildings.		
27	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (A.2.2.24)	XI.M38	The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP will be implemented as a new program. The program will manage loss of material, cracking, blistering, wall thinning, reduction of heat transfer, hardening or loss of strength of elastomeric and polymeric components, and flow blockage via inspections performed during periodic system and component surveillances.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO Implement the AMP and perform pre-PEO baseline inspections no earlier than 10 years prior to the SPEO	SLRA ML23009A354
28	Lubricating Oil Analysis (A.2.2.25)	XI.M39	The Lubricating Oil Analysis AMP is an existing program that will be enhanced to: a) Clarify that phase-separated water in any amount is not acceptable. If phase-separated water is identified in the sample, then corrective actions are to be initiated to identify the source and correct the issue.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO	SLRA ML23009A354
29	Monitoring of Neutron-	XI.M40	The Monitoring of Neutron-Absorbing Materials Other Than Boraflex AMP is an existing program that is credited.	No later than 6 months prior to	SLRA ML23009A354

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	Absorbing Materials Other Than Boraflex (A.2.2.26)			the SPEO, or no later than the last refueling outage prior to the SPEO	
30	Buried and Underground Piping and Tanks (A.2.2.27)	XI.M41	The Buried and Underground Piping and Tanks AMP is an existing program that will be enhanced to: a) Ensure that new or replaced backfill shall meet the requirements of NACE SP0169-2007 Section 5.2.3 or NACE RP0285-2002 Section 3.6. b) Measure wall thickness with volumetric examination or pit depth gages or calipers using techniques that have been determined to be effective for the material, environment, and conditions (e.g., remote methods) during the examination and are capable of quantifying general wall thickness and the depth of pits. c) Perform visual inspection of the external surfaces of controlled low strength material backfill, where such backfill is used, to detect potential cracks that could admit groundwater to the surface of the component. d) Inspect for cracking due to stress corrosion cracking in stainless steel and steel (in a carbonate-bicarbonate environment) utilizing a method that has been determined to be capable of detecting cracking. Coatings that: (a) are intact, well-adhered, and otherwise sound for the remaining inspection interval; and (b) exhibit small blisters that are few in number and completely surrounded by sound coating bonded to the substrate do not have to be removed. Inspections for cracking are conducted to	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO Implement the AMP and start 10-year interval inspections no earlier than 10 years prior to the SPEO. Commitment 30q will be implemented 5 years prior to the SPEO in order to credit the system for pre-SPEO inspections. Commitment 30u will be implemented no earlier than 6	SLRA ML23009A354 Supplement 2 ML23177A218 Supplement 4 ML23199A154 RAI Response Set 2 and Supplement 6 ML23248A474 RAI Response Set 3 ML23265A158 Supplement 8 ML24012A051

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			assess the impact of cracks on the pressure boundary function of the component. e) Perform inspections of buried and underground piping and tanks in accordance with NUREG-2191 Table XI.M41-2 Preventive Action Category C for buried steel and stainless steel components, unless a reevaluation of cathodic protection system performance, future OE, and soil conditions determines that another Preventive Action Category is more applicable. In the 10-year period prior to and during SPEO for each 10-year interval, perform buried and underground piping and tanks inspections in accordance with the Preventive Action Category C as outlined in NUREG-2191 Table XI.M41-2. When the inspections for a given material type is based on percentage of length and results in an inspection quantity of less than 10 feet, then 10 feet of piping is inspected. If the entire run of piping of that material type is less than 10 feet in total length, then the entire run of piping is inspected. f) Perform surface and/or volumetric nondestructive testing if evidence of wall loss beyond minor surface scale is observed. g) Include the guidance for piping inspection location selection as follows: (a) a risk ranking system software incorporates inputs that include coating type, coating condition, cathodic protection efficacy, cathodic protection overprotection history, backfill characteristics, soil resistivity, pipe contents, and pipe function; (b) opportunistic examinations of nonleaking pipes may be credited toward examinations if the location selection criteria are met; and (c) the use of guided wave ultrasonic examinations may not be substituted for the required inspections.	years prior to the SPEO and no later than 6 months prior to the SPEO.	

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			h) Degradation (e.g., coating condition, wall thinning) is projected, where practical, until the next scheduled inspection. Results are evaluated against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the components' intended functions throughout the SPEO based on the projected rate and extent of degradation. i) Utilize an acceptance criterion of no evidence of coating degradation. Otherwise have the type and extent of coating degradation evaluated as insignificant by an individual: (a) possessing a NACE Coating Inspector Program Level 2 or 3 inspector qualification; (b) who has completed the Electric Power Research Institute Comprehensive Coatings Course and completed the EPRI Buried Pipe Condition Assessment and Repair Training Computer Based Training Course; or (c) a coatings specialist qualified in accordance with an ASTM standard endorsed in RG 1.54, Revision 2, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants." j) Clarify that indications of cracking in metallic pipe are managed in accordance with the CAP. k) Clarify that backfill is acceptable if the inspections do not reveal evidence that the backfill caused damage to the component's coatings or the surface of the component (if not coated). l) Clarify that for pressure tests, the test acceptance criteria are that there are no visible indications of leakage, and no drop in pressure within the isolated portion of the piping that is not accounted for by a temperature change in the test media or by quantified leakage across test boundary valves.		

