Safety Evaluation Report

Related to the Subsequent License Renewal of Virgil C. Summer Nuclear Station, Unit 1

Docket No. 50-395

Dominion Energy South Carolina, Inc.

Revision 1

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Office of Nuclear Reactor Regulation

ABSTRACT

This safety evaluation (SE) documents the technical review by the U.S. Nuclear Regulatory Commission (NRC) staff of the Virgil C. Summer Nuclear Station, Unit 1 (V.C. Summer or VCSNS) subsequent license renewal application (SLRA).

V.C. Summer is located in Jenkinsville, South Carolina, which is approximately 26 miles northwest of Columbia, South Carolina. Unit 1 is a pressurized-water reactor designed by Westinghouse Electric Corporation. Dominion Energy South Carolina, Inc. (DESC or the applicant) operates V.C. Summer at a licensed power output of 2,900 megawatts thermal (MWt). The NRC issued the initial Unit 1 operating license for V.C. Summer on November 12, 1982, and renewed the operating license on April 23, 2004.

By letter dated August 17, 2023 (Agencywide Documents Access and Management System [ADAMS] Package Accession No. ML23233A175), as supplemented, DESC, on behalf of itself and Santee Cooper, submitted an application for a subsequent license renewal for V.C. Summer. DESC requested renewal for a period of 20 years beyond the current expiration at midnight on August 6, 2042, (Renewed Facility Operating License No. NPF-12).

In performing its review, the NRC staff used the SLRA; SLRA supplements; NUREG2191, 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); and the applicant's responses to requests for additional information. As part of its SLRA review, the NRC staff conducted a regulatory audit from November 6, 2023, through March 21, 2024, in accordance with the audit plan dated October 25, 2023, (ML23296A109) and as detailed in the audit report dated June 25, 2024 (ML24085A699).

This SE documents the NRC staff's technical review of the information submitted by DESC through October 24, 2024. Based on its review of the SLRA, the NRC staff determined that DESC 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 during the period of extended operation, and that time-limited aging analyses have been addressed.

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ABBREVIATIONS AND ACRONYMS

°C	degrees Celsius
°F	degrees Fahrenheit
ACI	American Concrete Institute
ACRS	Advisory Committee on Reactor Safeguards
ACSR	aluminum conductor steel reinforced
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
AOR	Analysis of Record
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&PV	Boiler and Pressure Vessel
B&W	Babcock & Wilcox
BFB	baffle-to-former bolts
BMI	bottom mounted instrument
BSW	biological shield wall
BWR	boiling-water reactor
BWRVIP	Boiling Water Reactor Vessel Internals Project
CAP	corrective action program
CASS	cast austenitic stainless steel
CB	core barrel
CBR	condensate backwash receiving
CLB	current licensing basis
CMAA	Crane Manufacturers Association of America
CMTR	Certified Material Test Reports
CRD	control rod drive
CRDM	control rod drive mechanism
CRGT	control rod guide tube

CUF	cumulative usage factor
CVCS	chemical and volume control system
DBA	design basis accident
DBE	design-basis event
DESC	Dominion Energy South Carolina
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
FCG	fatigue crack growth
FE	Further Evaluation
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
I&E	Inspection and evaluation
IASCC	irradiation-assisted stress corrosion cracking
IE	Irradiation embrittlement
IGSCC	intergranular stress corrosion cracking
INPO	Institute of Nuclear Power Operations
IPA	integrated plant assessment
ISG	interim staff guidance
ISI	inservice inspection
ISP	Integrated Surveillance Program
L&C	limitations and conditions
LBB	leak-before-break
LEFM	linear elastic fracture mechanics
LFET	Low Frequency Electromagnetic Technique

LOCA	loss-of-coolant accident
LPCI	low pressure coolant injection
LR	license renewal
LRA	license renewal application
LRBD	license renewal boundary drawings
LTOPS	Low-Temperature Over-Pressurization System
LWR	light water reactor
MEB	Metal Enclosed Bus
MIC	microbiologically induced corrosion
MRP	Material Reliability Program
MRV	minimum required value
NCV	Non-Cited Violation
NDT	nil-ductility transition
NDTT	nil-ductility transition temperature
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act
NOC	normal operating condition
NRC	U.S. Nuclear Regulatory Commission
NSSS	nuclear steam supply system
OBE	operating basis earthquake
OE	operating experience
PCAC	Primary Containment Atmospheric Control
PLL	predicted lower limit
PSW	primary shield wall
PTLR	pressure-temperature limits report
PWR	pressurized-water reactors
PWROG	Pressurized-Water Reactor Owners Group
PWSCC	primary water stress corrosion cracking
QA	quality assurance
RAI	requests for additional information
RAMA	Radiation Analysis Modeling Application
RB	reactor building
RBCS	Reactor Building Cooling System
RCI	request for confirmation of information
RCIC	reactor core isolation cooling
RCL	ceactor coolant line

RCP	reactor coolant pumps
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
RVIN	Reactor Vessel Inlet Nozzle
RVON	RV outlet nozzle
SAW	submerged arc welds
SBA	small break accident
SC	structures and components
SCC	stress corrosion cracking
SE	safety evaluation
SER	Safety Evaluation Report
SG	steam generator
SGON	steam generator outlet nozzle
SIF	stress intensity factor
SLC	standby liquid control
SLR	subsequent license renewal
SLRA	subsequent license renewal application
SMAW	shielded metal arc welds
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
TE	thermal embrittlement
TLAA	time-limited aging analyses
TR	Topical Report
TS	technical specifications
UFSAR	updated final safety analysis report

UGW	upper girth weld
USAR	updated safety analysis report
USE	upper-shelf energy
VCSNS or V.C. Summer	Virgil C. Summer Nuclear Station
VS	void swelling
WEC	Westinghouse Electric Company
WF	wide flange

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 Virgil C. Summer Nuclear Station, Unit 1 (V.C. Summer or VCSNS). Dominion Energy South Carolina, Inc. (DESC or the applicant), on behalf of itself and Santee Cooper, filed the SLRA by letter dated August 17, 2023, (Agencywide Documents Access and Management System [ADAMS] Package Accession No. ML23233A175), as supplemented by letters dated April 1, 2024 (ML24095A207), May 6, 2024 (ML24129A200), May 30, 2024 (ML24155A146), June 17, 2024 (ML24171A015) and October 24, 2024 (ML24302A144).

In its application, DESC seeks to renew V.C. Summer Renewed Facility Operating License No. NPF-12 for an additional 20 years beyond the current expiration of their renewed license at midnight on August 6, 2042. The NRC staff performed a safety review of DESC'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.

V.C. Summer is located in Jenkinsville, South Carolina, which is approximately 26 miles northwest of Columbia, South Carolina. Unit 1 is a Westinghouse-designed pressurized-water reactor that operates at a licensed power output of 2,900 megawatts thermal (MWt). The NRC staff issued the initial operating license for Unit 1 on November 12, 1982, and renewed the operating license on April 23, 2004. The V.C. Summer updated final safety analysis report (UFSAR) describes the plant and the site (ML24185A190).

Section 54.29 of 10 CFR, "Standards for issuance of a renewed license," sets forth the license renewal (LR) standards. Based on these standards, a renewed license may be issued if the Commission finds that aging effects are or will be managed during the period of extended operation, and that time-limited aging analyses have been addressed. In addition, the NRC's requirements in 10 CFR Part 51 concerning environmental review must be satisfied, and, when applicable, matters raised concerning consideration of Commission rules and regulations in adjudicatory proceedings must be addressed for the issuance of a renewed license. Accordingly, the NRC LR process consists of (1) a safety review, and (2) an environmental review. Regulations in 10 CFR Part 54, "Requirements for renewal of operating licenses for nuclear power plants," and 10 CFR Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions," set forth requirements for safety reviews and environmental reviews, respectively. The safety review for the V.C. Summer subsequent license renewal (SLR) is based on DESC's SLRA, as well as the NRC staff's audits, responses to the NRC staff's requests for additional information (RAIs), and responses to the NRC staff's requests for confirmation of information (RCIs). DESC supplemented its application and provided clarifications through its responses to the staff's questions in RAIs, RCIs, audits, meetings, and docketed correspondence. The NRC staff reviewed and considered the information submitted through October 24, 2024.

The public may view the SLRA and material related to the LR review on the NRC's website at http://www.nrc.gov.

This SE summarizes the results of the NRC 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 NRC staff's evaluation of LR 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's conclusions. The SE contains four appendices, which provide the following additional information:

- Appendix A: "License Renewal Commitments," contains a table showing DESC's commitments for subsequent renewal of the operating license.
- Appendix B: "Chronology," contains a chronology of the principal correspondence between the NRC staff and the applicant, as well as other relevant correspondence regarding the SLRA review.
- Appendix C: "Principal Contributors," contains a list of principal contributors to the SE.
- Appendix D: "References," contains a bibliography of the references that support the NRC staff's review.

1.2 License Renewal Background

Under the Atomic Energy Act (AEA) of 1954, as amended, and NRC regulations, the NRC 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 of operation 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 NRC staff's LR 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 LR 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 LR and SLR.

1.2.1 Safety Review

LR requirements for power reactors (applicable to both initial and SLR) are based on two key principles:

(1) The regulatory process is adequate to ensure that the licensing bases of all currently operating plants maintain an acceptable level of safety with the possible exception of the detrimental aging effects on the functions of certain 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 LR as including the following SSCs:

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

   i. The integrity of the reactor coolant pressure boundary;

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

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

(2) All 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].

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

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), a license renewal application must include a UFSAR supplement with a summary description of the applicant’s programs and activities for managing the effects of aging, as well as an evaluation of time-limited aging analyses (TLAAs) for the period of extended operation.

LR regulations also require TLAA identification and updating. Section 54.3 of 10 CFR, “Definitions,” specifies criteria that determine which licensee calculations and analyses are to be considered TLAAs for the purposes of LR. As required by 10 CFR 54.21(c)(1), the applicant must demonstrate that these analyses will remain valid for the period of extended operation, or that the analyses 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 V.C. Summer SLRA, DESC 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 NRC 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, thereby 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 for implementing the requirements of the National Environmental Policy Act of 1969, as amended (NEPA). The NRC staff's environmental review is ongoing. The staff will publish its environmental review findings separately from this report.

1.3 Principal Review Matters

10 CFR Part 54 describes the requirements for renewal of operating licenses for nuclear power plants. The NRC staff's technical review of the SLRA was performed in accordance with NRC guidance and 10 CFR Part 54 requirements. 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). DESC provided this information in SLRA Section 1, or incorporated by reference other documents that contained the information. The NRC staff reviewed SLRA Section 1 and finds that DESC 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, DESC stated in SLRA Section 1.1.10:

> 10 CFR 54.19(b) requires that license renewal applications 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-86) for Virgil C. Summer Nuclear Station states in Article VII that the Agreement shall terminate at the time of expiration of the license specified in Item 3 of the Attachment (to the Agreement). Item 3 of the Attachment to the Indemnity Agreement, as revised through Amendment No. 3, lists Virgil C. Summer Nuclear Station operating license number as NPF-12. The original Indemnity Agreement and the Amendments have been reviewed. Neither Article VII nor Item 3 of the Attachment specifies an expiration date for license number NPF-12. Therefore, no changes to the Indemnity Agreement are deemed necessary as part of this application. Should the license number

be changed by Nuclear Regulatory Commission (NRC) upon issuance of the subsequent renewed license, Dominion Energy South Carolina requests that NRC amend the Indemnity Agreement to include conforming changes to Item 3 of the Attachment and other affected sections of the Agreement.

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

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

SLRA Sections 3 and 4, as well as Appendix B, address the license renewal requirements of 10 CFR 54.21(a), (b), and (c). The NRC staff also finds that SLRA Appendix A addresses the LR 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 three months before the scheduled completion of the NRC staff’s review, the applicant must submit an SLRA amendment identifying any CLB changes that materially affect the contents of the SLRA, including the UFSAR supplement. By letter dated September 26, 2024, DESC submitted an SLRA update that summarizes the CLB changes that have occurred during the staff’s review of the SLRA (ML24274A194). The NRC staff finds that this submission satisfies the 10 CFR 54.21(b) requirements.

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

The NRC staff also 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 details 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 Advisory Committee on Reactor Safeguards (ACRS) issues a report documenting its evaluation of the NRC 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 NRC staff, industry, and other interested stakeholders gain experience and develop lessons-learned with each renewed license. The lessons-learned contribute to the staff’s performance goals of maintaining safety, improving effectiveness and efficiency, reducing regulatory burden, and increasing public confidence. The 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 LR guidance documents such as the SRP-SLR and GALL-SLR Report.

Table 1.4-1 identifies the current set of license renewal ISG topics, as well as the corresponding 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 3.0.3.1.17, 3.0.3.1.18 and 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 3.0.3.1.2, 3.0.3.2.2, 3.0.3.2.10, 3.0.3.2.13 and 3.3.2.2.2
SLR-ISG-2021-03-STRUCTURES (ML20181A381)	Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance	SE Sections 3.0.3.1.15, 3.0.3.2.22, 3.5.2.2.1.5 and 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 Sections 3.0.3.2.6 and 3.1.2.2.9

1.5 Summary of Open Items

An item is considered to be open if, in the NRC staff's judgment, the staff has not determined that the item meets all applicable regulatory requirements at the time of the issuance of this SE. After reviewing the SLRA, including additional information DESC submitted through October 24, 2024, the staff identified no open items.

1.6 Summary of Confirmatory Items

An item is considered confirmatory if, in the NRC staff's judgment, the staff and the applicant have reached an acceptable resolution that meets all applicable regulatory requirements but, at the time of the issuance of this SE, the staff had not received the necessary documentation to confirm the resolution. After reviewing the SLRA, including additional information DESC submitted through October 24, 2024, the staff finds that no confirmatory items exist that require a formal response from DESC.

1.7 Summary of Proposed License Conditions

After reviewing the SLRA, including additional information DESC submitted through October 24, 2024, the NRC staff deemed two license conditions appropriate and necessary:

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

described in the UFSAR 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 DESC to complete future activities described in the UFSAR supplement before the beginning of the subsequent period of extended operation. DESC must complete these activities no later than 6 months before the beginning of the subsequent period of extended operation and must also notify the NRC in writing when it has completed those activities. Unless modified in accordance with 10 CFR 50.59, the programs and commitments described in the UFSAR supplement remain to be in effect during the subsequent period of extended operation.

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) contains 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

Virgil C. Summer Nuclear Station 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 VCSNS 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:

- final safety analysis report (FSAR)
- engineering drawings
- controlled plant component database
- National Fire Protection Association (NFPA) 805 fire protection design basis document
- maintenance rule system basis database
- environmental qualification (EQ) documentation
- original license renewal documents:
  - application for initial renewed operating licenses for VCSNS
  - NUREG-1787, *Safety Evaluation Report Related to the License Renewal of the Virgil C. Summer Nuclear Station*, issued March 2004 (ML041040070)
- other current licensing basis (CLB) references:
  - NRC safety evaluation reports (SERs) which include the NRC staff's review of VCSNS docketed licensing submittals.
  - Engineering evaluations and calculations can provide additional information about the requirements or characteristics associated with the evaluated SCCs
  - Licensing correspondence includes relief requests, Licensee Event Reports, and responses to NRC communications such as NRC bulletins, generic letters, or enforcement actions.

2.1.3.1.2 Staff Evaluation

In 10 CFR 54.3, "Definitions," the CLB is defined 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 updated FSAR as required by 10 CFR 50.71, “Maintenance of records, making of reports.”

In addition, the CLB includes (1) 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, and (2) 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 NRC staff determined that 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 systems, structures, and components within the scope of the license renewal rule. 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 intended functions were identified from a review of the CLB and design basis 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:

> Safety-related classifications for systems and structures are based on the PAMS safety classification, system and structure descriptions and analyses in the FSAR, or on design basis documents such as engineering drawings, evaluations, or calculations. Systems and structures that are identified as safety-related in the FSAR or in design basis documents have been classified as satisfying the criteria of 10 CFR 54.4(a)(1) and have been included within the scope of subsequent license renewal.

In addition, SLRA Section 2.1.4.1 states, in part, the following:

> Plant conditions required per SLR-SRP, including conditions of normal operation, internal events, anticipated operational occurrences, design basis accidents, external events, and natural phenomena as described in the CLB, were considered for subsequent license renewal 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)) in order 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 SLRA Section 2.1.4.1, the applicant's evaluation of the Rule, and CLB definitions pertaining to 10 CFR 54.4(a)(1). In addition, the staff reviewed the applicant's description of design basis conditions in the CLB, which address DBEs as defined in 10 CFR 50.49(b)(1). The FSAR and design basis documents discussed events such as internal and external flooding, tornadoes, and missiles applicable to VCSNS. The staff determined the applicant's CLB definition of "safety-related" met the definition of "safety-related" specified in the Rule and the applicant's evaluation of DBEs is consistent with the SRP-SLR.

2.1.4.1.3 Conclusion

Based on the review of the SLRA and the FSAR, the NRC staff finds that the applicant's methodology for identifying safety-related SSCs relied upon to remain functional during and following DBEs, and for including those SSCs within the scope of 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. Specifically, 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 nonsafety-related SSCs whose failure can prevent the satisfactory accomplishment of safety functions.

<u>Nonsafety-Related SSCs Supporting Safety Functions</u>

SLRA Section 2.1.4.2 subheading, “Functional Support for Safety-Related SSC 10 CFR 54.4(a)(1) Functions,” discusses nonsafety-related systems identified in the VCSNS CLB, such as nonsafety-related piping and piping components between the main steam, turbine electro-hydraulic system, nonsafety-related in-core instrumentation isolation valves above the seal table, miscellaneous drains system, nuclear drains system, fuel handling system reactor cavity seal ring, nonsafety-related venturis in the feedwater system, portions of the emergency diesel generators air intake and exhaust piping, and turbine-driven emergency feedwater pump lubricating oil nonsafety-related piping and components. These nonsafety-related systems were included within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

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

SLRA Section 2.1.4.2 subheading, “Connected to and Provide Structural Support for Safety-Related SSCs,” states, in part, the following:

> The guidance of NEI 95-10, Appendix F (as referenced in NEI 17-01) was used to identify the endpoints of nonsafety-related piping components that are directly attached to, and provide support for, safety-related piping components. The attached nonsafety-related piping components must be included within scope up to and including the first seismic or equivalent anchor.