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			m) Clarify that cracks in cementitious backfill that could admit groundwater to the surface of the component are not acceptable. n) Require an extent of condition evaluation to determine the extent of degraded backfill in the vicinity where damage to the coating has been evaluated as significant and the damage was caused by nonconforming backfill. o) Evaluate the coated and uncoated metallic piping and tanks that show evidence of corrosion to ensure that the minimum wall thickness is maintained throughout the SPEO. This may include different values for large area minimum wall thickness and local area wall thickness. If the wall thickness extrapolated to the end of the SPEO meets minimum wall thickness requirements, the NUREG-2191 Section XI.M41 recommendations for expansion of sample size do not apply. p) Repair the degraded condition or replace the affected component when the coatings, backfill, or the condition of exposed piping does not meet the acceptance criteria. Expand the sample size when the depth or extent of degradation of the base metal could have resulted in a loss of pressure boundary function when the loss of material is extrapolated to the end of the SPEO in the following manner: The number of inspections within the affected piping categories are doubled or increased by 5, whichever is smaller. If the acceptance criteria are not met in any of the expanded samples, an analysis is conducted to determine the extent of condition and extent of cause. The number of follow-on inspections is determined based on the extent of condition and extent of cause.		

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			The timing of the additional examinations is based on the severity of the degradation identified and is commensurate with the consequences of a leak or loss of function. However, in all cases, the expanded sample inspection is completed within the 10-year interval in which the original inspection was conducted or, if identified in the latter half of the current 10-year interval, within 4 years after the end of the 10-year interval. These additional inspections conducted during the 4 years following the end of an inspection interval cannot also be credited towards the number of required inspections for the following 10-year interval. The number of inspections may be limited by the extent of piping or tanks subject to the observed degradation mechanism. q) Refurbish the Cathodic Protection System to meet the recommendations of GALL-SLR Section XI.M41, including the -850 mV polarized potential criteria of NUREG-2191, or acceptance criteria alternatives, and annual system monitoring. The cathodic protection system for buried piping shall also include a limiting critical potential of -1,200 mV to prevent overprotection. r) The acceptance criterion for the MNGP Cathodic Protection System is -850 mV relative to a CSE (instant off). For locations where the refurbished Cathodic Protection System cannot meet the -850 mV criterion, the acceptance criteria alternatives to the -850 mV criteria will be implemented as outlined in NUREG-2191, Section XI.M41, Subsection 6.m. s) If alternatives to visual inspections are performed, they will be performed in accordance with NUREG-2191, Section XI.M41, Subsection 4.e.		

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			t) Ensure that new and replacement underground components shall meet the requirements of Table 1 of NACE SP0169-2007 or Section 3.4 of NACE RP0285-2002 for coatings u) Underground stainless steel pipes located in the seismic gap space between the reactor and turbine buildings that are in the scope of this program, will have inspections performed on a sample of the pipes in the most susceptible penetration to corrosion at least once during every 6-year or 3 refueling outage period.		
31	Internal Coatings/Linings For In-scope Piping, Piping Components, Heat Exchangers, and Tanks (A.2.2.28)	XI.M42	The Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP is a new program. The program will manage the degradation of internal coatings/linings exposed to raw water, treated water, or waste water that can lead to loss of material of base metals or downstream effects such as reduction in flow, pressure, or heat transfer when coatings/linings become debris.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO Implement the AMP and perform pre-PEO baseline inspections no earlier than 10 years prior to the SPEO.	SLRA ML23009A354
32	ASME Section XI, Subsection IWE (A.2.2.29)	XI.S1	The ASME Section XI, Subsection IWE AMP is an existing program that will be enhanced to: a) Revise procedures to specify the preventive actions for storage, lubricants, and stress corrosion cracking potential discussed in	No later than 6 months prior to the SPEO, or no later than the last refueling outage	SLRA ML23009A354 Supplement 2 ML23177A218

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			Section 2 of Research Council for Structural Connections publication “Specification for Structural Joints Using High-Strength Bolts,” for structural bolting consisting of ASTM A325, ASTM A490, and equivalent bolts. b) Revise procedures to specify that accessible noncoated surfaces (including those comprising the torus vent system) are monitored for arc strikes. c) Implement periodic supplemental surface or enhanced visual examinations, in addition to visual examinations, at intervals no greater than 10 years to detect cracking on accessible portions of high-temperature (temperatures above 140°F) drywell piping penetrations that are not pressurized during local leak rate testing and have no CLB fatigue analysis. Cracking is corrected by repair or replacement or accepted by engineering evaluation. d) Conduct supplemental one-time surface or enhanced visual examinations, performed by qualified personnel using methods capable of detecting cracking, comprising a representative sample 5 of the stainless steel penetrations or dissimilar metal welds associated with high-temperature (temperatures above 140°F) stainless steel piping systems in frequent use. These inspections are intended to confirm the absence of SCC aging effects. e) Revise procedures to specify a one-time volumetric examination of metal shell surfaces that are inaccessible from one side if triggered by plant-specific OE identified after the date of issuance of the initial renewed license. If triggered, this inspection will be performed by sampling randomly selected, as well as focused, metal shell locations susceptible to corrosion that are inaccessible from one side. The trigger for this one-time examination is plant-specific occurrence or recurrence of metal	prior to the SPEO. Start the supplemental inspections in commitments 32-c), 32-d) no earlier than 5 years prior to the SPEO. Complete one-time inspection in commitment 32-e (of metal shell locations if degradation from the inaccessible side is identified) on a schedule established by the MNGP corrective action program. Inspection will be scheduled to provide reasonable assurance that the metal shell intended function is maintained consistent with	

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			shell corrosion (base metal material loss exceeding 10% of nominal plate thickness) that is determined to originate from the inaccessible side. Guidance provided in EPRI TR–107514 will be considered when establishing a sampling plan. This sampling is conducted to demonstrate, with 95% confidence, that 95% of the accessible portion of the metal shell is not experiencing greater than 10% wall loss. f) If SCC is identified as a result of the supplemental one-time inspections, additional inspections will be conducted in accordance with the site's corrective action process. This will include incrementing sample size by one additional penetration at a time from the uninspected population of stainless steel penetrations or dissimilar metal welds associated with high-temperature (greater than 140°F) stainless steel piping systems in frequent use until cracking is no longer detected. Periodic inspection of subject penetrations with dissimilar metal welds for cracking will be added to the ASME Section XI, Subsection IWE AMP if necessary, depending on the inspection results.	the CLB through the SPEO.	
33	ASME Section XI, Subsection IWF (A.2.2.30)	XI.S3	The ASME Section XI, Subsection IWF AMP is an existing program that will be enhanced to: a) Revise procedures to evaluate the acceptability of inaccessible areas (e.g., portions of ASME Class 1, 2, 3, and MC supports encased in concrete, buried underground, or encapsulated by guard pipe) when conditions are identified in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. b) Revise procedures to clarify that in addition to molybdenum disulfide (MoS_2), other lubricants containing sulfur will be prohibited from use on structural bolting.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO. Start the one-time inspection in commitment 33-f) no earlier than 5 years prior to the SPEO.	SLRA ML23009A354 Supplement 2 ML23177A218 Supplement 5 ML23240A695

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			c) Revise procedures to specify the preventive actions for storage, lubricants, and stress corrosion cracking potential discussed in Section 2 of Research Council for Structural Connections publication "Specification for Structural Joints Using High-Strength Bolts," for structural bolting consisting of ASTM A325, ASTM A490, and equivalent bolts. d) Revise procedures to specify that elastomeric or polymeric vibration isolation elements are monitored for cracking, loss of material, and hardening. e) Revise procedures to specify that accessible sliding surfaces are monitored for excessive loss of material due to wear and accumulation of debris or dirt. f) Perform and document a one-time inspection of an additional 5% of the sample populations for Class 1, 2, 3, and MC supports. The additional supports will be selected from the remaining population of IWF piping supports and will include components that are most susceptible to age-related degradation. g) Revise procedures to include tactile inspection (feeling, prodding) of elastomeric or polymeric vibration isolation elements to detect hardening if the vibration isolation function is suspect. h) Revise procedures to specify that, for component supports with high-strength bolting greater than one-in. nominal diameter, volumetric examination comparable to that of ASME Code, Section XI, Table IWB-2500-1, Examination Category B-G-1 will be performed to detect cracking in addition to the VT-3		

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			examination. A representative sample of bolts will be inspected during the inspection interval prior to the start of the SPEO and in each 10-year period during the SPEO. Identify the population of ASME Class 1, 2, 3, and MC high-strength structural bolting greater than one-in. nominal diameter within the boundaries of IWF-1300 and establish a sample to be 20% of the population (for a material/environment combination) up to a maximum of 25 bolts. i) Revise procedures to increase or modify the component support inspection sample when a component support is repaired to as-new condition by including another support that is representative of the remaining population of supports that were not repaired. j) Revise procedures to specify that the following conditions are also unacceptable: • Loss of material due to corrosion or wear; • Debris, dirt, or excessive wear that could prevent or restrict sliding of the sliding surfaces as intended in the design basis of the support; • Cracked or sheared bolts, including high-strength bolts, and anchors; • Loss of material, cracking, and hardening of elastomeric or polymeric vibration isolation elements that could reduce the vibration isolation function; and • Cracks.		