In addition, this Section of the SLRA further states, in part, the following:

> An alternative to specifically identifying a seismic anchor or equivalent anchor is to include enough of the nonsafety-related piping run to ensure that these anchors are included and thereby ensure the piping and anchor intended functions are maintained. The following methods provide assurance that the included piping encompasses the nonsafety-related piping included in the design basis seismic analysis and is consistent with the current licensing basis:
>
> a. A base-mounted component (e.g., pump, heat exchanger, tank, etc.) that is a rugged component and is designed not to impose loads on connecting piping. The subsequent license renewal scope should include the base-mounted component as it has a support function for the safety-related piping.

b. A flexible connection is considered a pipe stress analysis model end point when the flexible connection effectively decouples the piping systems (i.e., does not support loads or transfer loads across it to connecting piping).

c. A free end of nonsafety-related piping.

d. For nonsafety-related piping runs that are connected at both ends to safety-related piping include the entire run of nonsafety-related piping.

e. A point where the buried piping exits the ground. The buried portion of the piping should be included in the scope of subsequent license renewal. There are no areas at the site with buried piping in which the soil is subject to liquefaction.

f. A smaller branch line where the moment of inertia ratio of the larger piping to the smaller piping is equal to or greater than the acceptable ratio defined by the current licensing basis (16.7), because significantly smaller piping does not impose loads on larger piping and does not support larger piping.

SLRA Section 2.1.4.2 subheading, “Scoping of Abandoned Mechanical Components,” states, in part, the following:

> Abandoned piping components within structures containing safety-related 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 safety-related piping, and
> 2. The abandoned piping is separated from sources of water by blanks, blind flanges or pipe caps. Closed valves are not credited to keep fluid from abandoned components, and
> 3. The abandoned piping is empty of fluid. 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 ultrasonic testing or other method that is capable of confirming the absence of trapped fluid.
>
> If the above conditions are not met, the abandoned systems or portions thereof are included within the scope of license renewal for aging management.

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

SLRA Section 2.1.4.2 subheading, “Potential for Spatial Interactions with Safety-Related SSCs,” discusses the evaluation of nonsafety-related SSCs that could potentially impact safety-related SSCs through spatial interaction (i.e., impact, spray, or leakage).

SLRA Section 2.1.4.2 subheading, “Potential for Spatial Interactions with Safety-Related SSCs,” states, in part, the following:

> Nonsafety-related systems that are not connected to safety-related piping or components, or are outside the structural support boundary for the attached safety-related piping system, and have a spatial relationship such that their failure could adversely impact the performance of a safety-related SSC intended function, must be included within the scope of subsequent license renewal in accordance with 10 CFR 54.4(a)(2) requirements. As described in NEI 95-10,

> Appendix F, there are two options when performing this scoping evaluation: a mitigative option and a preventive option.

In addition, this Section of the SLRA further states, in part, the following:

> The preventive option for 10 CFR 54.4(a)(2) scoping was applied. The preventive option, as implemented, is based upon a "spaces" approach for determining potential for spatial interactions with safety-related SSCs. The boundaries for the "spaces" are structure boundaries (typically the outer walls defining an entire structure) that act as physical barriers and separate safety-related targets from nonsafety-related hazards.
>
> Nonsafety-related piping and components that contain water, oil, or steam are not excluded from scope unless it can be demonstrated that they are not in proximity to safety-related SSCs. This is demonstrated by confirming that there are no safety-related SSCs located within the same space (e.g., structure or enclosure) as the nonsafety-related piping or component containing water, oil, or steam. This demonstration is based on confirming that there are adequate physical barriers (e.g., structural boundaries) separating the nonsafety-related piping or component from safety-related SSCs, thereby preventing the potential spatial interaction. The structural barrier components are included in scope. No credit is taken for separation by distance alone without a physical barrier capable of preventing the spatial interaction.
>
> Potential spatial interaction is assumed for nonsafety-related SSCs that contain water, oil, or steam and that are located within structures that contain safety-related SSCs that are relied upon to perform safety-related functions.

SLRA Section 2.1.4.2 subheading, “Scoping of Abandoned Mechanical Components,” states the following:

> There are mechanical fluid components that have been abandoned. Abandoned piping components within structures containing safety-related 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 safety-related piping, and
> 2. The abandoned piping is separated from sources of water by blanks, blind flanges or pipe caps. Closed valves are not credited to keep fluid from abandoned components, and
> 3. The abandoned piping is empty of fluid. 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 ultrasonic testing or other method that is capable of confirming the absence of trapped fluid.
>
> If the above conditions are not met, the abandoned systems or portions thereof are included within the scope of license renewal for aging management. Abandoned equipment is not relied on to perform any function delineated in 10 CFR 54.4(a)(1) or (a)(3) as it is non-operational.

2.1.4.2.2 Staff Evaluation

The staff reviewed SLRA Section 2.1.4.2 in which the applicant described the scoping methodology for nonsafetyrelated SSCs in accordance with 10 CFR 54.4(a)(2). During the review, the NRC staff followed the guidance contained in SRPS-LR Section 2.1.3.1.2, “NonsafetyRelated,” 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 the applicant should base its evaluation on the plant’s CLB, engineering judgment and analyses, and relevant operating experience.

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

The NRC staff reviewed SLRA Section 2.1.4.2 subheading, “Functional Support for Safety-Related SSC 10 CFR 54.4(a)(1) Functions,” which describes nonsafetyrelated SSCs, such as nonsafety-related piping and piping components between the main steam, turbine electro-hydraulic system, nonsafety-related in-core instrumentation isolation valves above the seal table, miscellaneous drains system, nuclear drains system, fuel handling system reactor cavity seal ring, nonsafety-related venturis in the feedwater system, portions of the emergency diesel generators air intake and exhaust piping, and turbine driven emergency feedwater pump lubricating oil nonsafety-related piping and components. These nonsafetyrelated, non-plant SSCs support safety functions and were included within the scope of SLR in accordance with 10 CFR 54.4(a)(2). The NRC staff confirmed the applicant reviewed the FSAR, plant drawings, equipment database, and other CLB documents to identify the nonsafetyrelated support SSCs whose failure could prevent the performance of a safetyrelated intended function. The NRC staff determined that the applicant accurately identified the nonsafetyrelated SSCs that perform or support a safety function, and the applicant included those SSCs within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

The NRC staff further reviewed SLRA Section 2.1.4.2 subheading, “Functional Support for Safety-Related SSC 10 CFR 54.4(a)(1) Functions,” which also describes the method used to identify, for inclusion within the scope of SLR in accordance with 10 CFR 54.4(a)(2), those nonsafety-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 FSAR, plant drawings, equipment database, and other CLB documents and identified nonsafety-related SSCs that perform a function relied upon by safety-related SSCs, and whose failure could prevent the performance of a safety function. The NRC staff determined the applicant included those SSCs within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

The NRC staff determined the applicant’s methodology for identifying nonsafety-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>Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs</u>

The NRC staff reviewed SLRA Section 2.1.4.2 subheading, “Connected to and Provide Structural Support for Safety-Related SSCs,” which describes the method used to identify nonsafety-related SSCs directly connected to safety-related SSCs. Section 2.1.4.2 indicated that those nonsafety-related SSCS are required to be included within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

The staff determined that the applicant used a combination of the following to identify the bounding portion of nonsafety-related piping systems that were included 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 NRC staff determined that the applicant's methodology for identifying and including nonsafety-related SSCs directly connected to safety-related SSCs within the scope of SLR is in accordance with the guidance of the SRP-SLR and the requirements of 10 CFR 54.4(a)(2).

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

The NRC staff reviewed SLRA Section 2.1.4.2 subheading, "Potential for Spatial Interactions with Safety-Related SSCs," which describes the methods used to identify nonsafety-related SSCs with the potential for spatial interaction with safety-related SSCs. Section 2.1.4.2 indicated that those nonsafety-related SSCS are required 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 (i.e., spaces approach) to identify and evaluate the portions of nonsafety-related systems with the potential for spatial interaction with safety-related SSCs. The approach focused on the interaction between nonsafety-related and safety-related SSCs that are in the same space, which was described as a structure that contains safety-related SSCs. The staff determined that the applicant included the nonsafety-related SSCs located within the same space as safety-related SSCs within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

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

2.1.4.2.3 Conclusion

Based on the review of the SLRA, the NRC staff finds that the applicant's methodology for identifying, evaluating, and including nonsafety-related SSCs, whose failure could prevent satisfactory accomplishment of the intended functions of safety-related SSCs, within the scope of 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)," 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), and states, in part, the following:

> In accordance with 10 CFR 54.4(a)(3), the systems, structures, and components 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 50.62), and station blackout (10 CFR 50.63).

SLRA Section 2.1.4.3 further states the following:

> For each of the five regulations, a technical basis document was prepared to provide input into the scoping process. Each of the regulated event technical basis documents (described in Section 2.1.3.4) identify the systems and structures that are relied upon to demonstrate compliance with the applicable regulation. The technical basis documents also identify the source documentation used to determine the scope of components within the system that are credited to demonstrate compliance with each of the applicable regulated events. Guidance provided by the technical basis documents was incorporated into the system and structure scoping evaluations, to determine the SSCs credited for each of the 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 subsequent license renewal.

2.1.4.3.2 Staff Evaluation

The NRC staff reviewed SLRA Section 2.1.4.3, which described the process used to identify 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 (10 CFR 50.62, "Requirements for reduction of risk from anticipated transients without scram (ATWS) events for light-water-cooled nuclear power plants"), station blackout (SBO) (10 CFR 50.63, "Loss of all alternating current power"). Section 2.1.4.3 indicated that those nonsafety-related SSCS are required to be included within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

The NRC staff determined that the applicant's scoping process considered information sources used for scoping and screening in order to verify that the appropriate SSCs were included within the scope of SLR. The staff further determined that the applicant 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, the NRC 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 NRC staff finds that the applicant's methodology for identifying and including SSCs that are relied on to remain functional during regulated events is consistent with the requirements of 10 CFR 54.4(a)(3) and 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 (Reference 1.7-4).

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. Each of these identified plant systems and structures were evaluated against the scoping criteria in 10 CFR 54.4(a)(1), (a)(2), and (a)(3), to determine if the system or structure performs or supports a safety-related intended function, if the system or structure failure could prevent the satisfactory accomplishment of a safety-related function, or if the system or structure performs functions that demonstrate compliance with the requirements of one of the five subsequent license renewal regulated events. The intended function(s) that are the bases for including systems and structures within the scope of subsequent license renewal were also identified.

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

> A mechanical system was included within the scope of subsequent license renewal if any portion of the system met the scoping criteria in 10 CFR 54.4(a)(1), (a)(2), or (a)(3). Mechanical systems determined to be within the scope of subsequent license renewal were then further evaluated to determine those system components that are required to perform or support the identified system intended function(s).
>
> A structure was included within the scope of subsequent license renewal if any portion of the structure met the scoping criteria in 10 CFR 54.4(a)(1), (a)(2), or (a)(3). Structures 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 systems were included within the scope of subsequent license renewal if any portion of the system met the scoping criteria in 10 CFR 54.4(a)(1), (a)(2), or (a)(3). Electrical and I&C components within the in-scope electrical and I&C systems were included within the scope of subsequent license renewal.

2.1.4.4.2 Staff Evaluation

The NRC staff reviewed SLRA sections 2.0 and 2.1.1 and the associated subsections, which describe the applicant’s methodology for identifying SSCs within the scope of 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 onsite 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, FSAR references, and component types subject to an AMR. The staff determined that the applicant’s process is consistent with the description provided in SLRA Sections 2.0 and 2.1 through 2.5 and the guidance in SRP-SLR Section 2.1.

2.1.4.4.3 Conclusion

Based on the review of the SLRA, the NRC 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. In addition, the applicant 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 NRC 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, “Introduction,” states, in part, the following:

> After completion of the scoping, the screening process was performed to evaluate the structures and components within the scope of subsequent license renewal to identify the long-lived and passive structures and components subject to Aging Management Review (AMR). In addition, the passive intended functions of structures and components subject to Aging Management Review (AMR). In addition, the passive intended functions of structures and components subject to AMR were identified.

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

> Selected components, such as equipment supports, structural items (e.g., fire barriers), and passive electrical components, were scoped and screened as commodities. As such, they were not evaluated with the individual system or structure but were evaluated collectively as a commodity group.

SLRA Section 2.1.5.1, “Identification of Structures and Components Subject to AMR,” states, in part, the following:

> Structures and components that perform an intended function without moving parts or without a change in configuration or properties are defined as passive for subsequent license renewal. Passive structures and components that are not subject to replacement based on a qualified life or specified time period are defined as long-lived for subsequent license renewal. The screening procedure is the process used to identify the passive, long-lived structures and components within the scope of subsequent license renewal. These structures and components are subject to aging management review.

> NUREG-2192, Table 2.1-6 and NEI 95-10, Appendix B, were used as the basis for the identification of passive structures and components, as recommended by NEI 17-01, Section 1.1.

SLRA Section 2.1.5.1 Subheading, “Mechanical Systems,” states, in part, the following:

> For in-scope mechanical systems, the written descriptions and marked up system piping and instrumentation diagrams clearly identify the in-scope system boundary of passive components for subsequent license renewal. The marked-up system piping and instrumentation diagrams are called subsequent license renewal boundary drawings. These system boundary drawings were reviewed to identify the passive, long-lived components, and the identified components were entered into the subsequent license renewal database.

SLRA Section 2.1.5.1 Subheading, “Structures,” states, in part, the following:

> When a structure or structural component was determined to be within the scope of subsequent license renewal by the scoping process described in Section 2.1.4.5, the structure screening methodology classified the component as active or passive. Active components do not require aging management. This is consistent with guidance found in NEI 95-10, Appendix B, as referenced by NEI 17-01. During the structure screening process, the intended function(s) of passive structural components were documented. In the structure screening process, an evaluation was made to determine whether in-scope structural components were subject to replacement based on a qualified life or specified time period. If an in-scope structural component was determined to be subject to replacement based on a qualified life or specified time period, the component was identified as short-lived and was excluded from an AMR.

SLRA Section 2.1.5.1 Subheading, “Electrical Commodities,” states, in part, the following:

> Electrical and I&C components for the in-scope systems were assigned to commodity groups based on the listing in NUREG-2192, Table 2.1-6. Commodities subject to an aging management review were identified by applying 10 CFR 54.21(a)(1) to identify those commodities that perform their function without moving parts or a change in configuration ("passive" components). This method provides the most efficient means for determining the electrical commodities subject to an aging management review since many electrical and I&C components are active. Passive commodity groups were reviewed, and any that did not perform an intended function were determined to not require an aging management review. The remaining passive commodity groups were screened consistent with 10 CFR 54.21(a)(1)(ii) to exclude those commodities that are subject to replacement based on a qualified life or specific time period from the requirements of an aging management review. The remaining passive commodities were determined to be subject to aging management review.

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 changing the configuration or properties (passive). In addition, the IPA must identify components that are not subject to periodic replacement based on a qualified life or specified time period (long-lived). Furthermore, the IPA must include a description and justification of the methodology used to identify passive, long-lived SCs, as well as include 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, where 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 NRC staff reviewed the applicant's methodology used for mechanical and structural component screening as described in SLRA Section 2.1.1 "Introduction" and Section 2.1.5 "Screening Methodology." 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 NRC 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.

<u>Electrical</u>

The NRC staff reviewed the applicant's methodology used for electrical component screening as described in SLRA sections 2.1.1 and 2.1.5. 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 NRC 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 NRC staff finds that the applicant's screening methodology is consistent with the guidance contained in the SRP-SLR, and that the applicant identified the passive, long-lived components within the scope of SLR that are subject to an AMR. The NRC 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 NRC 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 NRC staff reviewed the plant-level scoping results to determine if 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 nonsafety-related SSCs whose failure could prevent satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1)(i), (ii), or (iii); and
- 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), anticipated transients without scram (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 nuclear power plant's mechanical, structural, electrical, and instrumentation and controls (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 NRC staff's review and evaluation of the applicant's scoping and screening methodology. To verify that the applicant properly implemented its methodology, the staff's review focused on the implementation results shown in SLRA Table 2.2-1.

The NRC 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 NRC staff sampled the contents of the FSAR 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 NRC staff did not identify any omissions.

2.2.4 Conclusion

Based on the review of the SLRA, the NRC 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 NRC staff focused its review on the implementation results. This focus allowed the staff to verify that the applicant identified the mechanical system SCs that met the scoping criteria and that were subject to an AMR, thus confirming that there were no omissions.