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			k) Revise procedures to include monitoring for irradiation embrittlement during existing IWF inspections of the reactor vessel support steel.		
34	10 CFR Part 50, Appendix J (A.2.2.31)	XI.S4	The 10 CFR Part 50, Appendix J AMP is an existing program that is credited.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.	SLRA ML23009A354
35	Masonry Walls (A.2.2.32)	XI.S5	The Masonry Walls Amp is an existing program that will be enhanced to: a) Update the implementing procedure to include the inspection of masonry walls in the Radwaste Building. b) Update the implementing procedure to monitor and inspect for gaps between the supports and masonry walls that could potentially impact the intended function or potentially invalidate its evaluation basis. c) Update the implementing procedure for more frequent inspections in areas where significant loss of material, cracking, or other signs of degradation are projected or observed to provide reasonable assurance than there is no loss of intended function between inspections. d) Update the implementing procedure for trending of crack widths and lengths and gaps between supports and masonry walls that approach or exceed acceptance criteria. e) Update the implementing procedure will include projected degradation until the next scheduled inspection where it is practical.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.	SLRA ML23009A354 Supplement 2 ML23177A218

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			f) Update the implementing procedure to include acceptance criteria to ensure observed aging effects do not invalidate the evaluation basis of the wall or impact its intended function. g) Update the implementing procedure to state that if any projected inspection results will not meet acceptance criteria prior to the next scheduled inspection, inspection frequencies are adjusted as determined by the MNGP CAP. h) Update the implementing procedure to include a corrective action option to develop a new analysis or evaluation basis that accounts for the degraded condition of the wall (i.e., acceptance by further evaluation). i) Update the implementing procedure to include the comparison of inspection results with previous inspections to identify changes or trends in the condition of masonry walls.		
36	Structures Monitoring (A.2.2.33)	XI.S6	The Structures Monitoring AMP is an existing program that will be enhanced to: a) Revise the implementing procedure to include preventive actions to ensure bolting integrity for replacement and maintenance activities by specifying proper selection of bolting material and lubricants, and appropriate installation torque or tension to prevent or minimize loss of bolting preload and cracking of high-strength bolting. For structural bolting consisting of ASTM A325, ASTM A490, ASTM F1852 and/or ASTM F2280 bolts, the preventive actions for storage, lubricant selection, and bolting and coating material selection discussed in Section 2 of the Research Council for Structural Connections publication, “Specification for Structural Joints Using High-Strength Bolts,” will be used.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.	SLRA ML23009A354 Supplement 2 ML23177A218 Supplement 5 ML23240A695 Supplement 8 ML24012A051

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			b) Revise the implementing procedure to include monitoring and trending of leakage volumes and chemistry for signs of concrete or steel reinforcement degradation if active through-wall leakage or groundwater infiltration is identified. c) Revise the implementing procedure to include provisions for more frequent inspections in areas where significant signs of degradation are projected or observed to provide reasonable assurance that there is no loss of intended function between inspections. d) Revise the implementing procedure to include evidence of water in-leakage as a finding requiring further evaluation. This may include engineering evaluation, more frequent inspections, or destructive testing of affected concrete to validate existing concrete properties, including concrete pH levels. When leakage volumes allow, assessment may include analysis of the leakage pH, along with mineral, chloride, sulfate, and iron content in the water. e) Revise the implementing procedure to include tactile inspection in addition to visual inspection of elastomeric elements to detect hardening. f) Revise the implementing procedure to include qualification requirements for both inspection and evaluation personnel that are in accordance with ACI 349.3R-02. g) Revise the implementing procedure to explicitly include inspection of the following components and commodities: • Expansion plugs • Fuel Storage Racks (New Fuel) • Manhole covers, supports • Supports		

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			• Biological Sheild Wall Structural Steel • Concrete Diesel Fuel Oil Storage Tank Deadmen • Vibration Isolation Elements • Electrical Enclosures • RPV to Drywell Refueling Seal • Exterior Surfaces of Roofing h) Revise the implementing procedure to include acceptance criteria for concrete surfaces based on the “second-tier” evaluation criteria provided in ACI 349.3R-02. i) Revise the implementing procedure to include that if any projected inspection results will not meet acceptance criteria prior to the next scheduled inspection, inspection frequencies are adjusted as determined by the CAP. j) Revise the implementing procedure to include acceptance criteria for inspections of the following components and commodities: • Expansion plugs • Fuel Storage Racks (New Fuel) • Manhole covers, supports • Supports • Biological Shield Wall Structural Steel • Concrete Diesel Fuel Oil Storage Tank Deadmen • Vibration Isolation Elements • Electrical Enclosures • RPV to Drywell Refueling Seal • Exterior Surfaces of Roofing k) Ensure that the implementing procedure states that visual inspections of inaccessible concrete for evidence of leaching of calcium hydroxide and carbonation are performed if the area		

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			becomes accessible or if inspections in an accessible area identifies a condition that would be a leading indicator for the inaccessible area. l) Include trending of quantitative measurements and qualitative information for findings exceeding the acceptance criteria for all applicable parameters monitored or trended. m) Revise the implementing procedure to include enhanced acceptance criteria for detection of alkali-silica reactions in concrete to include: • Alkali-silica gel exudations • Surface staining • Expansion causing structural deformation, relative movement or displacement, or misalignment/distortion of attached components n) Revise the implementing procedure to include monitoring for irradiation embrittlement during existing structures monitoring inspections of the Biological Shield wall Structural Steel.		
37	Inspection of Water-Control Structures Associated with Nuclear Power Plants (A.2.2.34)	XI.S7	The Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP is an existing program that will be enhanced to: a) Revise the implementing procedure to include preventive actions to ensure bolting integrity for replacement and maintenance activities by specifying proper selection of bolting material and lubricants, and appropriate installation torque or tension to prevent or minimize loss of bolting preload and cracking of high-strength bolting. For structural bolting consisting of ASTM A325, ASTM A490, ASTM F1852 and/or ASTM F2280 bolts, the preventive actions for storage, lubricant selection, and bolting and coating material selection discussed in Section 2 of the Research Council for Structural Connections publication,	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.	SLRA ML23009A354 Supplement 2 ML23177A218

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			"Specification for Structural Joints Using High-Strength Bolts," will be used. b) Revise the implementing procedure to include evidence of water in-leakage as a finding requiring further evaluation. This may include engineering evaluation, more frequent inspections, or destructive testing of affected concrete to validate existing concrete properties, including concrete pH levels. When leakage volumes allow, assessment may include analysis of the leakage pH, along with mineral, chloride, sulfate, and iron content in the water. c) Ensure that the implementing procedure states that visual inspections of inaccessible concrete for evidence of leaching of calcium hydroxide and carbonation are performed if the area becomes accessible or if inspections in an accessible area identifies a condition that would be a leading indicator for the inaccessible area. d) Include qualification requirements for both inspection and evaluation personnel that is in accordance with ACI 349.3R. e) Include trending of quantitative measurements and qualitative information for findings exceeding the acceptance criteria for all applicable parameters monitored or trended. f) Revise the implementing procedure to include that if any projected inspection results will not meet acceptance criteria prior to the next scheduled inspection, inspection frequencies are adjusted as determined by the CAP. g) Revise the implementing procedure to include acceptance criteria for concrete surfaces based on the "second-tier" evaluation criteria provided in ACI 349.3R-02.		

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			h) Revise the implementing procedure to include monitoring and trending of leakage volumes and chemistry for signs of concrete or steel reinforcement degradation if active through-wall leakage or groundwater infiltration is identified. i) Revise the implementing procedure to include provisions for more frequent inspections in areas where significant signs of degradation are projected or observed to provide reasonable assurance that there is no loss of intended function between inspections.		
38	Protective Coating Monitoring and Maintenance (A.2.2.35)	XI.S8	The Protective Coating Monitoring and Maintenance AMP is an existing program that will be enhanced to: a) Specify that thorough visual inspections shall be carried out on previously designated areas and on areas noted as deficient during the walk-through. When follow-up inspections beyond visual inspections are specified by the Nuclear Coatings Specialist, they will be performed by individuals trained and certified in the applicable reference standards of ASTM Guide D5498 for the inspection designated by the Nuclear Coatings Specialist. b) Specify that any required coatings repairs be prioritized between the current or future outages. c) Specify that if coating areas cannot be inspected, it will be noted in the inspection documentation with a reason why the inspection could not be conducted. d) Reference Position C4 of RG 1.54 Revision 3 for Maintenance of Service Level I Coatings.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.	SLRA ML23009A354

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
39	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (A.2.2.36)	XI.E1	The Electrical Insulation For Electrical Cables and Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements AMP is an existing program that will be enhanced to: a) Identify the most limiting temperature, radiation, and moisture environments and their basis. Cable and connection inspections are performed for the most limiting insulation plant environments. b) Review plant-specific OE: • For previously identified and mitigated ALEs for cumulative aging effects that could potentially impact service life. • To identify in-scope cable and connection insulation previously subjected to ALE during the original period of extended operation. Cable and connection insulation is evaluated to confirm that the dispositioned corrective actions continue to support in-scope cable and connection intended functions during the SPEO. c) Perform an engineering evaluation when unacceptable visual indications of cable jacket and connection insulation surface anomalies that could potentially lead to a loss of intended function are identified to determine if additional actions are required. Ensure insulation material test results are within the acceptance criteria. d) Test a representative sample of 20 percent of each cable and connection type with a maximum sample size of 25 when a large number of cables and connections are identified as potentially degraded and document the technical basis for the sample selection.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.	SLRA ML23009A354