The NRC staff 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 FSAR. The objective was to determine whether the applicant, in accordance with 10 CFR 54.4, identified components and supporting structures for mechanical systems that met the scoping criteria for 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 NRC staff reviewed the SLRA, applicable sections of the FSARs, 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 NRC staff evaluated the applicant's screening results. For those SCs with intended functions included under 10 CFR 54.4(a), the staff verified that the applicant properly screened out only: (1) SCs that have functions performed with moving parts or that have a change in configuration or properties, or (2) SCs 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”
- SLRA Section 2.3.1.4, “Steam Generators”
- SLRA Section 2.3.2.1, “Reactor Building Spray”
- SLRA Section 2.3.2.2, “Refueling Water”
- SLRA Section 2.3.2.3, “Residual Heat Removal”
- SLRA Section 2.3.2.4, “Safety Injection”
- SLRA Section 2.3.3.1, “Air Handling and Local Ventilation and Cooling”
- SLRA Section 2.3.3.2, “Auxiliary Coolant”
- SLRA Section 2.3.3.3, “Boron Recycle”
- SLRA Section 2.3.3.4, “Building Services”
- SLRA Section 2.3.3.5, “Chemical and Volume Control”
- SLRA Section 2.3.3.6, “Chilled Water”
- SLRA Section 2.3.3.7, “Circulating Water”
- SLRA Section 2.3.3.8, “Component Cooling”
- SLRA Section 2.3.3.9, “Demineralized Water - Nuclear Services”
- SLRA Section 2.3.3.10, “Diesel Generator Services”
- SLRA Section 2.3.3.11, “Domestic Water”
- SLRA Section 2.3.3.12, “Excess Liquid Waste”
- SLRA Section 2.3.3.13, “Fire Service”
- SLRA Section 2.3.3.14, “Fuel Handling”
- SLRA Section 2.3.3.15, “Gaseous Waste Processing”
- SLRA Section 2.3.3.16, “Hydrogen Removal, Post Accident”
- SLRA Section 2.3.3.17, “In-core Instrumentation”
- SLRA Section 2.3.3.18, “Industrial Cooler”
- SLRA Section 2.3.3.19, “Instrument Air”
- SLRA Section 2.3.3.20, “Leak Detection”
- SLRA Section 2.3.3.21, “Liquid Effluents from Nuclear Plant to Penstock”

- SLRA Section 2.3.3.22, “Liquid Waste Processing”
- SLRA Section 2.3.3.23, “Material Handling”
- SLRA Section 2.3.3.24, “Nitrogen Blanketing”
- SLRA Section 2.3.3.25, “Nuclear and Miscellaneous Drains”
- SLRA Section 2.3.3.26, “Nuclear Sampling”
- SLRA Section 2.3.3.27, “Radiation Monitoring”
- SLRA Section 2.3.3.28, “Radwaste Solidification & Solids Handling”
- SLRA Section 2.3.3.29, “Reactor Building Cooling Unit Drains”
- SLRA Section 2.3.3.30, “Reactor Building Leak Rate Testing”
- SLRA Section 2.3.3.31, “Reactor Makeup Water Supply”
- SLRA Section 2.3.3.32, “Service Water”
- SLRA Section 2.3.3.33, “Spent Fuel Cooling”
- SLRA Section 2.3.3.34, “Station Service Air”
- SLRA Section 2.3.3.35, “Thermal Regeneration”
- SLRA Section 2.3.4.1, “Auxiliary Boiler Steam and Feedwater”
- SLRA Section 2.3.4.2, “Condensate”
- SLRA Section 2.3.4.3, “Emergency Feedwater”
- SLRA Section 2.3.4.4, “Extraction Steam”
- SLRA Section 2.3.4.5, “Feedwater”
- SLRA Section 2.3.4.6, “Gland Sealing Steam”
- SLRA Section 2.3.4.7, “Main Steam”
- SLRA Section 2.3.4.8, “Main Steam Dump”
- SLRA Section 2.3.4.9, “Nuclear Blowdown Processing”
- SLRA Section 2.3.4.10, “Steam Generator Blowdown”
- SLRA Section 2.3.4.11, “Turbine Cycle Chemical Feed”
- SLRA Section 2.3.4.12, “Turbine Cycle Sampling”
- SLRA Section 2.3.4.13, “Turbine Electro-Hydraulic”

2.3.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and FSARs 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 VCSNS LRBDs, FSAR, and additional documents. The results of those reviews are described in the following table.

SLRA Section 2.3, “Scoping and Screening Results: Mechanical Systems”				
SLRA Section	**SLRA Section Title**	**Documents Reviewed by Staff**		
		SLRA Tables	**FSAR**	**SLRA Drawings**
SLRA Section 2.3.1, “Reactor Coolant System”				
2.3.1.1	Reactor Pressure Vessel	Table 2.3.1-1, Reactor Vessel Table 3.1.2-1, Reactor Vessel, Internals, and Reactor Coolant System – Reactor Vessel – Aging Management Evaluation	Sections 5.1, 5.2.1, 5.4	SLR-302-601
2.3.1.2	Reactor Vessel Internals	Table 2.3.1-2, Reactor Vessel Table 3.1.2-2, Reactor Vessel, Internals, and Reactor Coolant System – Reactor Vessel – Aging Management Evaluation	Section 4.2.2	None
2.3.1.3	Reactor Coolant See below the table for additional review in “Additional Discussion”	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 3.1.2, 4.3.2.5; Chapters 5, 15; Table 6.2-54	SLR-302-601 SLR-302-602 SLR-302-606 SLR-302-612
2.3.1.4	Steam Generators	Table 2.3.1-4, Steam Generators Table 3.1.2-4, Reactor Vessel, Internals, and Reactor Coolant System – Steam Generators – Aging Management Evaluation	Sections 5.1, 5.2.1, 5.5.2, and 15.4	SLR-302-601

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
SLRA Section 2.3.2, "Engineered Safety Features"				
2.3.2.1	Reactor Building Spray	Table 2.3.2-1, Reactor Building Spray Table 3.2.2-1, Engineering Safety Features – Reactor Building Spray – Aging Management Evaluation	Section 6.2.2.2.1; Table 6.2-53	SLR-302-661
2.3.2.2	Refueling Water	Table 2.3.2-2, Refueling Water Table 3.2.2-2, Engineering Safety Features – Refueling Water – Aging Management Evaluation	Sections 6.3.2.4, 6.3.2.6, 9.1.3, and Table 9.1-1	SLR-302-651
2.3.2.3	Residual Heat Removal	Table 2.3.2-3, Residual Heat Removal Table 3.2.2-3, Engineering Safety Features – Residual Heat Removal – Aging Management Evaluation	Sections 3.1.2.4, 5.5.7, 6.3.2.2.4.1, and Table 6.2-53	SLR-302-641
2.3.2.4	Safety Injection	Table 2.3.2-4, Safety Injection Table 3.2.2-4, Engineering Safety Features – Safety Injection – Aging Management Evaluation	Section 6.3.2 and Table 6.2-53	SLR-302-322 SLR-302-691 SLR-302-692 SLR-302-693 SLR-302-812
SLRA Section 2.3.3, "Auxiliary Systems"				
2.3.3.1	Air Handling and Local Ventilation and Cooling	Table 2.3.3-1, Air Handling and Local Ventilation and Cooling Table 3.3.2.1, Auxiliary Systems - Air Handling and Local Ventilation and Cooling - Aging Management Evaluation	Section 9.4	SLR-302-852 SLR-912-102 SLR-912-103 SLR-912-105 SLR-912-120 SLR-920-125 SLR-912-130 SLR-912-131 SLR-912-132 SLR-912-134 SLR-912-136 SLR-912-138 SLR-912-139 SLR-912-140 SLR-912-141 SLR-912-154

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
				SLR-912-142 SLR-912-144 SLR-912-147 SLR-912-150 SLR-912-155 SLR-912-157 SLR-912-158 SLR-912-170
2.3.3.2	Auxiliary Coolant	Table 2.3.3-2, Auxiliary Coolant Table 3.3.2-2, Auxiliary Systems - Auxiliary Coolant - Aging Management Evaluation	Section 9.4.7.2.10	SLR-302-852
2.3.3.3	Boron Recycle	Table 2.3.3-3, Boron Recycle Table 3.3.2-3, Auxiliary Systems - Boron Recycle - Aging Management Evaluation	Section 9.3.6	SLR-09-269 SLR-302-751
2.3.3.4	Building Service	Table 2.3.3-4, Building Service Table 3.3.2-4, Auxiliary Systems - Building Service - Aging Management Evaluation	Section 3.8.1.1.2.3, Figures 3.8-19 through 3.8-20a	None
2.3.3.5	Chemical and Volume Control	Table 2.3.3-5, Chemical and Volume Control Table 3.3.2-5, Auxiliary Systems - Chemical and Volume Control - Aging Management Evaluation	Section 6.3, 9.3.4 and Table 6.2-53	SLR-12-004 SLR-302-322 SLR-302-671 SLR-302-672 SLR-302-673 SLR-302-674 SLR-302-675 SLR-302-677
2.3.3.6	Chilled Water	Table 2.3.3-6, Chilled Water Table 3.3.2-6, Auxiliary Systems - Chilled Water - Aging Management Evaluation	Section 9.4.7	SLR-302-841 SLR-302-842 SLR-302-843 SLR-302-845 SLR-54-064-2 SLR-54-660
2.3.3.7	Circulating Water System	Table 2.3.3-7, Circulating Water System Components Subject to Aging Management Review	Section 10.4.5	SLR-302-201

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		Table 3.3.2-7, Auxiliary Systems - Circulating Water - Aging Management Evaluation		
2.3.3.8	Component Cooling	Table 2.3.3-8, Component Cooling Table 3.3.2-8, Auxiliary Systems - Component Cooling - Aging Management Evaluation	Section 9.2.2	SLR-09-238 SLR-09-269 SLR-12-004 SLR-302-611 SLR-302-612 SLR-302-613 SLR-302-614
2.3.3.9	Demineralized Water - Nuclear Services	Table 2.3.3-9, Demineralized Water - Nuclear Services Table 3.3.2-9, Auxiliary Systems - Demineralized Water - Nuclear Services - Aging Management Evaluation	Section 9.2.3	SLR-302-715
2.3.3.10	Diesel Generator Services	Table 2.3.3-10, Diesel Generator Services Table 3.3.2-10, Auxiliary Systems - Diesel Generator Services - Aging Management Evaluation	Sections 8.3.1.1.2, 9.5.4 and 9.5.8	SLR-302-281 SLR-302-351 SLR-302-353 SLR-32-005 Sh. 2 SLR-32-005 Sh. 3 SLR-32-005 Sh. 4 SLR-32-005 Sh. 5 SLR-32-005 Sh. 6
2.3.3.11	Domestic Water	Table 2.3.3-11, Domestic Water Table 3.3.2-11, Auxiliary Systems - Domestic Water - Aging Management Evaluation	Sections 9.2.3.2 and 9.2.4	SLR-911-110
2.3.3.12	Excess Liquid Waste	Table 2.3.3-12, Excess Liquid Waste Table 3.3.2-12, Auxiliary Systems - Excess Liquid Waste - Aging Management Evaluation	Section 11.2.2.4	SLR-302-734
2.3.3.13	Fire Service See below the table for additional review in "Additional Discussion"	Table 2.3.3-13, Fire Service Table 3.3.2-13, Auxiliary Systems - Fire Service - Aging	Section 9.5.1	SLR-302-231 Sh. 1 SLR-302-231 Sh. 2 SLR-302-231 Sh. 3 SLR-302-231 Sh. 4 SLR-302-231 Sh. 5 SLR-302-232

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
		Management Evaluation		
2.3.3.14	Fuel Handling	Table 2.3.3-14, Fuel Handling Table 3.3.2-14, Auxiliary Systems - Fuel Handling - Aging Management Evaluation	Sections 3.8.1.1.2.2, 6.2.6.2.2.1, 9.1.4 and Figures 3.8-16 and 9.1-7	SLR-302-651 SLR-302-715
2.3.3.15	Gaseous Waste Processing	Table 2.3.3-15, Gaseous Waste Processing Table 3.3.2-15, Auxiliary Systems - Gaseous Waste Processing - Aging Management Evaluation	Section 11.3	SLR-302-741 SLR-302-742 SLR-302-743 SLR-302-744 SLR-302-745
2.3.3.16	Hydrogen Removal, Post Accident	Table 2.3.3-16, Hydrogen Removal, Post Accident Table 3.3.2-16, Auxiliary Systems - Hydrogen Removal, Post Accident - Aging Management Evaluation	Section 6.2.5	SLR-302-861
2.3.3.17	In-Core Instrumentation	Table 2.3.3-17, In-Core Instrumentation Table 3.3.2-17, Auxiliary Systems – In-Core Instrumentation Aging Management Evaluation	Section 4.4.5.1 and 7.7.1.9	None
2.3.3.18	Industrial Cooler	Table 2.3.3-18, Industrial Cooler Table 3.3.2-18, Auxiliary Systems - Industrial Cooler - Aging Management Evaluation	Section 9.4.7.2.5	SLR-302-851 Sh.1 SLR-302-851 Sh.2
2.3.3.19	Instrument Air	Table 2.3.3-19, Instrument Air Table 3.3.2-19, Auxiliary Systems - Instrument Air - Aging Management Evaluation	Sections 5.5.7.1.3.4 and 9.3.1	SLR-302-273 SLR-302-274 SLR-817-130

SLRA Section 2.3, “Scoping and Screening Results: Mechanical Systems”				
2.3.3.20	Leak Detection	Table 2.3.3-20, Leak Detection Table 3.3.2-20, Auxiliary Systems - Leak Detection - Aging Management Evaluation	Sections 9.2.7 and 7.6.5	SLR-302-812 SLR-302-824
2.3.3.21	Liquid Effluents from Nuclear Plant to Penstock	Table 2.3.3-21, Liquid Effluents from Nuclear Plant to Penstock Table 3.3.2-21, Liquid Effluents from Nuclear Plant to Penstock - Aging Management Evaluation	Section 11.2	SLR-302-362
2.3.3.22	Liquid Waste Processing	Table 2.3.3-22, Liquid Waste Processing Table 3.3.2-22, Auxiliary Systems - Liquid Waste Processing - Aging Management Evaluation	Section 11.2	SLR-09-238 SLR-302-735 SLR-302-736 SLR-302-737 SLR-302-738 SLR-302-825
2.3.3.23	Material Handling	Table 2.3.3-23, Material Handling Table 3.3.2-23, Auxiliary Systems - Material Handling - Aging Management Evaluation	Sections 3.12, 9.1.4.2.2 and 9.1.4.3	None
2.3.3.24	Nitrogen Blanketing	Table 2.3.3-24, Nitrogen Blanketing Table 3.3.2-24, Auxiliary Systems - Nitrogen Blanketing - Aging Management Evaluation	None	SLR-302-311
2.3.3.25	Nuclear and Miscellaneous Drains	Table 2.3.3-25, Nuclear and Miscellaneous Drains Table 3.3.2-25, Auxiliary Systems - Nuclear and Miscellaneous Drains - Aging Management Evaluation	Sections 6.2.2.3.1.1 and 9.3.3	SLR-302-352 SLR-302-821 SLR-302-822 SLR-302-823 SLR-302-824

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
2.3.3.26	Nuclear Sampling	Table 2.3.3-26, Nuclear Sampling Table 3.3.2-26, Auxiliary Systems - Nuclear Sampling - Aging Management Evaluation	Section 9.3.2	SLR-302-182 SLR-302-771 SLR-302-772
2.3.3.27	Radiation Monitoring	Table 2.3.3-27, Radiation Monitoring Table 3.3.2-27, Auxiliary Systems - Radiation Monitoring - Aging Management Evaluation	Section 11.4	SLR-806-001 SLR-806-005 SLR-806-006
2.3.3.28	Radwaste Solidification & Solids Handling	Table 2.3.3-28, Radwaste Solidification & Solids Handling Table 3.3.2-28, Auxiliary Systems - Radwaste Solidification & Solids Handling - Aging Management Evaluation	Section 11.5.3	SLR-302-732
2.3.3.29	Reactor Building Cooling Unit Drains	Table 2.3.3-29, Reactor Building Cooling Unit Drains Table 3.3.2-29, Auxiliary Systems - Reactor Building Cooling Unit Drains - Aging Management Evaluation	None	SLR-302-824
2.3.3.30	Reactor Building Leak Rate Testing	Table 2.3.3-30, Reactor Building Leak Rate Testing Table 3.3.2-30, Auxiliary Systems - Reactor Building Leak Rate Testing - Aging Management Evaluation	Section 6.2.6.1.5	SLR-302-811
2.3.3.31	Reactor Makeup Water Supply	Table 2.3.3-31, Reactor Makeup Water Supply Table 3.3.2-31, Auxiliary Systems - Reactor Makeup Water Supply - Aging Management Evaluation	Section 9.2.7	SLR-302-791

SLRA Section 2.3, “Scoping and Screening Results: Mechanical Systems”				
2.3.3.32	Service Water	Table 2.3.3-32, Service Water Table 3.3.2-32, Auxiliary Systems - Service Water - Aging Management Evaluation	Section 9.2.1	SLR-14-094 SLR-302-221 Sh. 1 SLR-302-221 Sh. 2 SLR-302-222 Sh. 1 SLR-302-222 Sh. 2 SLR-302-222 Sh. 3 SLR-302-222 Sh. 4 SLR-302-322 SLR-54-660
2.3.3.33	Spent Fuel Cooling	Table 2.3.3-33, Spent Fuel Cooling Table 3.3.2-33, Auxiliary Systems - Spent Fuel Cooling - Aging Management Evaluation	Section 9.1.3	SLR-302-322 SLR-302-651
2.3.3.34	Station Service Air	Table 2.3.3-34, Station Service Air Table 3.3.2-34, Auxiliary Systems - Station Service Air - Aging Management Evaluation	Sections 6.2.6.2.1.3 and 9.3.1	SLR-302-241 SLR-302-242
2.3.3.35	Thermal Regeneration	Table 2.3.3-35, Thermal Regeneration Table 3.3.2-35, Auxiliary Systems – Thermal Regeneration - Aging Management Evaluation	Section 9.3.4	SLR-302-676
SLRA Section 2.3.4, “Steam and Power Conversion Systems”				
2.3.4.1	Auxiliary Boiler Steam and Feedwater	Table 2.3.4-1, Auxiliary Boiler Steam & Feedwater System Components Subject to Aging Management Review Table 3.4.2-1 Steam and Power Conversion System - Auxiliary Boiler Steam & Feedwater - Aging Management Evaluation	None	SLR-302-051

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
2.3.4.2	Condensate	Table 2.3.4-2, Condensate System Components Subject to Aging Management Review Table 3.4.2-2, Steam and Power Conversion System - Condensate - Aging Management Evaluation	Section 10.4.7.1	SLR-302-085
2.3.4.3	Emergency Feedwater	Table 2.3.4-3, Emergency Feedwater System Components Subject to Aging Management Review Table 3.4.2-3, Steam and Power Conversion System – Emergency Feedwater - Aging Management Evaluation	Section 10.4.9	SLR-302-085 SLR-302-322
2.3.4.4	Extraction Steam	Table 2.3.4-4, Extraction Steam System Components Subject to Aging Management Review Table 3.4.2-4, Steam and Power Conversion System - Extraction Steam - Aging Management Evaluation	Section 10.3.2.3	SLR-302-041
2.3.4.5	Feedwater	Table 2.3.4-5, Feedwater System Components Subject to Aging Management Review Table 3.4.2-5, Steam and Power Conversion System - Feedwater - Aging Management Evaluation	Section 10.4.7.2	SLR-302-083