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
40	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements used in Instrumentation Circuits (A.2.2.37)	XI.E2	The Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements used in Instrumentation Circuits AMP is an existing program that will be enhanced to: a) Revise the implementing procedures to include documented periodic review of calibration test results for neutron monitors and radiation monitors within the scope of this program at least once every 10 years.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO Reviews and tests to start prior to SPEO.	SLRA ML23009A354
41	Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (A.2.2.38)	XI.E3A	The Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements AMP is an existing program that will be enhanced to: a) Include non-EQ, in-scope, inaccessible medium-voltage power cables that are energized less than 25% of the time and potentially exposed to significant moisture to the scope of this program. b) Inspect in-scope manholes at least once annually and after event-driven occurrences, unless level monitoring system is installed, then manhole inspections will be performed at least once every 5 years and only after event-driven occurrences when indicated by level monitoring system. c) Ensure manhole inspection include direct indication that the cables are not wetted or submerged, and that cable/splices and cable support structures are intact. d) Test medium-voltage power cables within the scope of this program at least once every 6 years.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.	SLRA ML23009A354 Supplement 4 ML23199A154

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
42	Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (A.2.2.39)	XI.E3B	The Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP will be implemented as a new program. The program will manage the effects of reduced insulation resistance of non-EQ, in-scope, inaccessible instrument and control cables, that are potentially exposed to significant moisture.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.	SLRA ML23009A354 Supplement 4 ML23199A154
43	Electrical Insulation for Inaccessible Low Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (A.2.2.40)	XI.E3C	The Electrical Insulation for Inaccessible Low-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP will be implemented as a new program. The program will manage the effects of reduced insulation resistance of non-EQ, in-scope, inaccessible low voltage cables, that are potentially exposed to significant moisture.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.	SLRA ML23009A354 Supplement 4 ML23199A154
44	Metal Enclosed Bus (A.2.2.41)	XI.E4	The Metal-Enclosed Bus AMP is an existing program that will be enhanced to: a) Inspect accessible elastomer and bolted connections that are not covered with heat shrink tape, sleeving, insulating boots, etc. for degradation. b) Perform an engineering evaluation of MEB segments that are not accessible for inspection. The evaluation can be based on results of accessible MEB inspections, tests, or other analysis.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO.	SLRA ML23009A354

Item No.	Aging Management Program or Activity (Section)	NUREG -2192 Section	Commitment	Implementation Schedule	Source
			c) Define a representative sample size as 20 percent of the accessible bolted connection population, with a maximum of 25.		
45	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (A.2.2.42)	XI.E6	The Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP is an existing program that will be enhanced to: a) Perform a one-time test of a representative sample of in-scope connections. Evaluation of the one-time test results will technically justify if periodic testing is warranted at least once every 10 years and will be documented. b) Define a representative sample size as 20 percent of the accessible connector type population, with a maximum sample of 25 per connection type. c) Define that the inspection frequency will be at least once every 5 years only when visual inspections are utilized as an alternative to measurement testing. d) Define the acceptance criteria for thermography, contact resistance measurements, and visual inspections.	No later than 6 months prior to the SPEO, or no later than the last refueling outage prior to the SPEO Implement the AMP and start the one-time and 10-year interval inspections no earlier than 10 years prior to the SPEO.	SLRA ML23009A354
46	Quality Assurance Program (A.1.3)	Appendix A	The Quality Assurance Program is an existing program that is credited.	Ongoing	SLRA ML23009A354
47	Operating Experience Program (A.1.4)	Appendix B	The Operating Experience Program is an existing program that is credited.	Ongoing	SLRA ML23009A354

APPENDIX B

CHRONOLOGY

B. Chronology

This appendix lists chronologically the routine licensing correspondence between the U.S. Nuclear Regulatory Commission (NRC) staff and Northern States Power Company, a Minnesota corporation (NSPM, the applicant). This appendix also lists other correspondence under Monticello Nuclear Generating Plant, Unit 1 (Monticello or MNGP) Docket No. 50-263 related to the staff's review of the Monticello subsequent license renewal application. These documents may be obtained online in the NRC's Agencywide Documents Access and Management System (ADAMS) Public Documents collection at https://www.nrc.gov/reading-rm/adams.html. To begin the search, select "Begin Web-based ADAMS Search." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov.