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
2.3.4.6	Gland Sealing Steam	Table 2.3.4-6, Gland Sealing Steam System Components Subject to Aging Management Review Table 3.4.2-6, Steam and Power Conversion System - Gland Sealing Steam - Aging Management Evaluation	Sections 10.4.3 and 10.3.2.3	SLR-302-141
2.3.4.7	Main Steam	Table 2.3.4-7, Main Steam System Components Subject to Aging Management Review Table 3.4.2-7, Steam and Power Conversion System - Main Steam - Aging Management Evaluation	Sections 10.3, 10.3.2.3 and 5.5.7	SLR-302-011 SLR-302-012 SLR-302-014 SLR-302-121 SLR-302-122 SLR-302-123
2.3.4.8	Main Steam Dump	Table2.3.4-8, Main Steam Dump System Components Subject to Aging Management Review Table 3.4.2-8, Steam and Power Conversion System - Main Steam Dump - Aging Management Evaluation	Sections 10.4.4 and 10.3.2.3	SLR-302-031 SLR-302-121
2.3.4.9	Nuclear Blowdown Processing	Table 2.3.4-9, Nuclear Blowdown Processing Components Subject to Aging Management Review Table 3.4.2-9, Steam and Power Conversion System - Nuclear Blowdown Processing - Aging Management Evaluation	Section 10.4.8	SLR-302-782 SLR-302-783

SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems"				
2.3.4.10	Steam Generator Blowdown	Table 2.3.4-10, Steam Generator Blowdown System Components Subject to Aging Management Review Table 3.4.2-10, Steam and Power Conversion System - Steam Generator Blowdown - Aging Management Evaluation	Section 10.4.8 and Table 6.2-53	SLR-302-781
2.3.4.11	Turbine Cycle Chemical Feed	Table 2.3.4-11, Turbine Cycle Chemical Feed System Components Subject to Aging Management Review Table 3.4.2-11, Steam and Power Conversion System - Turbine Cycle Chemical Feed - Aging Management Evaluation	None	SLR-302-171
2.3.4.12	Turbine Cycle Sampling	Table 2.3.4-12, Turbine Cycle Sampling System Components Subject to Aging Management Review Table 3.4.2-12, Steam and Power Conversion System - Turbine Cycle Sampling - Aging Management Evaluation	Sections 10.3.5 and 10.3.2.3	SLR-302-181 SLR-302-182
2.3.4.13	Turbine Electro-Hydraulic	Table 2.3.4-13, Turbine Electro-Hydraulic System Components Subject to Aging Management Review	Sections 10.2.2.2 and 10.3.2.3	None

Additional Discussion

SLRA Section 2.3.1.3, "Reactor Coolant"

For VCSNS, the NRC staff reviewed SLRA Section 2.3.1.3, "Reactor Coolant"; NUREG-1787, *Safety Evaluation Report Related to the License Renewal of Virgil C. Summer Nuclear Station, Unit 1*, March 2004 (ML041040070); relevant subsequent license renewal boundary drawings; the Updated Final Safety Analysis Report (UFSAR), Chapter 9, Auxiliary Systems, Section 9.5.1, "Fire Protection;" and the following fire protection CLB, document listed in VCSNS fire protection license condition 2.C.18:

> Virgil C. Summer Nuclear Station, Unit 1 – Issuance of Amendment Regarding Transition to a Risk-Informed, Performance-Based Fire Protection Program in Accordance with Title 10 of the *Code of Federal Regulations* Section 50.48(c) (TAC No. ME7586), February 21, 2015 (ML14287A289).

The VCSNS fire protection program is based on compliance with 10 CFR 50.48(a), 10 CFR 50.48(c), "*National Fire Protection Association Standard NFPA 805*," and the VCSNS fire protection license condition. On February 21, 2015, the NRC issued a license amendment for VCSNS to incorporate the NFPA 805 fire protection licensing basis in accordance with 10 CFR 50.48(c).

The amendment authorized transition of the licensee's fire protection program to a risk-informed, performance-based program based on the 2001 Edition of NFPA 805. The NFPA 805 standard describes how to use performance-based methods, such as risk-informed methods, fire probabilistic risk assessment, and fire modeling to demonstrate compliance with nuclear safety performance criteria (similar to compliance with post-fire safe-shutdown requirements in Appendix R to 10 CFR Part 50), and to assure that SSCs (safety-related and important to safety) are protected from fire. The purpose of the fire protection program established by the NFPA 805 is to provide assurance, through a defense-in-depth design, that a fire will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition or significantly increase the risk of radioactive releases to the environment during any operational mode or plant configuration.

During its review, the NRC staff evaluated the RCP motor oil collection system and components described in the SLRA, UFSAR, and subsequent license renewal boundary drawings to verify that the applicant included within the scope of license renewal all components with intended function, as described in 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of license renewal to verify that it included all passive or long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The NRC staff confirmed that the RCP motor oil collection system and associated components are included in SLRA Table 2.3.1-3, "Reactor Coolant," with AMR results in SLRA Table 3.1.2-3, "Reactor Vessel, Internals, and Reactor Coolant System – Reactor Coolant – Aging Management Evaluation." The staff confirmed that these components are highlighted in the subsequent license renewal boundary drawings. Based on the information in the SLRA boundary drawings, UFSAR, and CLB documents, the NRC staff did not identify any omissions by the applicant in the scoping of the fire protection systems and components in accordance with 10 CFR 54.4(a).

SLRA Section 2.3.3.13, "Fire Service"

For VCSNS, the NRC staff reviewed the SLRA Section 2.3.3.13, "Fire Service"; NUREG-1787; relevant subsequent license renewal boundary drawings, UFSAR, Chapter 9, Auxiliary Systems, Section 9.5.1, and the following fire protection CLB, document listed in VCSNS fire protection license condition 2.C.18:

> Virgil C. Summer Nuclear Station, Unit 1 – Issuance of Amendment Regarding Transition to a Risk-Informed, Performance-Based Fire Protection Program in Accordance with Title 10 of the *Code of Federal Regulations* Section 50.48(c) (TAC No. ME7586), February 21, 2015 (ML14287A289).

The VCSNS fire protection program is based on compliance with 10 CFR 50.48(a), 10 CFR 50.48(c), and the VCSNS fire protection license condition. On February 21, 2015, the NRC issued a license amendment for the VCSNS to incorporate the NFPA 805 fire protection licensing basis in accordance with the 10 CFR 50.48(c). The amendment authorized the transition of the licensee's fire protection program to a risk-informed, performance-based program based on the 2001 Edition of NFPA 805. The NFPA 805 standard describes how to use performance-based methods, such as risk-informed methods, fire probabilistic risk assessment, and fire modeling, to demonstrate compliance with nuclear safety performance criteria and to assure that SSCs (safety-related and important to safety) are protected from fire. The purpose of the fire protection program established by NFPA 805 is to provide assurance, through a defense-in-depth design, that a fire will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition or significantly increase the risk of radioactive releases to the environment during any operational mode or plant configuration.

During its review, the NRC staff evaluated the fire protection components described in the SLRA, UFSAR, and subsequent license renewal boundary drawings to verify that the applicant included within the scope of subsequent license renewal all components with an intended function, as described in 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of subsequent license renewal to verify that it included all passive or long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

SLRA Table 2.3.3-13 identifies the fire protection system component types that are within the scope of the subsequent license renewal, with AMR results in SLRA Table 3.3.2-13.

A virtual audit was held with the Dominion Energy South Carolina, Inc. (DESC) staff for fire protection on the scoping and screening topics through a breakout session on January 11, 2024. The NRC staff discussed fire protection, scoping, and screening audit questions; interviewed DESC staff, and reviewed documentation provided by the applicant.

During the discussion, the DESC staff addressed the NRC staff's concerns as identified in the SLRA Section 2.3.3-13 audit question related to the passive components in the incipient fire detection system installed in the relay and upper cable spreading rooms. The DESC staff stated that the incipient fire detection installed in the relay and upper cable spreading rooms are credited under the NFPA 805 licensing basis within the scope of subsequent license renewal and are, therefore, subject to an AMR. However, detectors and indicators/alarms are active components and are not subject to an AMR. Passive electrical components associated with the incipient detection system (i.e., cables and connections), are evaluated as commodities in SLRA Section 2.5 with the associated AMR results in Section 3.6. Further, the DESC staff stated that they planned to submit a supplement to its SLRA addressing the NRC staff's concerns. Based on the licensee's intent to submit a supplement to its SLRA, the NRC staff did not identify the need for any additional information for the SLRA Section 2.3.3-13, scoping, and screening review.

In the SLRA, Supplement 1, dated April 1, 2024 (ML24095A207), the applicant provided a revision to the SLRA which included the passive components in the incipient fire detection installed in the relay and upper cable spreading rooms within the scope of subsequent license renewal and subject to an AMR.

The NRC staff concludes that the DESC addressed and resolved the NRC staff's concern in response to the audit question as discussed above, and adequately identified the incipient detection system components within the scope of subsequent license renewal and subject to an AMR as required by 10 CFR 54.4(a) and 10 CFR 54.21(a)(1), respectively.

2.3.3 Conclusion

Based on a review of the SLRA, FSAR, and LRBDs, the NRC 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 NRC staff to confirm that there were no omissions of SCs that meet the scoping criteria and that are subject to an AMR.

The NRC staff's evaluation of the information in the SLRA was the same for all structures and structural components. The objective was to determine whether the applicant identified, in accordance with 10 CFR 54.4, structures and structural components that meet the 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 NRC 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 FSAR, for each structure in order 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 NRC staff evaluated the applicant's screening results. For those SCs with intended functions included under 10 CFR 54.4(a), the staff verified that the applicant properly screened out only: (1) SCs that have functions performed with moving parts or that have a change in configuration or properties, or (2) SCs that are subject to replacement after a qualified life or specified time period, as described in 10 CFR 54.21(a)(1). The NRC 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 2.4.21, as listed below, describe the structures and structural components subject to an AMR and the boundaries of the structures:

- SLRA Section 2.4.1.1, "Reactor Building"
- SLRA Section 2.4.1.2, "Auxiliary Building"
- SLRA Section 2.4.1.3, "Auxiliary Service Building"
- SLRA Section 2.4.1.4, "Circulating Water Intake Structure"

- SLRA Section 2.4.1.5, “Component Supports”
- SLRA Section 2.4.1.6, “Control Building”
- SLRA Section 2.4.1.7, “Diesel Generator Building”
- SLRA Section 2.4.1.8, “Duct Banks”
- SLRA Section 2.4.1.9, “Earthen Embankments”
- SLRA Section 2.4.1.10, “Electrical Manholes”
- SLRA Section 2.4.1.11, “Electrical Substation and Transformer Areas”
- SLRA Section 2.4.1.12, “Fuel Handling Building”
- SLRA Section 2.4.1.13, “Intermediate Building”
- SLRA Section 2.4.1.14, “Miscellaneous Structural Commodities”
- SLRA Section 2.4.1.15, “NSSS Supports”
- SLRA Section 2.4.1.16, “Service Water Discharge Structure”
- SLRA Section 2.4.1.17, “Service Water Intake Structure”
- SLRA Section 2.4.1.18, “Service Water Pumphouse”
- SLRA Section 2.4.1.19, “Tank and Equipment Foundations”
- SLRA Section 2.4.1.20, “Turbine Building”
- SLRA Section 2.4.1.21, “Water Treatment Building”

SLRA Tables 2.4-1 through 2.4-21 list the structures and structural component types subject to an AMR and their intended functions. SLRA tables 3.5.2-1 through 3.5.2-21 provide the results of the applicant’s AMR for structures and structural components.

2.4.2 Staff Evaluation

The NRC staff evaluated the system functions described in the SLRA and FSAR using guidance in NUREG 2192, Section 2.4, “Scoping and Screening Results: Structures,” 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 NRC staff’s review of the SLRA, FSAR, 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 NRC staff also concludes that the applicant adequately identified the passive, long-lived SCs subject to an AMR in accordance with the requirements in 10 CFR 54.21(a)(1).

2.5 Scoping and Screening Results: Electrical and Instrumentation and Controls

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

In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant must list passive, long-lived SCs that are within the scope of SLR and that are subject to an AMR. To verify that the applicant properly implemented its methodology, the NRC staff 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 NRC staff's evaluation of the information in the SLRA was the same for all electrical and I&C components. The objective was to determine whether the applicant identified, in accordance with 10 CFR 54.4, components that meet the 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 NRC 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 FSAR, 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 NRC staff evaluated the applicant's screening results. For those SCs with intended functions included under 10 CFR 54.4(a), the staff verified that the applicant properly screened out only: (1) SCs that have functions performed with moving parts or that have a change in configuration or properties, or (2) SCs that are subject to replacement after a qualified life or specified time period, as described in 10 CFR 54.21(a)(1). The NRC staff confirmed in the AMR that the applicant only 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 Tables 2.5.1-1 through 2.5.1-3 list the electrical and I&C system components subject to an AMR and their intended functions. SLRA Tables 3.6.2-1 through 3.6.2-3 provide the results of the applicant's AMR for electrical and I&C system components.

2.5.2 Staff Evaluation

2.5.2.1 Components within the Scope of Subsequent License Renewal

Plant SSCs that perform specific functions within the scope of license renewal are identified in 10 CFR 54.4(a). SRP-SLR and RG 1.188, Rev.2, provide the guidance on the scoping of electrical and I&C SSCs based on the license renewal intended functions identified in 10 CFR 54.4(a). In addition, SRP-SLR, Section 2.5.2.1.1, "Components Within the Scope of SBO (10 CFR 50.63)," provides the guidance to identify components in the onsite and offsite power systems that are relied upon to meet the requirements of 10 CFR 50.63 (i.e., the SBO rule) for license renewal, as required by 10 CFR 54.4(a)(3). The electrical components used to meet the requirements of 10 CFR 50.63 include electrical components used to cope with and recover from an SBO. The offsite power system for SBO recovery includes the portion that is used to connect the plant to the offsite power source, which meets the requirements under 10 CFR 54.4(a)(3).

The applicant performed an initial plant-level scoping of the nuclear power plant's electrical and I&C systems in accordance with the scoping criteria identified in 10 CFR 54.4(a) using the scoping methodology described in the SLRA, Section 2.1.4, "Scoping methodology." The applicant identified the safety classifications and functions of the electrical and I&C systems and evaluated these systems' functions against the criteria of 10 CFR 54.4(a)(1), (a)(2), and (a)(3). The results of the applicant's plant-level scoping for electrical and I&C systems are provided in the SLRA Table 2.2-1, "Plant-Level Scoping Report Results." The NRC staff's evaluation for the plant-level scoping results for the electrical and I&C systems is provided in Section 2.2, "Plant Level Scoping Results," of this SE.

In SLRA Section 2.1.4.5, "Scoping Boundary Determination," the applicant states that electrical and I&C components within in-scope systems located in SLRA Table 2.2-1 were included within the scope of SLR. SLRA Section 2.5, "Scoping and Screening Results: Electrical and Instrumentation and Control Systems," states that SLRA Table 2.2-1 includes switchyard components credited with restoring offsite power. SLRA Table 2.2-1 indicates that the 230-kV and 115-kV Parr Engineered Safety Features (ESF) substations are in-scope of license renewal. In SLRA Revision 0 and Supplement 2, Section 2.1.3.4, "10 CFR 54.4(a)(3) – Regulated Events," the applicant describes the in-scope electrical components that are relied upon to recover from an SBO event in accordance with the guidance in the SRP-SLR. The in-scope electrical components for recovery from an SBO event include components in the offsite power systems from:

- the 115-kV Parr ESF Line disconnect switches, circuit breakers, associated control components (including cables), voltage regulators, switchyard bus, high voltage insulators to connect the 115-kV Parr ESF Line, circuit switcher XES4 to the ESF transformer XTF-4 down to and including the ESF buses XSW-1DA and XSW-1DB via bus XSW-1DX and insulated cables, cable bus, and circuit breakers; and
- the 230-kV Bus #3 disconnect switches, circuit breakers, associated control components (including cables), transmission conductors, switchyard bus, high voltage insulators to connect the 230-kV Bus #3 Breaker XCB-8892 to the Emergency Auxiliary Transformer XTF-31 down to the ESF buses XSW-1DA and XSW-1DB via insulated cables, cable bus, and circuit breakers.

The in-scope electrical components for recovery from an SBO event also include the emergency diesel generators with associated controls and support equipment connected to the ESF buses XSW-1DA and XSW-1DB through cables and circuit breakers. The boundary for the SBO offsite power recovery path is depicted in SLRA Supplement 1, Figure 2.1-1, "SBO Offsite Recovery Path."

The NRC staff reviewed the in-scope electrical systems in Section 2.1.3.4 of SLRA Revision 0, Supplement 1, and Supplement 2; Figure 2.1-1 of SLRA Supplement 1; and Section 8.4, "Station Blackout," of FSAR to confirm that the applicant did not omit any equipment required to comply with 10 CFR 50.63 for license renewal in accordance with the guidance in SRP-SLR. Based on its review, the NRC staff finds that the electrical components provided for the restoration of offsite power following an SBO event conforms to the guidance in SRP-SLR for meeting 10 CFR 50.63 and are, therefore, acceptable. In addition, because all electrical and I&C components within in-scope systems in SLRA Table 2.2-1 were included within the scope of SLR, the NRC staff finds that the applicant has identified the components within the scope of SLR for the electrical and I&C systems.

2.5.2.2 Components Subject to an Aging Management Review

The requirement to identify structures and components subject to an AMR is specified in 10 CFR 54.21(a)(1). The SRP-SLR and RG 1.188, Rev.2 provide the guidance on the screening of electrical and I&C components based on the screening criteria in 10 CFR 54.21(a)(1) as well as the commodity grouping of components. In addition, 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.

The applicant’s screening methodology for the in-scope electrical and I&C components is described in Section 2.1.5.1, “Identification of Structures and Components Subject to AMR,” of the SLRA. The applicant used a component commodity group approach, as described in the SRP-SLR and NEI 17-01, as endorsed in RG 1.188, Rev. 2, to screen the electrical and I&C components subject to AMR. This screening methodology involved (1) placing the in-scope electrical and I&C components in commodity groups, and (2) applying the screening criteria of 10 CFR 54.21(a)(1) to the in-scope electrical and I&C commodity groups to identify passive and long-lived commodity groups that perform/support a license renewal intended function and require an AMR.

In SLRA, Revision 0 as well as Supplement 1, Section 2.5, the applicant stated that the electrical and I&C components for the in-scope systems were assigned to commodity groups based on similar design and/or functional characteristics. The applicant also stated that the electrical and I&C commodity groups are based on the listing of SRP-SLR Table 2.1-6. The applicant applied the screening criterion of 10 CFR 54.21(a)(1)(i) to the commodity groups to identify those that perform their functions without moving parts or without a change in configuration or properties (i.e., passive). The passive electrical and I&C commodity groups are provided in SLRA, Section 2.5. The applicant eliminated passive electrical and I&C commodity groups that did not perform an intended function, which is defined in SLRA Table 2.1-1, “Passive Structure and Component Intended Function Definitions.”