Table B-1. Chronology

Date	ADAMS Accession No.	Subject
12/1/2021	ML21336A524	NSPM, Notice of Intent to Pursue Subsequent License Renewal for Monticello Nuclear Generating Plant
03/31/2022	ML22084A385	NRC, Monticello - Meeting Summary for Environmental Pre-Submittal Meeting for Subsequent License Renewal Application on March 15, 2022
10/24/2022	ML22292A012	NRC, Monticello - Meeting Summary for Environmental Pre-Submittal Meeting for Subsequent License Renewal Application on September 13, 2022
01/09/2023	ML23009A354	NSPM, Monticello Nuclear Generating Plant, Unit 1- Application for Subsequent Renewed Facility Operating License
01/24/2023	ML23010A005	NRC, Monticello Nuclear Generating Plant, Unit 1 – Receipt and Availability of the Subsequent License Renewal Application
02/23/2023	ML23047A135	NRC, Monticello Nuclear Generating Plant, Unit 1 – Determination of Acceptability and Sufficiency for Docketing, Proposed Review Schedule, and Opportunity for a Hearing Regarding The Northern States Power Company–A Minnesota Corporation's, Application for Subsequent License Renewal
02/24/2023	ML23048A023	NRC, Monticello Nuclear Generating Plant, Unit 1 – Aging Management Audit Plan Regarding the Subsequent License Renewal Application Review
02/28/2023	ML23048A037	NRC, Monticello Nuclear Generating Plant, Unit 1 – Subsequent License Renewal Application Online Reference Portal
04/3/2023	ML23094A136	NSPM, Monticello Nuclear Generating Plant Subsequent License Renewal Application Supplement 1
06/21/2023	ML23172A105	NRC, Monticello Nuclear Generating Plant Subsequent License Renewal Application (SLRA) Safety Review Requests for Confirmation of Information – Set #1
06/26/2023	ML23177A218	NSPM, Monticello Nuclear Generating Plant Subsequent License Renewal Application Supplement 2
07/11/2023	ML23193B025	NSPM, Monticello Nuclear Generating Plant Subsequent License Renewal Application Supplement 3
07/18/2023	ML23199A154	NSPM, Monticello Nuclear Generating Plant Subsequent License Renewal Application Supplement 4 and Responses to Request for Confirmation of Information – Set #1
07/19/2023	ML23200A349	NRC, Monticello Nuclear Generating Plant Subsequent License Renewal Application (SLRA) Safety Review Requests for Additional Information – Set #1