The applicant eliminated uninsulated ground conductors from the passive commodity groups because ground conductors are necessary for equipment and personnel protection, and they do not perform an intended function for license renewal. The NRC staff reviewed the VCSNS FSAR and confirmed that uninsulated ground conductors are not credited in the VCSNS design basis and have no requirements associated with them. Therefore, the NRC staff finds it acceptable to eliminate uninsulated ground conductors from the scope of SLR because they have no license renewal intended function, as described in 10 CFR 54.4.

Table 2.1-6 in the SRP-SLR, indicates that the commodity groups of elements and sensors 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, “Scoping and Screening Results: Mechanical Systems,” the applicant discussed the pressure boundary function of flow elements and radiation monitors (e.g., sensors). The NRC staff’s evaluation of these components is provided in Section 2.3 of this SE.

The applicant applied the screening criterion of 10 CFR 54.21(a)(1)(ii) to 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) to be subjected to an AMR. Based on 10 CFR 54.21(a)(1)(ii), the applicant excluded from the AMR all electrical and I&C components and commodities included in the EQ of electric equipment aging management program because these commodities have defined qualified lives and are subject to replacement based on their qualified lives. Electrical penetrations pigtails, which are passive components according to SLRA Section 2.5, are excluded from AMR because they are part of electrical penetrations that are included in the EQ Program, as stated in SLRA Section 2.4.1.1, "Reactor Building." Also, SLRA Section 2.5.1.2, "Cables and Connections," states that cables and connections that are within the cables and connections commodity group and the EQ Program are not subject to an AMR in accordance with the screening criteria of 10 CFR 54.21(a)(1)(ii). The NRC staff finds it acceptable to eliminate electrical and I&C components that are included in the EQ Program from the passive, long-lived commodity groups because the elimination is consistent with the requirements of 10 CFR 54.21(a)(1)(ii).

The applicant subjected the remaining passive and long-lived electrical and I&C components and commodity groups, all or part of which are not in the VCSNS EQ Program, to AMR. In addition, SLRA, Table 2.5.1-1, "Cable Bus," Table 2.5.1-2, "Cables and Connections," and Table 2.5.1-3, "High Voltage Insulators," listed the following electrical and I&C components and commodity groups that are subjected to an AMR with their associated component intended functions:

- Cables Bus enclosure assembly (includes Tap Box enclosure) – Enclosure Protection
- Cable Bus insulation, insulators – Insulate
- Cable Connections (metallic parts) – Conducts Electricity
- Connector contacts for electrical connections exposed to borated water leakage – Conducts Electricity
- Fuse Holder - Not Part of Active Equipment (Insulation Material) – Insulate
- Fuse Holder - Not Part of Active Equipment (metallic clamps) – Conducts Electricity
- Insulation Material for Electrical Cable and Connections Used in Instrumentation Circuits – Insulate
- Insulation Material for Electrical Cable and Connections – Insulate
- Insulation Material for Inaccessible or Below Ground Instrumentation and Control Cable – Insulate
- Insulation Material for Inaccessible or Below Ground Low Voltage Power Cable – Insulate
- Insulation Material for Inaccessible or Below Ground Medium Voltage Power Cable – Insulate
- Switchyard bus and connections – Conducts Electricity
- Transmission conductors – Conducts Electricity
- Transmission connectors – Conducts Electricity
- High Voltage Insulators – Insulate

The NRC staff reviewed the above list of components and commodity groups in SLRA Section 2.5.1 to verify that the applicant did not omit any passive and long-lived components that meet the screening criteria of 10 CFR 54.21(a)(1). Based on its review, the staff finds that the VCSNS 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 NRC staff concludes that the applicant has identified the electrical and I&C components subject to an AMR in accordance with 10 CFR 54.21(a)(1).

2.5.3 Conclusion

Based on the NRC staff's evaluation in SE Section 2.5.2 and its review of the SLRA and FSAR, 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 NRC staff also concludes that the applicant identified the components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.6 Conclusion for Scoping and Screening

Based on its review of the information in SLRA Section 2.0, the NRC 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).

Furthermore, the NRC staff found that the applicant adequately identified those SSCs that are 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 Dominion Energy South Carolina, Inc. (DESC or the applicant), aging management reviews (AMRs) and aging management programs (AMPs) for Virgil C. Summer Nuclear Station, Unit No. 1 (V.C. Summer or VCSNS).

The applicant described these AMRs and AMPs in its subsequent license renewal application (SLRA) for V.C. Summer. 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 49 AMPs that the applicant will rely on to manage or monitor the aging of passive, long-lived SCs.

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

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

(2) engineered safety features (SE Section 3.2)

(3) auxiliary systems (SE Section 3.3)

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

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

(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 (ADAMS Accession Nos. 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 (RG) 1.188, Revision 2, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses," issued April 2020 (ML20017A265).

The organization of 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 VCSNS 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: (1) consistent with the GALL-SLR Report, (2) consistent with the GALL-SLR Report but uses a different AMP to manage aging effects, or (3) is not applicable at VCSNS. 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 the following three types of evaluations of VCSNS 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 an 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 November 6, 2023, to March 21, 2024, in accordance with the audit plan dated October 25, 2023 (ML23296A109) and as detailed in the audit report dated June 25, 2024 (ML24085A699).

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 SLR

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

(3) "parameters monitored or inspected" – should be linked to the degradation of the 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. OEs 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 (UFSAR) supplement for the facility that must contain a summary description of the programs and activities for managing the effects of aging and the evaluation of time-limited aging analyses for the period of extended operation determined by the integrated plant assessment and the evaluation of time-limited aging analyses, respectively. Consistent with the SRP-SLR, the staff reviewed the final safety analysis report (FSAR) 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 3.0-1 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. V.C. Summer Aging Management Programs

V.C. Summer 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	A2.1 B3.1	Existing	Consistent with enhancements	X.M1 Fatigue Monitoring	3.0.3.2.1
Neutron Fluence Monitoring	A2.2 B3.2	Existing	Consistent with exception	X.M2 Neutron Fluence Monitoring	3.0.3.2.2
Environmental Qualification of Electric Equipment	A2.3 B3.3	Existing	Consistent	X.E1 Environmental Qualification (EQ) of Electric Components	3.0.3.1.1
Concrete Containment Unbonded Tendon Prestress	A2.4 B3.4	Existing	Consistent with exception and enhancements	X.S1 Concrete Containment Tendon Prestress	3.0.3.2.3

V.C. Summer Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-2191 GALL-SLR Report	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in This Safety Evaluation
ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	A1.1 B2.1.1	Existing	Consistent with enhancement	XI.M1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	3.0.3.2.4
Water Chemistry	A1.2 B2.1.2	Existing	Consistent	XI.M2 Water Chemistry	3.0.3.1.2
Reactor Head Closure Stud Bolting	A1.3 B2.1.3	Existing	Consistent with exception and enhancements	XI.M3 Reactor Head Closure Stud Bolting	3.0.3.2.5
Boric Acid Corrosion	A1.4 B2.1.4	Existing	Consistent	XI.M10 Boric Acid Corrosion	3.0.3.1.3
Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components	A1.5 B2.1.5	Existing	Consistent	XI.M11B Cracking of Nickel-Alloy Components and Loss of Material due to Boric Acid- Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs Only)	3.0.3.1.4
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	A1.6 B2.1.6	Existing	Consistent	XI.M12 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	3.0.3.1.5
PWR Vessel Internals	A1.7 B2.1.7	Existing	Consistent with enhancements	XI.M16A PWR Vessel Internals	3.0.3.2.6
Flow-Accelerated Corrosion	A1.8 B2.1.8	Existing	Consistent	XI.M17 Flow-Accelerated Corrosion (FAC)	3.0.3.1.6
Bolting Integrity	A1.9 B2.1.9	Existing	Consistent with enhancements	XI.M18 Bolting Integrity	3.0.3.2.7
Steam Generators	A1.10 B2.1.10	Existing	Consistent with exceptions	XI.M19 Steam Generators	3.0.3.2.8
Open-Cycle Cooling Water System	A1.11 B2.1.11	Existing	Consistent with enhancements	XI.M20 Open-Cycle Cooling Water System	3.0.3.2.9
Closed Treated Water Systems	A1.12 B2.1.12	Existing	Consistent with enhancements	XI.M21A Closed Treated Water Systems	3.0.3.2.10
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	A1.13 B2.1.13	Existing	Consistent with enhancements	XI.M23 Inspection of Overhead Heavy Load and Light Load Handling Related to Refueling) Handling Systems	3.0.3.2.11
Compressed Air Monitoring	A1.14 B2.1.14	Existing	Consistent with enhancements	XI.M24 Compressed Air Monitoring	3.0.3.2.12

V.C. Summer 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
Fire Protection	A1.15 B2.1.15	Existing	Consistent with enhancements	XI.M26 Fire Protection	3.0.3.2.13
Fire Water System	A1.16 B2.1.16	Existing	Consistent with enhancements	XI.M27 Fire Water System	3.0.3.2.14
Outdoor and Large Atmospheric Metallic Storage Tanks	A1.17 B2.1.17	New	Consistent	XI.M29 Outdoor and Large Atmospheric Metallic Storage Tanks	3.0.3.1.7
Fuel Oil Chemistry	A1.18 B2.1.18	Existing	Consistent with enhancements	XI.M30 Fuel Oil Chemistry	3.0.3.2.15
Reactor Vessel Material Surveillance	A1.19 B2.1.19	Existing	Consistent	XI.M31 Reactor Vessel Material Surveillance	3.0.3.1.8
One-Time Inspection	A1.20 B2.1.20	New	Consistent	XI.M32 One-Time Inspection	3.0.3.1.9
Selective Leaching	A1.21 B2.1.21	New	Consistent	XI.M33 Selective Leaching	3.0.3.1.10
ASME Code Class 1 Small-Bore Piping	A1.22 B2.1.22	Existing	Consistent with enhancements	XI.M35 ASME Code Class 1 Small-Bore Piping	3.0.3.2.16
External Surfaces Monitoring of Mechanical Components	A1.23 B2.1.23	Existing	Consistent with enhancements	XI.M36 External Surfaces Monitoring of Mechanical Components	3.0.3.2.17
Flux Thimble Tube Inspection	A1.24 B2.1.24	Existing	Consistent with enhancement	XI.M37 Flux Thimble Tube Inspection	3.0.3.2.18
Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	A1.25 B2.1.25	Existing	Consistent with enhancements	XI.M38 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	3.0.3.2.19
Lubricating Oil Analysis	A1.26 B2.1.26	Existing	Consistent with enhancements	XI.M39 Lubricating Oil Analysis	3.0.3.2.20
Monitoring of Neutron-Absorbing Materials Other Than Boraflex	A1.27 B2.1.27	Existing	Consistent	XI.M40 Monitoring of Neutron-Absorbing Materials Other Than Boraflex	3.0.3.1.11
Buried and Underground Piping and Tanks	A1.28 B2.1.28	Existing	Consistent with enhancements	XI.M41 Buried and Underground Piping and Tanks	3.0.3.2.21
Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	A1.29 B2.1.29	New	Consistent	XI.M42 Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	3.0.3.1.12

V.C. Summer Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	Final Comparison to the NUREG-2191 GALL-SLR Report	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in This Safety Evaluation
ASME Section XI, Subsection IWE	A1.30 B2.1.30	Existing	Consistent with enhancements	XI.S1 ASME Section XI, Subsection IWE Inservice Inspection (IWE)	3.0.3.2.22
ASME Section XI, Subsection IWL	A1.31 B2.1.31	Existing	Consistent	XI.S2 ASME Section XI, Subsection IWL Inservice Inspection (IWL)	3.0.3.1.13
ASME Section XI, Subsection IWF	A1.32 B2.1.32	Existing	Consistent with exception and enhancements	XI.S3 ASME Section XI, Subsection IWF Inservice inspection (IWF)	3.0.3.2.23
10 CFR Part 50, Appendix J	A1.33 B2.1.33	Existing	Consistent	XI.S4 10 CFR Part 50, Appendix J	3.0.3.1.14
Masonry Walls	A1.34 B2.1.34	Existing	Consistent with enhancements	XI.S5 Masonry Walls	3.0.3.2.24
Structures Monitoring	A1.35 B2.1.35	Existing	Consistent with enhancements	XI.S6 Structures Monitoring	3.0.3.2.25
Inspection of Water-Control Structures Associated with Nuclear Power Plants	A1.36 B2.1.36	Existing	Consistent with enhancements	XI.S7 Inspection of Water-Control Structures Associated with Nuclear Power Plants	3.0.3.2.26
Protective Coating Monitoring and Maintenance	A1.37 B2.1.37	Existing	Consistent	XI.S8 Protective Coating Monitoring and Maintenance	3.0.3.1.15
Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	A1.38 B2.1.38	Existing	Consistent with enhancements	XI.E1 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.2.27
Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements used in Instrumentation Circuits	A1.39 B2.1.39	Existing	Consistent	XI.E2 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	3.0.3.1.16

V.C. Summer 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	A1.40 B2.1.40	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	A1.41 B2.1.41	New	Consistent	XI.E3B Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.1.17
Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	A1.42 B2.1.42	New	Consistent	XI.E3C Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.1.18
Fuse Holders	A1.43 B2.1.43	New	Consistent	XI.E5 Fuse Holders	3.0.3.1.19
Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	A1.44 B2.1.44	New	Consistent	XI.E6 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.1.20
High-Voltage Insulators	A1.45 B2.1.45	New	Consistent	XI.E7 High-Voltage Insulators New AMP	3.0.3.1.21

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:

- Environmental Qualification of Electric Equipment
- Water Chemistry
- Boric Acid Corrosion
- Cracking of nickel-alloy components and loss of material due to boric acid-induced corrosion in reactor coolant pressure boundary components

- Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)
- Flow-Accelerated Corrosion
- Outdoor and Large Atmospheric Metallic Storage Tanks
- Reactor Vessel Material Surveillance
- One-Time Inspection
- Selective Leaching
- Monitoring of Neutron-Absorbing Materials Other Than Boraflex
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks
- ASME Section XI, Subsection IWL
- 10 CFR Part 50, Appendix J
- Protective Coating Monitoring and Maintenance
- 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 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
- Fuse Holders
- Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- High-Voltage Insulators

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 FSAR supplement summary of the program.

3.0.3.1.1 Environmental Qualification of Electric Equipment

SLRA Section B3.3 describes the existing Environmental Qualification of Electric Equipment as consistent with GALL-SLR Report AMP X.E1, "Environmental Qualification of Electric Equipment."

<u>Staff Evaluation</u>

During its audit (ML24085A699), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding elements of GALL-SLR Report AMP X.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 X.E1.

Operating Experience

SLRA Section B3.3 summarizes OE related to the Environmental Qualification of Electric Equipment. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant OE information to: (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database and (2) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the 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 was evaluated.

FSAR Supplement

SLRA Section A3.4 provides the FSAR supplement for the Environmental Qualification of Electric Equipment. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table X-01.

The staff also noted that the applicant committed to ongoing implementation of the existing Environmental Qualification of Electric Equipment for managing the effects of aging for applicable components during the subsequent period of extended operation.

Conclusion

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

3.0.3.1.2 Water Chemistry

SLRA Section B2.1.2 describes the existing Water Chemistry program as consistent with GALL-SLR Report AMP XI.M2, “Water Chemistry,” as modified by SLR-ISG-2021-02-MECHANICAL, “Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance,” dated February 2021 (ML20181A434).

Staff Evaluation

During its audit (ML24085A699), 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 element(s) of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M2, as modified by SLR-ISG-2021-02-MECHANICAL. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M2, as modified by SLR-ISG-2021-02-MECHANICAL.

Operating Experience

SLRA Section B2.1.2 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 (ML24085A699), 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 Water Chemistry program was evaluated.

FSAR Supplement

SLRA Section A1.2 provides the FSAR supplement for the Water Chemistry program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing Water Chemistry program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

Based on its review of the applicant's Water Chemistry program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.3 Boric Acid Corrosion

SLRA Section B2.1.4 describes the existing Boric Acid Corrosion Program as consistent with GALL-SLR Report AMP XI.M10, "Boric Acid Corrosion."

Staff Evaluation

During its audit (ML24085A699), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M10. Based on a review of the SLRA, the staff finds that the program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M10.

Operating Experience

SLRA Section B2.1.4 summarizes OE related to the Boric Acid Corrosion Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, 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 Boric Acid Corrosion Program was evaluated.

FSAR Supplement

SLRA Section A1.4 provides the FSAR supplement for the Boric Acid Corrosion Program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing Boric Acid Corrosion 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 FSAR supplement is an adequate summary description of the program.

Conclusion

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

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

SLRA Section B2.1.5 describes the existing Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components program as consistent with GALL-SLR Report AMP XI.M11B, "Cracking of

Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components."

Staff Evaluation

During its audit (ML24085A699), the staff reviewed 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 program to the corresponding program elements of GALL-SLR Report AMP XI.M11B.

Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M11B.

Operating Experience

SLRA Section B2.1.5 summarizes operating experience (OE) related to the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the 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 Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components program was evaluated.

FSAR Supplement

SLRA Section A1.5 provides the FSAR supplement for the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components 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 FSAR supplement is an adequate summary description of the program.

Conclusion

Based on its review of the applicant's Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.5 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel

SLRA Section B2.1.6 describes the existing Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) program as consistent with GALL-SLR Report AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)."

Staff Evaluation

During its audit (ML24085A699), the staff reviewed 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 program to the corresponding program elements of GALL-SLR Report AMP XI.M12.

Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M12.

Operating Experience

SLRA Section B2.1.6 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, 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.

FSAR Supplement

SLRA Section A1.6 provides the FSAR supplement for the Thermal Aging Embrittlement of CASS program. The staff reviewed this FSAR 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 Thermal Aging Embrittlement of CASS 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 FSAR 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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.6 Flow- Accelerated Corrosion

SLRA Section B2.1.8 describes the existing flow-accelerated corrosion program as consistent with GALL-SLR Report AMP XI.M17, “Flow-Accelerated Corrosion.”

Staff Evaluation

During its audit (ML24085A699), the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA of the applicant’s program to the corresponding program elements of GALL-SLR Report AMP XI.M17.

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.M17.