Date	ADAMS Accession No.	Subject
08/07/2023	ML23219A103	NRC, Monticello Nuclear Generating Plant Subsequent License Renewal Application (SLRA) Safety Review Requests for Additional Information – Set #2
08/15/2023	ML23227A175	NSPM, Monticello Nuclear Generating Plant Subsequent License Renewal Application Response to Request for Additional Information - Set #1
08/25/2023	ML23237A480	NRC, Monticello Nuclear Generating Plant Subsequent License Renewal Application (SLRA) Safety Review Requests for Additional Information – Set #3
08/28/2023	ML23240A695	NSPM, Monticello Nuclear Generating Plant Subsequent License Renewal Application Supplement 5
08/31/2023	ML23214A232	NRC, Monticello Nuclear Generating Plant, Unit 1 – Report For the Aging Management Audit Regarding the Subsequent License Renewal Application Review
09/05/2023	ML23248A474	NSPM, Monticello Nuclear Generating Plant Subsequent License Renewal Application Responses to Request for Additional Information – Set #2 and Supplement 6
09/22/2023	ML23265A158	NSPM, Monticello Nuclear Generating Plant Subsequent License Renewal Application Responses to Request for Additional Information – Set #3
09/25/2023	ML23268A017	NRC, Monticello Nuclear Generating Plant Subsequent License Renewal Application (SLRA) Safety Review Requests for Confirmation of Information – Set #2
10/3/2023	ML23276B433	NSPM, Monticello Nuclear Generating Plant Subsequent License Renewal Application Responses to Request for Confirmation of Information – Set #2
10/13/2023	ML23289A001	NRC, Monticello Nuclear Generating Plant Subsequent License Renewal Application (SLRA) Safety Review Requests for Additional Information – Round #2 Set #1
10/18/2023	ML23289A144	NRC, Monticello Nuclear Generating Plant, Unit 1 – Limited Aging Management Audit Plan Regarding the Subsequent License Renewal Application Review
11/9/2023	ML23313A158	NSPM, Monticello Nuclear Generating Plant Subsequent License Renewal Application Responses to Request for Additional Information – Round #2 Set #1
11/9/2023	ML23313A159	NRC, U.S. Nuclear Regulatory Commission Summary of the October 10, 2023, Public Meeting to Discuss Monticello's Condensate Backwash Receiving Tank Fatigue Evaluation
11/30/2023	ML23334A147	NSPM, Monticello Nuclear Generating Plant Subsequent License Renewal Application Supplement 7
11/30/2023	ML23332A165	NRC, Monticello Nuclear Generating Plant, Unit 1 – Second Limited Aging Management Audit Plan Regarding the Subsequent License Renewal Application Review
1/11/2024	ML24012A051	NSPM, Monticello Nuclear Generating Plant Subsequent License Renewal Application Supplement 8
2/26/2024	ML24047A092	NRC, Monticello, Unit 1, Limited-Scope Audit Report for Buried Piping and External Surfaces AMPs
2/27/2024	ML24054A158	NRC, Monticello Nuclear Generating Plant, Unit 1 – Limited Aging Management Audit Report Regarding the Subsequent License Renewal Application Review
2/29/2024	ML24060A269	NSPM, Monticello Nuclear Generating Plant - Subsequent License Renewal Application Annual Update 1 and 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
Benson, Michael	Reviewer—Mechanical and Materials
Bhatt, Santosh	Reviewer—Nuclear
Bloom, Steve	Management Oversight
Boruk, Reena	Reviewer—Mechanical and Materials
Buford, Angela	Management Oversight
Cintron, Jorge	Review—Electrical
Curran, Gordon	Reviewer—Scoping and Screening Methodology
Dijamco, David	Reviewer—Mechanical and Materials
Fairbanks, Carolyn	Reviewer—Mechanical and Materials
Foli, Adakou	Review—Electrical
Fu, Bart	Reviewer—Mechanical and Materials
Gardner, William (Tony)	Reviewer—Mechanical and Materials
Gavula, James	Reviewer—Mechanical and Materials
Gibson, Lauren	Management Oversight
Hammock, Jessica	Project Manager
Haywood, Emma	Reviewer—Mechanical and Materials
Im, Austin	Project Manager
Iqbal, Naeem	Reviewer—Scoping and Screening Methodology
Istar, Ata	Reviewer—Structural
Jackson, Christopher	Reviewer—Nuclear
Jenkins, Joel	Reviewer—Mechanical and Materials
Johnson, Andrew	Reviewer—Mechanical and Materials
Johnson, Marieliz	Project Manager
Ju, Daniel	Reviewer—Scoping and Screening Methodology
Kalikian, Varoujan	Reviewer—Mechanical and Materials
Klein, Paul	Reviewer—Mechanical and Materials
Krepel, Scott	Management Oversight
Lee, Brian	Reviewer—Scoping and Screening Methodology
Lee, Samuel	Management Oversight
Makar, Gregory	Reviewer—Mechanical and Materials
McConnel, Matthew	Review—Electrical
Medoff, James	Reviewer—Mechanical and Materials
Min, Seung	Reviewer—Mechanical and Materials
Mitchell, Matthew (Matt)	Management Oversight
Nold, David	Reviewer—Scoping and Screening Methodology
Paige, Jason	Management Oversight
Parker, Cory	Reviewer—Mechanical and Materials
Prinaris, Andrew	Reviewer—Structural

Name	Area of Responsibility
Ramadan, Liliana	Review—Electrical
Rezai, Ali	Reviewer—Mechanical and Materials
Robinson, Jay	Management Oversight
Sahd, Philip	Management Oversight
Sida, Karen	Reviewer—Mechanical and Materials
Smith, Brian	Management Oversight
Terry, Leslie	Reviewer—Mechanical and Materials
Thomas, George	Reviewer—Structural
Thomas, Vaughn	Project Manager
Thomson, Bernie	Management Oversight
Tseng, Ian	Management Oversight
Tyree, Christopher	Project Manager
Wang, George	Reviewer—Structural
Wise, Brandon	Reviewer—Nuclear
Wise, John	Senior Technical Advisor
Wittick, Brian	Management Oversight
Xi, Zuhan	Reviewer—Structural
Yee, On	Reviewer—Mechanical and Materials
Yoder, Matthew	Reviewer—Chemical

APPENDIX D

REFERENCES

D. References

This appendix lists the references used throughout this safety evaluation for review of the Monticello Nuclear Generating Plant, Unit 1 subsequent license renewal application.

Table D-1. References

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U.S. Nuclear Regulatory Commission (NRC)
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RG 1.99, “Radiation Embrittlement of Reactor Vessel Material,” Revision 2, May 1988 (ML003740284)
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SLR-ISG-2021-01-PWRVI, “Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized-Water Reactors,” January 2021 (ML20217L203)
SLR-ISG-2021-03-STRUCTURES, “Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance,” February 2021 (ML20181A381)
Monticello, License Amendment 1, Amendment Revises License Conditions Relating to Completion of Facility Modifications for Fire Protection in Accordance with Requirements of 10 CFR 50.48 & 10 CFR 50, Appendix R, February 12, 1981 (ML020880540)

References
Monticello, License Amendment 1, Amendment Revises License Conditions Relating to Completion of Facility Modifications for Fire Protection in Accordance with Requirements of FR 50.48 & 10 CFR 50, Appendix R, October 7, 1985 (ML020910203)
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