Operating Experience

SLRA Section B2.1.8 summarizes OE related to the flow-accelerated corrosion program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, 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 flow-accelerated corrosion program was evaluated.

FSAR Supplement

SLRA Section A1.8 provides the FSAR supplement for the flow-accelerated corrosion program. The staff reviewed this FSAR 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 flow-accelerated corrosion 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 FSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.1.7 Outdoor and Large Atmospheric Metallic Storage Tanks

SLRA Section B2.1.17 describes the new Outdoor and Large Atmospheric Metallic Storage Tanks program as consistent with the GALL-SLR Report AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks."

Staff Evaluation

During its audit (ML24085A699), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M29.

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.M29.

Operating Experience

SLRA Section B2.1.17 summarizes OE related to the Outdoor and Large Atmospheric Metallic Storage Tanks program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24085A699), the staff reviewed search results of the plant OE information to (1) to identify examples of age-related degradation, as documented in the applicant's corrective action program database and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the 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 Outdoor and Large Atmospheric Metallic Storage Tanks program was evaluated.

FSAR Supplement

SLRA Appendix A Section A1.17 provides the FSAR supplement for the Outdoor and Large Atmospheric Metallic Storage Tanks program. The staff reviewed this FSAR 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 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 FSAR 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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.8 Reactor Vessel Material Surveillance

SLRA Section B2.1.19 describes the existing Reactor Vessel Material Surveillance as consistent with GALL-SLR Report AMP XI.M31 "Reactor Vessel Material Surveillance."

Staff Evaluation

During its audit (ML24085A699), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M31.

The staff noted that the GALL-SLR Report recommends that one reactor vessel surveillance capsule be withdrawn at an outage with a neutron fluence between one and two times the projected peak reactor vessel wall neutron fluence at the end of the subsequent period of extended operation. The applicant's current surveillance capsule withdrawal schedule will insert the previously withdrawn capsule Y into the reactor vessel and remove it from the reactor vessel at an outage when it receives a neutron fluence of 1.14×10^{20} n/cm^2. This neutron fluence is between one and two times the peak, projected inside radius neutron fluence for the reactor vessel of 6.52×10^{19} n/cm^2 to 1.304×10^{20} n/cm^2. This surveillance capsule withdrawal schedule was proposed to the NRC by the applicant by letter of January 23, 2023, (ML23024A154) and approved by the NRC by letter of September 20, 2023 (ML23250A311).

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.M31

Operating Experience

SLRA Section B2.1.19 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 (ML24085A699), 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 Reactor Vessel Material Surveillance program was evaluated.

FSAR Supplement

SLRA Section A1.19 provides the FSAR supplement for the Reactor Vessel Material Surveillance program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff finds that the information in the FSAR 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 concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.9 One-Time Inspection

SLRA Section B2.1.20 describes the new One-Time Inspection as consistent with GALL-SLR Report AMP XI.M32, "One-Time Inspection."

Staff Evaluation

During its audit (ML24085A699), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M32.

Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M32

Operating Experience

SLRA Section B2.1.20 summarizes OE related to the One-Time Inspection. The staff reviewed OE information in the application and during the audit. As discussed in the Audit

Report, the staff reviewed search results of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the 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 was evaluated.

FSAR Supplement

SLRA Section A1.20 provides the FSAR supplement for the One-Time Inspection. The staff reviewed this FSAR 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 implementation of the new program 10 years before the subsequent period of extended operation, and that for those inspections that are to be completed prior to the subsequent period of extended operation, they are completed either 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 FSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.1.10 Selective Leaching

SLRA Section B2.1.21 describes the new Selective Leaching program as consistent with GALL-SLR Report AMP XI.M33, "Selective Leaching."

Staff Evaluation

During its audit (ML24085A699), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M33.

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.M33.

Operating Experience

SLRA Section B2.1.21 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 (ML24085A699), the staff reviewed plant OE information from 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.

FSAR Supplement

SLRA Section A1.21 provides the FSAR supplement for the Selective Leaching program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted the applicant committed to implement the new Selective Leaching program and begin inspections 10 years prior to the subsequent period of extended operation for managing the effects of aging for applicable components. For inspections that are to be completed prior to the subsequent period of extended operation, the staff also noted that the applicant committed to complete these inspections 6 months prior to the subsequent period of extended operation or no later than the last refueling outage prior to the subsequent period of extended operation. The staff finds that the information in the FSAR 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 concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.11 Monitoring of Neutron-Absorbing Materials Other Than Boraflex

SLRA Section B2.1.27 describes the existing Monitoring of Neutron-Absorbing Materials Other Than Boraflex program as consistent with GALL-SLR Report AMP XI.M40, "Monitoring of Neutron-Absorbing Materials Other Than Boraflex."

Staff Evaluation

During its audit (ML24085A699), 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 element(s) of the SLRA 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 B2.1.27 summarizes OE related to the Monitoring of Neutron-Absorbing Materials Other Than Boraflex program. The staff reviewed Boral OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database and (2) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the 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.

FSAR Supplement

SLRA Section A1.27 provides the FSAR supplement for the Monitoring of Neutron-Absorbing Materials Other Than Boraflex program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in 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 FSAR 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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

SLRA Section B2.1.29 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.”

Staff Evaluation

During its audit (ML24085A699), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M42. Based on a review of the SLRA, the staff finds that the program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M42.

Operating Experience

SLRA Section B2.1.29 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, 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 Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program was evaluated.

FSAR Supplement

SLRA Section A1.29 provides the FSAR supplement for the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01.

The staff also noted the applicant committed to implement the new Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program 10 years before the subsequent period of extended operation, with initial inspections 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 for managing the effects of aging for applicable components. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.1.13 ASME Section XI, Subsection IWL

SLRA Section B2.1.31 describes the existing ASME Section XI, Subsection IWL AMP as consistent with GALL-SLR Report AMP XI.S2, “ASME Section XI, Subsection IWL.”

Staff Evaluation

During its audit (ML24085A699), 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 element(s) of the SLRA of the applicant’s program to the corresponding program elements of GALL-SLR Report AMP XI.S2.

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.S2.

Operating Experience

SLRA Section B2.1.31 summarizes OE related to the ASME Section XI, Subsection IWL. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database and (2) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging 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, Subsection IWL AMP was evaluated.

FSAR Supplement

SLRA Section A1.31 provides the FSAR supplement for the ASME Section XI, Subsection IWL AMP. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing ASME Section XI, Subsection IWL AMP for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.1.14 10 CFR Part 50, Appendix J

SLRA Section B2.1.33 describes the existing 10 CFR Part 50, Appendix J Program as consistent with GALL-SLR Report AMP XI.S4, “10 CFR Part 50, Appendix J.”

Staff Evaluation

During its audit (ML24085A699), 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 element(s) of the SLRA 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 B2.1.33 summarizes OE related to the 10 CFR Part 50, Appendix J Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff 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 operating experience at the plant are bounded by those for which the 10 CFR Part 50, Appendix J Program was evaluated.

FSAR Supplement

SLRA Section A1.33 provides the FSAR supplement for the 10 CFR Part 50, Appendix J Program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also 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 finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

Based on its review of the applicant’s 10 CFR Part 50, Appendix J Program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-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

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

3.0.3.1.15 Protective Coating Monitoring and Maintenance

SLRA Section B2.1.37 states that "Protective Coating Monitoring and Maintenance," is an existing program that is consistent with NUREG-2191, Section XI.S8, Protective Coating Monitoring and Maintenance as modified by SLR-ISG-Structures-2020-XX, Updated Aging Management Criteria for Structures Portions of the Subsequent License Renewal Guidance.

Staff Evaluation

During its audit (ML24085A699), 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 element(s) of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.S8.

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.S8.

Operating Experience

SLRA Section B2.1.37 summarizes OE related to the Protective Coating Monitoring and Maintenance program. The staff evaluated OE information by reviewing the SLRA and conducting an audit (ML24085A699). During the audit, the staff independently searched plant-specific 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.

FSAR Supplement

SLRA Section A1.37, provides the UFSAR supplement for the Protective Coating Monitoring and Maintenance program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in 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 UFSAR supplement is an adequate summary description of the program.

Conclusion

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

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

SLRA Section B2.1.39 describes the existing Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits as consistent with 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 (ML24085A699), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding elements of the GALL-SLR Report AMP XI.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 are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E2.

Operating Experience

SLRA Section B2.1.39 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. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the 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 was evaluated.

FSAR Supplement

SLRA Section A1.39 provides the FSAR supplement for the Electrical Insulation for Electrical Cables and Connections not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits. The staff reviewed this FSAR 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 Electrical Insulation for Electrical Cable and Connections Not Subject to 10 CFR 50.49 Environmental Requirement Used in Instrumentation Circuits for managing the effects of aging for applicable components during the subsequent period of extended operation.

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

Conclusion

Based on its review of the applicant's Electrical Insulation for Electrical Cables and Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits, 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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

SLRA Section B2.1.41 describes the new Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements as consistent with GALL-SLR Report AMP XI.E3B, "Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," as modified by SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance." The applicant amended this SLRA section by letter dated May 30, 2024. (ML24155A144) (Supplement 3).

Staff Evaluation

During its audit (ML24085A699), 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 the GALL-SLR Report AMP XI.E3B, as modified by SLR-ISG-2021-04-ELECTRICAL.

Based on a review of the SLRA, as modified by Supplement 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" 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 B2.1.41, as modified by Supplement 3, summarizes OE related to the Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the 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 was evaluated.

FSAR Supplement

SLRA Section A1.41 provides the FSAR supplement for the Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01, as modified by SLR-ISG-2021-04-ELECTRICAL.

The staff also noted that the applicant committed to implement the new Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirement AMP 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components. As noted in the SLRA commitment, the new program will manage the effects of reduced insulation resistance or degraded dielectric strength of non-environmentally qualified, in-scope, inaccessible (e.g., installed in buried conduits, cable trenches, cable troughs, duct banks, underground vaults, or direct buried installations), instrument and control cables, potentially exposed to significant moisture (Revised – Supplement 3). The commitment also noted that the applicant will evaluate industry and plant-specific OE in the development and implementation of the program.

The staff finds that the information in the FSAR supplement, as amended by letter dated May 30, 2024 (Supplement 3), 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, 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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

SLRA Section B2.1.42 describes the new Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements 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, “Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance.”

<u>Staff Evaluation</u>

During its audit (ML24085A699), 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 the GALL-SLR Report AMP XI.E3C, 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” are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E3C, as modified by SLR-ISG-2021-04-ELECTRICAL.

<u>Operating Experience</u>

SLRA Section B2.1.42, summarizes OE related to the Electrical Insulation for Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database and (2) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the 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 Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements was evaluated.

<u>FSAR Supplement</u>

SLRA Section A1.42, as amended by letter dated May 30, 2024 (ML24155A144) (Supplement 3), provides the FSAR supplement for the Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01, as modified by SLR-ISG-2021-04-ELECTRICAL.

The staff also noted that the applicant committed to implement the new Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirement AMP 6 months prior to the subsequent period of extended operation.

As noted in the SLRA commitment, the new program will manage the effects of reduced insulation resistance of non-environmentally qualified, in-scope, inaccessible (e.g., installed in buried conduits, cable trenches, cable troughs, duct banks, underground vaults, or direct buried installations), low-voltage power cables (operating voltage less than 2 kV), that are potentially exposed to significant moisture. The commitment also noted that the applicant will evaluate industry and plant-specific OE in the development of the program.

The staff finds that the information in the FSAR supplement, as amended by Supplement 3, 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, 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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.19 Fuse Holders

SLRA Section B2.1.43 describes the new Fuse Holders as consistent with GALL-SLR Report AMP XI.E5, "Fuse Holders."

Staff Evaluation

During its audit (ML24085A699), 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 element(s) of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.E5.

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.E5.

Operating Experience

SLRA Section B2.1.43 summarizes OE related to the Fuse Holders. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the 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 Fuse Holders was evaluated.

FSAR Supplement

SLRA Section A1.43 provides the FSAR supplement for the Fuse Holders. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01.

The staff also noted the applicant committed to implement the new Fuse Holders 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 FSAR supplement is an adequate summary description of the program.

Conclusion

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

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

SLRA Section B 2.1.44 describes the new Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements as consistent with GALL-SLR Report AMP XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Staff Evaluation

During its audit (ML24085A699), 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 element(s) of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.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 are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E6.

Operating Experience

SLRA Section B 2.1.44 summarizes OE related to the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the 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 was evaluated.

FSAR Supplement

SLRA Section A1.44 provides the FSAR supplement for the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.

The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to implement the new Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements 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 FSAR supplement is an adequate summary description of the program.

Conclusion

Based on its review of the applicant's Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements 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 will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.21 High-Voltage Insulators

SLRA Section B2.1.45 describes the new High-Voltage Insulators as consistent with GALL-SLR Report AMP XI.E7," High-Voltage Insulators."

Staff Evaluation

During its audit (ML24085A699), 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 element(s) of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.E7.

Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E7.

Operating Experience

SLRA Section B2.1.45 summarizes OE related to the High-Voltage Insulators. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the 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 High-Voltage Insulators was evaluated.

FSAR Supplement

SLRA Section A1.45 provides the FSAR supplement for the High-Voltage Insulators. The staff reviewed this FSAR 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 High-Voltage Insulators 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 FSAR supplement is an adequate summary description of the program.

Conclusion

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

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

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

- Fatigue Monitoring
- Neutron Fluence Monitoring
- Concrete Containment Unbonded Tendon Prestress
- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- Reactor Head Closure Stud Bolting

- Pressured Water Reactor (PWR) Vessel Internals
- Steam Generators
- 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
- ASME Code Class 1 Small-Bore Piping
- External Surfaces Monitoring of Mechanical Components
- Flux Thimble Tube Inspection
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting 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
- Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- Electrical Insulation for Inaccessible Medium-Voltage Power Cables 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 B3.1 states that the Fatigue Monitoring AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP X.M1, “Fatigue Monitoring.”

Staff Evaluation

During its audit (ML24085A699), 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 “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements not associated the 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,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” 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 is documented below.

Enhancement 1. SLRA Section B3.1 includes an enhancement to the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements. The enhancement relates to revising the program procedures to require: (1) transient cycles associated with the ASME Code, Section XI, Appendix A and L fatigue-sensitive locations be identified and tracked each 10-year interval; and (2) a surveillance limit be established for transient cycles associated with the ASME Code, Section XI, Appendix A and L fatigue-sensitive locations and corrective actions be initiated prior to exceeding the ASME Code, Section XI, Appendix A or L analyses transient cycle assumptions.

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 it is implemented, it will ensure that (1) the program will monitor the actual cycles of the transients that are used in the flaw-tolerance analyses for the components subject to the aging effects of environmentally assisted fatigue and (2) based on the actual cycle monitoring, a corrective action will be initiated and taken (e.g., more rigorous analyses or repair/replacement activities) before the actual cycles exceed the transient cycles assumed in the flaw-tolerance analyses so that the integrity of the components will be maintained for the subsequent period of extended operation.

Enhancement 2. SLRA Section B3.1 includes an enhancement to the “corrective actions” program element. The enhancement relates to revising the implementing procedures to include component repair, component replacement, performance of a more rigorous analysis, performance of an ASME Code, Section XI, Appendix A or L flaw-tolerance analysis, or scope expansion that considers other locations with the highest expected cumulative usage factor (CUF_{en}) values, as corrective action considerations when a cycle counting surveillance limit is exceeded.

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 it is implemented, it will ensure that appropriate corrective actions will be taken as needed to prevent the environmentally adjusted CUF_{en} values from exceeding the fatigue design limit (1.0), consistent with the corrective actions described in GALL-SLR AMP X.M1; for example, repair/replacement activities, more rigorous calculations of CUF_{en} values, flaw-tolerance analyses and the associated inspections to confirm the integrity of the components, and scope expansion for monitoring other locations with the highest expected CUF_{en}.

Enhancement 3. SLRA Section B3.1 includes an enhancement to the “corrective actions” program element. The enhancement relates to revising the implementing procedures to require that when a cycle-counting surveillance limit is reached, action will be taken to ensure that the analytical bases of the high-energy line break locations are maintained.

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 it is implemented, it will ensure that corrective actions will be taken as needed to maintain the validity of the high-energy line break locations for the subsequent period of extended operation.

Operating Experience

SLRA Section B3.1 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 (ML24085A699), the staff conducted an independent 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) 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.

FSAR Supplement

SLRA Section A2.1 provides the FSAR supplement of the Fatigue Monitoring AMP. The staff also noted that the applicant committed to implement the program enhancements 6 months prior to the subsequent period of extended operation, as described in SLRA Table A4.0-1. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.2.2 Neutron Fluence Monitoring

SLRA Section B3.2. describes the existing Neutron Fluence Monitoring program as consistent, with exceptions, with GALL-SLR Report AMP X.M.2, “Neutron Fluence Monitoring,” as modified by SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of the Subsequent License Renewal Guidance."

The applicant stated in the SLRA that Neutron Fluence Monitoring program at V.C. Summer is an existing program that manages loss of fracture toughness due to neutron fluence of the RPV regions for which neutron fluence is projected to exceed 1×10^{17} n/cm^2 (E >1 MeV) during the subsequent period of extended operations to ensure that applicable reactor pressure vessel neutron irradiation embrittlement analyses will remain within their applicable limits. The Neutron Fluence Monitoring program includes provisions for the neutron fluence projections for the RPV beltline and extended beltline regions and the evaluation of ex-vessel neutron dosimetry. The fluence projections are further used to perform pressurized thermal shock assessments, calculation of pressure/temperature limit curves, evaluation of cold overpressure protection, assessment of the upper shelf energy and tracking the effective full-power years for pressure/temperature curve applicability.

The applicant stated that fluence projections for beltline region performed in support of the Neutron Fluence Monitoring program are consistent with the methodology described in WCAP-18124-NP-A, “Fluence Determination with RAPTOR-M3G and FERRET” (ML18204A010) and follow the guidance in NRC RG 1.190, “Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence,” (ML010890301).

The applicant stated that the methods, assumptions, and results of neutron fluence calculations for the extended beltline region are described in plant-specific evaluation in WCAP-18709-NP, “V.C. Summer Unit 1 Subsequent License Renewal: Reactor Pressure Vessel Extended Beltline Neutron Exposure Evaluation,” which follows the guidance of RG 1.190 for the neutron transport and dosimetry evaluation methodologies. The applicant claimed that there is enough margin in the extended beltline material fluence evaluation to demonstrate that the extended beltline materials, including the nozzles, will not become limiting during the subsequent period of extended operations. In the SLRA, the applicant also provided details on a gap analysis performed to evaluate the inspection recommendations from materials reliability program for the subsequent period of extended operations. The analysis included plant-specific 80-year neutron fluence values for reactor vessel internal (RVI) components that were calculated using a plant-specific RVI component model, and a plant-specific core neutron source conforming to RG 1.190.

<u>Staff Evaluation</u>

The staff reviewed the applicant’s claim 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 of the applicant’s SLRA program are consistent with the corresponding program elements in GALL-SLR Report AMP X.M2, as modified by SLR-ISG-2021-02-MECHANICAL. The staff conducted an audit (ML24085A699) to verify applicant’s claim of consistency with the GALL-SLR Report. The NRC staff found that applicant’s fluence monitoring program is consistent with GALL-SLR Report

AMP X.M.2, as modified by SLR-ISG-2021-02-MECHANICAL since it identifies the scope of a Neutron Fluence Monitoring program with respect to RPV fluence estimates using approved methodology, consistent with the NRC RG 1.190.

Exception. SLRA Section B3.2 includes an exception to the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” and “monitoring and trending,” program elements. The applicant stated that it will not monitor for changes in the neutron fluence values of the RVI components using dosimetry during the subsequent period of extended operations. The GALL-SLR Report specifies that neutron fluence levels in specific components be monitored to verify component locations within the scope of this program are identified.

The GALL-SLR Report AMP X.M.2 states that the use of RG 1.190 to estimate neutron fluence for RVI components may require additional justification. The technical justification for use of RG 1.190 to estimate neutron fluence for RVI components is documented in WCAP-18353-NP, “Reactor Internals Fluence Evaluation for a Westinghouse 3-Loop Plant with Two Units– Subsequent License Renewal.” As a justification for the exception, the applicant stated that V.C. Summer is a Westinghouse three-loop up-flow design which has a low leakage core loading, making it similar to the Westinghouse three-loop plant analyzed in the WCAP-18353-NP. The applicant further stated WCAP-18353-NP demonstrates the neutron fluence for the plant analyzed with rated power of 2,940 MWt is below the threshold at which visible radiation-induced aging effects are expected for reactor vessel internals and bounds the V.C. Summer rated thermal power (2,900 MWt). The NRC staff audited the WCAP-18353-NP and reviewed the justification provided for the exception against the corresponding program elements in GALL-SLR Report AMP X.M2. The applicant stated it will perform visual inspections of the RVI at the 10-year In-Service Inspection intervals during the subsequent period of extended operations, in accordance with the ASME Section XI and the Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227, Revision 1-A).

The NRC staff finds the exception acceptable because adequate justification is provided in the SLRA for not monitoring the neutron fluence for the RVI components using dosimetry during the subsequent period of extended operations, and that the RVI components will be inspected for neutron radiation damage mechanisms in accordance with applicant’s PWR Vessel Internals program.

Operating Experience

SLRA Section B3.2 provides examples of OE related to the Neutron Fluence Monitoring program to show its effectiveness in managing aging effects during the subsequent period of extended operations. The staff reviewed the plant OE information provided in the SLRA to identify any examples of age-related degradation and provide a basis for the staff’s conclusions regarding the ability of the applicant’s proposed AMPs to manage the effects of aging in the subsequent period of extended operations. Based on its review of the OE at the plant the staff did not identify any deficiencies indicating that applicant should modify its Neutron Fluence Monitoring program and finds it acceptable.

FSAR Supplement

SLRA Section A2.2 provides the FSAR supplement for the Neutron Fluence Monitoring program. The staff reviewed the FSAR supplement description of the program and noted that monitoring is performed in accordance with the methods that are defined for the licensing basis in NRC-approved reports and are consistent with the recommended description in GALL-SLR Report Table X-01. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion

Based on its review, the NRC staff finds that the applicant's Neutron Fluence Monitoring program elements are consistent with the GALL-SLR Report. The staff reviewed the exception identified by the applicant and concluded that the AMP, with the exception, is 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 operations, as required by 10 CFR 54.21(a)(3). The staff reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, consistent with 10 CFR 54.21(d).

3.0.3.2.3 Concrete Containment Unbonded Tendon Prestress

SLRA Section B3.4 states that the Concrete Containment Unbonded Tendon Prestress Program is an existing program, with enhancements, will be consistent with the program elements in the GALL-SLR Report AMP X.S1, "Concrete Containment Unbonded Tendon Prestress," except for the exceptions identified in the SLRA.

Staff Evaluation

During its audit (ML24085A699), 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.S1.

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

Exception. SLRA Section B3.4 includes an exception to the "monitoring and trending" and "acceptance criteria," program elements which relates to only the prestress forces from 1990 up to the current examinations are plotted against time for the vertical tendons. The corresponding GALL-SLR elements recommends that all measured data be used to develop the tendon force trend lines for prestress losses; however, as described in FSAR Section 3.8.1.6.3.3-8, the vertical tendons were re-tensioned in 1990 and restored to their original design lock-off force (1,402 kips). The re-tensioning was required to maintain the minimum average vertical prestress force because the loss in prestress force for the vertical tendons was occurring at a faster rate than originally predicted. The staff reviewed this exception against the corresponding program elements in GALL-SLR Report AMP X.S1 and finds it acceptable because after the vertical tendons were re-tensioned in 1990, the data prior to that are no longer valid for developing the tendon force trend line with time. Furthermore, using data from 1990 and onward predicts the vertical tendon forces will remain above the minimum required value through the end of the subsequent period of extended operation.

Enhancement 1. SLRA Section B3.4 includes an enhancement to the “scope of program,” “preventive actions,” “detection of aging effects,” and “acceptance criteria,” program elements which relates to revising procedures to specify the trend analyses of tendon prestress loss will include trends projected through the end of the subsequent period of extended operation. The current program only extends the trend line to the next examination interval. The staff reviewed this enhancement, against the corresponding program elements in GALL-SLR Report AMP X.S1 and finds it acceptable for the following reasons: (1) when it is implemented, the effects of aging on the prestressing force will be trended and adequately managed for the subsequent period of extended operation and (2) the effects of aging such as the prestress force trend lines falling below the minimum required value (MRV) will be identified in advance, evaluated and causes documented, and corrective actions may be taken to prevent the prestress force from falling below the MRV.

Enhancement 2. SLRA Section B3.4 includes an enhancement to the “monitoring and trending” and “acceptance criteria” program elements which relates to revising procedures to specify for each inspection interval, the prestress force trend lines, the predicted lower limit (PLL), and MRV will be developed for the subsequent period of extended operation as part of the regression analysis for each tendon group. The PLL values are not currently required to be included on the plots for trending the tendon prestress forces. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP X.S1 and finds it acceptable because, when implemented, the PLL values along with the tendon force trends and MRV value will be plotted against time and updated at each surveillance as part of the tendon group regression analysis for the subsequent period of extended operation.

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.S1. The staff also reviewed the exception associated with the “monitoring and trending” and “acceptance criteria” program elements, and its justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the “scope of program,” “preventive actions,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria,” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience

SLRA Section B3.4 summarizes OE related to the Concrete Containment Unbonded Tendon Prestress Program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database and (2) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the 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 Concrete Containment Unbonded Tendon Prestress Program was evaluated.

FSAR Supplement

SLRA Section A2.4 provides the FSAR supplement for the Concrete Containment Unbonded Tendon Prestress Program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table X-01. The staff also noted that the applicant committed to implementing the existing Concrete Containment Unbonded Tendon Prestress Program with enhancements 6 months prior to the subsequent period of extended operation for managing the effects of aging on applicable components. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.2.4 ASME Section XI In-Service Inspection, Subsections IWB, IWC, and IWD

SLRA Section B2.1.1 states that the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program is an existing program with an enhancement that will be consistent with the program elements in the GALL-SLR Report AMP XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD.” The applicant amended this SLRA section by letter dated April 1, 2024 (ML24095A207).

Staff Evaluation

During its audit (ML24085A699), the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements of the SLRA of the applicant’s program to the corresponding program elements of GALL-SLR Report AMP XI.M1.

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

Enhancement. SLRA Section B2.1.1 as amended by letter dated April 1, 2024 (ML24095A207), includes an enhancement to the “scope of program” element which relates to volumetric inspections to be performed on the pressurizer surge line hot leg nozzle every 48 years for management of environmentally assisted fatigue. Based on the last satisfactory inspection performed in the first quarter (Q1) of 1993, the next inspection will be performed by Q1 of 2041 (ML24095A207). The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M1 and finds it acceptable because, when it is implemented, it will inspect the hot leg nozzle to confirm the absence of a flaw prior to entering the subsequent period of extended operation. The results of the volumetric inspection would either validate the 48-year inspection frequency as determined by the applicant's flaw-tolerance evaluation or require that the applicant perform corrective actions as needed, prior to entering the subsequent period of extended operation.

Based on a review of the SLRA, and supplemental information provided by letter dated May 30, 2024 (ML24155A146), the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M1. The staff finds that the AMP is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancement associated with the "scope of program" program element and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience

SLRA Section B2.1.1 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 (ML24085A699), the staff conducted an independent search of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMP to manage the effects of aging in the subsequent period of extended operation.

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

FSAR Supplement

SLRA Appendix A, Section A1.1 provides the FSAR supplement for the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program for V.C. Summer. The staff reviewed the FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to continue implementation of the applicant's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program during the subsequent period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

Based on its review of applicant's ASME Section XI In-Service 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 also reviewed the enhancement, and finds that, with the enhancement implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the

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

3.0.3.2.5 Reactor Head Closure Stud Bolting

SLRA Section B2.1.3 states that the Reactor Head Closure Stud Bolting program is an existing program with an enhancement that will be consistent with the program elements in the GALL-SLR Report AMP XI.M3, “Reactor Head Closure Stud Bolting,” except for the exception identified in the SLRA.

Staff Evaluation

During its audit (ML24085A699), 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 the exception and enhancement follows.

Exception. SLRA Section B2.1.3 includes an exception to the “preventive actions,” and “corrective actions” program elements which relates to reactor head closure studs procured to specifications that do not limit measured yield and tensile strength to 150 ksi and 170 ksi, respectively, as recommended by RG 1.65, Revision 1, April 2010. The staff reviewed this exception against the corresponding program elements in GALL-SLR Report AMP XI.M3 and finds it acceptable because there have been no recordable cracking indications identified by the In-Service Inspection program and the volumetric examination per ASME Code, Section XI, Table IWB-2500-1 will continue to be in place.

Enhancement. SLRA Section B2.1.3 includes an enhancement to the “preventive actions,” and “corrective actions” program elements which relates to the revision of reactor head closure stud procurement documents to include the measured yield strength and tensile strength limits recommended by RG 1.65 Revision 1 and NUREG-2191 Section IX.M3. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M3 and finds it acceptable because when it is implemented it will bring any reactor head closure studs procured going forward into alignment with current NRC guidance.

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

Operating Experience

SLRA Section B2.1.3 summarizes OE related to the Reactor Head Closure Stud Bolting program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24085A699), 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 Reactor Head Closure Stud Bolting program was evaluated.

FSAR Supplement

SLRA Section A1.3 provides the FSAR supplement for the Reactor Head Closure Stud Bolting program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.2.6 PWR Vessel Internals

SRLA Section B2.1.7 states that the PWR Vessel Internals Program is an existing program with enhancements that will be consistent with the program elements in the version of GALL-SLR AMP XI.M16A, "PWR Vessel Internals," that is included in Appendix D of NRC Interim Staff Guidance Document No. SLR-ISG-2021-01-PWRVI, "Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized-Water Reactors," (ML20217L203). Henceforth any reference of GALL-SLR AMP XI.M16A in this SE section refers to the version of the AMP XI.M16A in SLR-ISG-2021-01-PWRVI.

The applicant amended the PWR Vessel Internals Program (including Enhancement 1 of the AMP) in SLRA Supplement 1 dated April 1, 2024 (ML24095A207). The applicant made an associated change of the AMR item for the core barrel (CB) upper girth weld (UGW) (as provided in SLRA Table 3.1.2-2) in SLRA Supplement 3 dated May 30, 2024 (ML24155A146), where the change to the AMR item was implemented to reflect the applicant's recategorization of the CB UGW as a designated Primary category weld for the AMP.

Staff Evaluation

The staff's guidance in SRP-SLR Section 3.1.2.2.9 and in GALL-SLR AMP Section XI.M16A establishes that the program is to be based on either (1) a staff-approved version of MRP-227 that covers an assessment of RVI component-specific aging through 80-years of plant operations, or (2) use of Electric Power Research Institute (EPRI) Material Reliability Program's (MRP) Non-Proprietary Topical Report 3002017168 (MRP-227, Rev. 1-A; ML20175A112) as a starting point for the AMP, subject to the results of a plant-specific gap analysis that is performed for the design of PWR RVI components at the site.

Since the assessment in MRP-227, Rev. 1-A is based on a 60-year operational period, SRP-SLR Section 3.1.2.2.9 states that a gap analysis is to be performed for programs using MRP-227, Rev. 1-A to define any potential changes to the inspection and evaluation (I&E) criteria that may be necessary for an 80-year operational period. The staff confirmed that the applicant's AMP includes an RVI gap analysis. The staff evaluated the results of the gap analysis as part of the OE review, as discussed below.

During its audit (ML24085A699), the staff reviewed the applicant's claim of consistency with the staff's updated AMR and aging management guidance for PWR RVI components in SLR-ISG-2021-01-PWRVI. 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 PWR Vessel Internals Program to the corresponding program elements in GALL-SLR Report AMP XI.M16A, "PWR Vessel Internals."

For the "preventive actions," "parameters monitored or inspected," and "corrective actions" program elements, the staff finds them acceptable as follows:

(1) The staff verified that the "preventive actions" program element of the AMP references application of the applicant's Water Chemistry program for managing and mitigating impacts caused by corrosive aging effects and mechanisms (including loss of material induced by general, pitting corrosion, crevice corrosion or cracking induced by stress corrosion cracking [SCC], or irradiation-assisted stress corrosion cracking mechanisms), which is consistent with the "preventive actions" program element criteria defined in GALL-SLR AMP XI.M16A and in MRP-227, Rev. 1-A.

(2) The staff verified that the "parameters monitored or inspected" program element of the AMP monitors all aging effect and mechanisms that are defined for PWR RVI components in the "parameters monitored or inspected" program element of GALL-SLR AMP XI.M16A and in MRP-227, Rev. 1-A, or in the supplemental records that were used for development of the RVI gap analysis of the AMP (as identified and discussed in the OE section of this evaluation).

(3) The staff verified that the "corrective actions" program element of the AMP defines appropriate corrective actions for VCSNS Primary, Expansion, or Existing Program category components RVI components that are consistent with the corrective actions defined for the component types in MRP-227, Rev. 1-A, or as defined in MRP 2018-022 (ML19081A061) or other supplemental reports within the scope of the AMP or used for development of the applicant's RVI gap analysis of the AMP. For example, the supplemental acceptance criteria are defined in WCAP-17096-NP-A, Rev. 3, "Reactor

Internals Acceptance Criteria Methodology and Data Requirements," (ML19218A179) for some Primary or Expansion category components within the scope of the AMP.

The staff also reviewed the portions of the "scope of program," "detection of aging effects," "monitoring and trending," "acceptance criteria," program elements associated with the enhancements of the AMP to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluations of these enhancements are documented below.

Enhancement 1. The PWR Vessel Internals Program, as amended in the applicant's letter of April 1, 2024 (i.e., in SLRA Supplement 1), includes an enhancement to the "scope of program," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements, which relates to the applicant's Commitment No. 7.1 in SLRA Appendix A, Table A4-01 (as updated and revised in the letter of April 1, 2024). The Enhancement will call for a future revision of the implementation procedures of the AMP to include "*a list of the components that require inspections for the Primary, Expansion, and Existing Programs categories specified in MRP-227, Revision 1-A, including the components identified in the VCSNS gap analysis*," or alternatively, to specify implementation of "*the latest NRC-approved version of MRP-227 that provides aging management to 80 years*" of plant operations.

The staff reviewed this enhancement against: (1) the corresponding program elements of GALL-SLR AMP XI.M16A, and (2) the additional program element criteria in the "administrative controls" and "confirmation process" elements of GALL-SLR AMP XI.M6A. The "administrative controls" and "confirmation process" program elements of GALL-SLR AMP XI.M6A, and the corresponding program elements in the applicant's PWR Vessel Internals Program, ensure that the applicant will implement its PWR Vessel Internal Program in accordance with both the applicant's 10 CFR Part 50, Appendix B quality assurance process and the applicant's NEI 03-08 process for implementing the latest staff-approved version of the ERPI MRP-227 guidelines as part of the AMP. As part of the process, the staff noted that Section 7 of MRP-227, Rev. 1-A ensures that the program will be kept up to date with ensuing interim guidelines or staff-approved versions of MRP-227 issued by EPRI MRP, or by supplemental methodologies, alert letters, or bulletins (issued by the PWROG or industry vendors) that apply to the design of the RVI components at the plant.

The staff confirmed that Section 7 in MRP-227, Rev. 1-A establishes that such potential adjustments of the PWR Vessel Internals Program (e.g., those called for by the gap analysis of the AMP) will need to be incorporated into the licensee's implementation procedures for the AMP and implemented as part of the NEI 03-08 "Mandatory" or "Needed" industry requirements for the AMP. Such NEI 03-08 implementation protocols are defined, accounted for, and referenced in the "administration controls" and "confirmation process" program elements of GALL-SLR AMP XI.M16A and provide added assurance that the PWR Vessel Internals Program will be kept up to date with industry guidelines applying the RVI components even after the staff's review of the PWR Vessel Internals Program is completed for the SLRA.

Thus, the staff finds Enhancement 1 (as amended in the letter of April 1, 2024) to be acceptable because the staff has confirmed that: (1) the AMP will implement the I&E criteria for Primary, Expansion, or Existing Program category RVI components consistent with the I&E criteria defined and accepted for the component types in MRP-227, Rev. 1-A, or alternately, in accordance with the results of the applicant's RVI gap analysis of AMP or a staff-approved version of MRP-227 that covers 80 years of plant operations, and (2) when the enhancement is implemented, the "scope of program," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements of the PWR

Vessel Internals Program will be consistent with the corresponding program elements in GALL-SLR AMP XI.M16A, “PWR Vessel Internals.”

Enhancement 2. The PWR Vessel Internals Program includes an enhancement to the “parameters monitored or inspected,” and “acceptance criteria” program elements, which relates to the revision of the implementing procedure of the AMP to include the following I&E criteria for the RVI hold-down spring:

> “Procedure will be revised to require additional spring height measurements prior to the subsequent period of extended operations to establish the CB hold-down spring height and determine if replacement of the CB hold down spring is required.”

The staff noted that this enhancement conservatively identifies that performance of additional RVI hold-down spring height measurements will be performed during the subsequent period of extended operations in addition to those that were performed on the hold-down spring during the 2021 refueling outage of facility. Specifically, the staff confirmed that the applicant’s 80-year gap analysis and OE assessment identified that RVI hold-down spring measurements performed in 2021 could not ensure remaining hold-down spring preload life through the end of the subsequent period of extended operation. The staff also confirmed that this enhancement for additional measurements of RVI hold-down spring height is consistent with the gap analysis criteria the hold-down springs in MRP 2018-022, which was relied on for development of the gap analysis results for the AMP.

Based on these confirmations, the staff finds Enhancement 2 to be acceptable because when implemented (1) the program will implement the additional spring height measurements of the hold-down spring consistent with the criteria in MRP 2018-022 and I&E management basis for this component type that is defined in the gap analysis of the AMP and (2) the “parameters monitored or inspected” and “acceptance criteria” program element criteria for PWR Vessel Internals Program will be consistent with the corresponding program elements in GALL-SLR AMP XI.M16A.

Review of License Renewal Applicant/Licensee Action Items (A/LAIs). The staff’s April 25, 2019, safety evaluation (ML19081A001) for MRP-227, Rev. 1-A includes A/LAI No. 1 on the maximum reinspection interval that can be applied for re-inspections of Westinghouse-design Primary category baffle-to-former bolts (BFBs). In this A/LAI, the staff established that any supplemental analysis used to support a reinspection interval greater than 10 years (as set as a maximum reinspection interval in MRP 2017-009 [ML17087A106]) would need to be submitted for staff review and approval prior to implementation of the alternative reinspection interval for the BFBs. During the staff’s audit of the AMP (refer to Section B2.1.7 of the Audit Report [ML24085A699]), the staff verified that the applicant addressed this A/LAI topic by limiting any duration between scheduled inspections of the BFBs to a maximum 10-year reinspection interval basis.

Thus, the staff finds that the applicant has appropriately addressed A/LAI No. 1 in the PWR Vessel Internals Program because the staff confirmed that (1) the applicant’s I&E criteria and plant procedures for inspecting BFBs preclude the reinspection interval from exceeding a 10 year period, and (2) the reinspection basis for the BFBs is appropriately set up by the “detection of aging effects” and “monitoring and trending” elements of the PWR Vessel Internals Program to specify a maximum 10-year reinspection interval basis for the BFB component type. This A/LAI topic is resolved for the review of the SLRA.

Operating Experience

Operating Experience (and Gap Analysis Review). The PWR Vessel Internals Program summarizes OE related to the applicant's PWR Vessel Internals Program. As has been discussed in the Audit Report (ML24085A699) input for this AMP, the staff reviewed relevant OE information for the PWR Vessel Internals Program during the audit, including generic OE that is accounted for through applicant's adoption and implementation of MRP-227, Rev. 1-A or in the supplemental industry methodologies that the applicant used for development of the AMP's RVI gap analysis. The following subsections summarize the staff's evaluations of VCSNS-specific and generic OE that applies to the AMP.

VCSNS plant-specific OE results. As is documented in Section B2.1.7 of the Audit Report for the SLRA, the staff observed and confirmed that the applicant's past inspections of Primary category and Existing Program category RVI components in the AMP did not identify the presence of any flaw or age-related indications in the components that otherwise (if detected and present in the components) might (1) require the applicant to initiate corrective actions of the components or (2) for defined Primary category components with linked Expansion category components, prompt needed applicant actions to implement sample-expansion inspections or alternative aging management strategies of the specified RVI components that are defined as Expansion category components for the AMP. Thus, the staff finds that the applicant's program appropriately addresses plant-specific RVI OE because the applicant has provided sufficient demonstration that the program implements the proper inspections of Primary and Existing Program category components within the scope of the AMP. The program also includes activities to record the plant-specific inspection results for potential implementation of corrective actions that may need to be applied to defined Primary or Existing Program components of the AMP, or potentially to the Expansion category components if triggered by the inspections results of Primary category component(s) linked to a specified Expansion category component type.

Generic OE – Including OE Accounted for in the RVI gap analysis of the AMP. As part of the audit, the staff confirmed that the applicant applied the following industry records among the source records that the applicant used for the development of the RVI gap analysis of the AMP and those PWR RVI component-specific inspection categorization or I&E criteria adjustments that the applicant determined were necessary for specified PWR RVI components in the AMP (when compared to those defined for the specified RVI component types in MRP-227, Rev. 1-A):

- EPRI Letter MRP 2018-022 (ML19081A061)
- EPRI Letter MRP 2017-009 (ML17087A106)
- EPRI Letter MRP 2023-005 (ML23290A020)
- EPRI Proprietary Report No. 3002013220 (ML19081A063 [proprietary, non-public version]; ML19081A060 [redacted, publicly available version])

The staff verified that these records address the generic OE that has been addressed and incorporated into the scope of the PWR Vessel Internals Program. Based on this set of gap analysis records, the staff confirmed that the radial support key wear surfaces and upper core plate inserts are included as Existing Program components for the AMP, with the required ASME Section XI VT-3 inspections being referenced as the strategy for managing loss of material due to wear in the component types. The staff finds these changes acceptable because the staff has confirmed that the VT-3 I&E strategies are consistent with those recommended for managing loss of material due to wear in Westinghouse-design radial support keys and upper core plates inserts, as defined in (1) MRP 2018-022 and (2) the “parameters monitored” and “detection of aging effects” program elements of GALL-SLR AMP XI.M16A.

The staff noted that the generic OE includes recent domestic, non-VCSNS-specific OE with cracking of Westinghouse-design CB UGWs that occurred in late 2022. Based on the relevant OE information provided in MRP 2023-005 and the applicant actions to address this OE in SLRA Supplements 1 and 3, the staff confirmed that the applicant has elevated the CB UGW to be a Primary category weld for the PWR Vessel Internals Program. The staff confirmed that this is in addition to the designation of the CB upper flange weld and the CB lower flange weld as the other two Primary CB weld components for the program. Prior to the development of MRP-2023-005, EPRI MRP established the CB UGW as one of the linked Expansion category components in MRP-227, Rev. 1-A for the Primary category CB upper flange weld. The staff also confirmed that the MRP 2023-005 record appropriately defines the nondestructive evaluation methods and inspection frequencies that will be applied to the CB UGW and the new corresponding Expansion category components or welds for the CB UGW as a Primary component. The staff finds these changes acceptable because the staff has confirmed that (1) the CB UGW has been placed in an inspection category of the AMP (Primary category) that will call for definitive condition monitoring inspections of the weld type during the subsequent period of extended operation and (2) the applicant has accounted for the change to Primary category status of the weld type through the amendment of the AMR item that applies to the CB UGW in SLRA Table 3.1.2-2, as amended and provided in applicant’s letter of May 30, 2024 (i.e., in SLRA Supplement 3).

The staff noted that, in MRP 2017-009, the EPRI MRP recategorized the I&E criteria for Westinghouse-design Primary category BFBs based on the oriented direction of the reactor coolant flow through the reactor core and the results of past Primary category inspections performed on the BFBs as part of the AMP. The staff notes that this is a significant adjustment of the I&E criteria and protocols for Westinghouse-design BFBs in MRP-227 evaluation space, given that (1) extensive reports of cracking in Westinghouse-design BFBs have been reported in at least two U.S. PWRs with Westinghouse-designed internals and (2) EPRI MRP’s protocols for Westinghouse-design BFBs in MRP 2017-009 address EPRI MRP’s efforts to address this OE on a generic basis. As is documented in the staff’s April 25, 2019, SE for MRP-227, Rev. 1/Rev. 1-A, the staff has verified that the amended I&E criteria in MRP 2017-009 call for the licensee of a Westinghouse-PWR to establish its schedule for performing the Primary BFB inspections using the tier-based scheduling basis in MRP 2017-009, where the timing of the inspections is based the following parameter variables: (1) the direction or orientation of reactor coolant flow through the unit’s reactor core (i.e., up-flow or downflow design conditions), (2) the type of stainless steel (Type 316 or 304) material used in fabrication of the BFBs, and (3) the percentage of BFBs in the plant design with detected indications for past unit-specific volumetric inspections performed on the BFBs (including clustered grouping of BFBs with detected flaw indications based on the current staff accepted definition for clustered groupings of BFBs in MRP 2017-009).

The staff’s audit report input for PWR Vessel Internals Program provides documentation of the staff’s observation that the up-flow orientation of reactor coolant through the VCSNS reactor core and the lack of relevant indications from the licensee’s past inspections of the BFBs provide sufficient support for scheduling subsequent volumetric inspections of the VCSNS BFBs in accordance with the I&E criteria for Tier 3/Tier 4 ranked BFBs in MRP 2017-009 (i.e., implementation of the inspections at 35 effective full-power years with re-inspections of the BFBs to be performed at a 10-year frequency). This includes the applicant’s basis for defining cluster groupings of BFB’s with noted age-related conditions, as defined in the MRP 2017-009 record and approved in the staff's April 25, 2019, safety evaluation for MRP-227, Rev. 1-A. Thus, the staff finds that the applicant has resolved OE for the BFBs both on generic and plant-specific basis because the staff has confirmed that that: (1) the applicant has provided sufficient information that demonstrates the BFBs will be inspected according to the schedule for Tier 3/Tier 4 type BFBs in MRP-2017-009 and (2) the site-specific OE results for past inspections performed on the VCSNS BFBs have not generated any plant-specific OE results (with detected flaw indications) that might otherwise prompt a potential and needed change to the current Tier 3/Tier 4 inspection schedule basis for the BFBs at VCSNS.

The staff also confirmed that the following generic industry criteria for managed Westinghouse-design PWR RVI components do not apply to the site-specific basis for PWR Vessel Internals Program:

- The staff verified that the criteria in MRP-227, Rev. 1-A and MRP 2018-022 for designating Westinghouse-design baffle corner bolts as part of the Primary BFB grouping do not apply to the AMP; the staff confirmed the design of the baffle plates at VCSNS does not include baffle corner bolts.
- The staff verified that the criteria in MRP 2018-022 for designating Westinghouse-design upper and lower fuel alignment pins as additional Existing Program components do not apply to the AMP. The staff confirmed that (1) the applicable supplemental guidance only applies to design of these pins if the stainless steel materials used for the pins were subject to a nitriding "malcomized" surface treatment and (2) for this aspect of the review, that the stainless steel materials used in the design of the referenced pins were not subject to any malcomized, nitriding surface treatments.
- The staff verified that the augmented I&E criteria in MRP-227, Rev. 1-A or MRP 2018-022 for managing cracking of the control rod guide tube (CRGT) support pins (split pins) as Existing Program components (using a site-specific program basis) do not apply to the AMP. The staff confirmed that (1) the augmented aging management basis only applies if the CRGT split pins were original split pins made from X-750 nickel-alloy materials and (2) the CRGT split pins at VCSNS are made from Type 316 stainless steel materials, which justifies the placement CRGT split pins in the No Additional Measures category of the AMP.
- The staff verified that the augmented I&E criteria in MRP-227, Rev. 1-A or MRP 2018-022 for managing cracking in Westinghouse-design thermal shield flexures (as MRP-227 defined Primary category components that are the subject of generic OE) do not apply to the AMP. The staff confirmed that the VCSNS RVI design does not include thermal shield flexures and instead uses a set of neutron panels (in lieu of a thermal shield assembly) for thermal and radiation exposure mitigation functions, where the neutron panels are placed in No Additional Measures category in MRP-227, Rev. 1-A.

Thus, based on this review, the staff finds the applicant's basis for addressing generic OE in the AMP to be acceptable because (1) the applicant has provided sufficient demonstration that the program is designed and adjusted to account for generic OE that may potentially impact the I&E criteria for RVI components that are specified as Primary, Expansion, or Existing Program category components for the AMP, (2) the staff's review of the RVI gap analysis as a source of generic OE for the AMP has demonstrated that the applicant has made conservative adjustments of the AMP based on the revised inspection categories or I&E criteria for specified RVI components in the MRP guideline reports used for development of the RVI gap analysis of the AMP, and (3) the staff has confirmed that this is consistent with the NEI 03-08 "Mandatory" or "Needed" requirements defined for the AMP both in Section 7 of MRP-227, Rev. 1-A and in the "administrative controls" and "confirmation process" program elements in GALL-SLR AMP XI.M16A.

FSAR Supplement

SLRA Section A1.7 provides the FSAR supplement for the PWR Vessel Internals Program. The staff also noted that the applicant committed to ongoing implementation of the existing PWR Vessel Internals Program for managing the effects of aging for applicable components during the subsequent period of extended operation.

The staff also noted that, in Commitment No. 7 of SLRA Table A4.0-1, "Subsequent License Renewal Commitments" (as amended in SLRA Supplement 1), the applicant committed to implementation of AMP Enhancements 1 and 2. The staff finds the amendment of SLRA Commitment No. 7 to be acceptable because it is consistent with the versions of AMP Enhancements 1 and 2 provided in LRA Supplement 1, as previously discussed, evaluated, and accepted in this SE section.

Thus, the staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

Based on its review of the applicant's PWR Vessel Internals Program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with those in GALL-SLR AMP XI.M16A. The staff also reviewed the enhancements and finds that, when the enhancements are implemented in accordance with SLRA Commitment No. 7, 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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.7 Bolting Integrity

SLRA Section B2.1.9 states that the Bolting Integrity program is an existing condition program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M18, "Bolting Integrity."

Staff Evaluation

During its audit (ML24085A699), 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 "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 four enhancements are as follows.

Enhancement 1. SLRA Section B2.1.9 includes an enhancement to the “parameters monitored/inspected” “detection of aging effects” program elements for which procedure(s) will be revised to specify instructions for performing inspections of pressure boundary bolting for locations that preclude detection of joint leakage, including bolting in submerged environments, bolting for air or gas systems, and bolting for piping systems not normally pressurized as follows:

- Submerged closure bolting is visually inspected for loss of material during maintenance activities. In this case, bolt heads are inspected when made accessible, and bolt threads are inspected when joints are disassembled. In each 10-year period during the subsequent period of extended operation, a representative sample of bolt heads and threads is inspected up to a maximum of 25 bolts for each material and environment combination. If opportunistic maintenance activities will not provide access to 20 percent of the population (for a material/environment combination) up to a maximum of 25 bolt heads and threads over a 10-year period, then periodic pump vibration measurements are taken and trended.

- For air or gas systems, inspections are performed consistent with that of submerged closure bolting. Closure bolting for air or gas systems is visually inspected for loss of material during maintenance activities. In this case, bolt heads are visually inspected when made accessible, and bolt threads are visually inspected when joints are disassembled. In each 10-year period during the subsequent period of extended operation, a representative sample of bolt heads and threads is inspected up to a maximum of 25 bolts for each material and environment combination. If opportunistic maintenance activities will not provide access to 20 percent of the population (for a material/environment combination) up to a maximum of 25 bolt heads and threads over a 10-year period, then soap bubble testing will be performed.

- For piping systems not normally pressurized, the torque of the bolting will be checked to the extent that the closure bolting is not loose. In each 10-year period during the subsequent period of extended operation, a representative sample of bolt heads and threads is inspected up to a maximum of 25 bolts for each material and environment combination.

The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M18 and finds it acceptable because when it is implemented it will make the program consistent with the GALL-SLR Report recommendations to ensure that pressure boundary bolting for locations that preclude detection of joint leakage, including bolting in submerged environments, bolting for air or gas systems, and bolting for piping systems not normally pressurized will be inspected.

Enhancement 2. SLRA Section B2.1.9 includes an enhancement to the “detection of aging effects” program element for which procedure(s) will be revised to include (1) inspections of pressure-retaining bolting in inaccessible areas when they become accessible by means such as excavation, dewatering, or shielding/barrier removal and (2) a requirement during opportunistic maintenance activities to document the condition of bolt heads and threads. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M18 and finds it acceptable because when it is implemented it will make the program consistent with the GALL-SLR Report recommendations to ensure that the pressure-retaining bolting in inaccessible areas will be inspected when they become accessible.

Enhancement 3. SLRA Section B2.1.9 includes an enhancement to the “detection of aging effects” program element wherein procedure(s) will be revised to specify that inspections and tests be performed by personnel qualified in accordance with site procedures and programs to perform the specified task. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M18 and finds it acceptable because when it is implemented it will make the program consistent with the GALL-SLR Report recommendations to specify inspections and tests be performed by personnel qualified in accordance with site procedures and programs to perform the specified task.

Enhancement 4. SLRA Section B2.1.9 includes an enhancement to the "monitoring and trending," "acceptance criteria," and corrective actions" program elements which relates to procedure(s) that will be revised to evaluate sampling-based inspections against plant-specific acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the components' intended functions throughout the subsequent period of extended operation based on the projected rate and extent of degradation. If any projected inspection results will not meet the acceptance criteria prior to the next scheduled inspection, sampling frequencies will be evaluated and adjusted as determined by the Corrective Action Program. Bolting that is unsuitable for continued use will be replaced. 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 will be conducted if one of the inspections does not meet the 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 the acceptance criteria, or 20% of each applicable material and environment combination is inspected, whichever is less. If subsequent inspections do not meet the acceptance criteria, an extent of condition and extent of cause analysis will be conducted to determine the further extent of inspections. Additional samples will be inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. The additional inspections will include inspections of components with the same material and environment combination and will be completed within the 10-year inspection interval in which the original inspection was conducted. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M18 and finds it acceptable because when it is implemented it will make the program consistent with the GALL-SLR Report recommendations to ensure that (1) the sampling bases will maintain the components' intended functions based on the projected rate and extent of degradation for bolting as described in GALL-SLR Report AMP XI.M18, (2) the selected representative sample is sufficient to provide adequate representative inspection results, and (3) appropriate acceptance criteria is clearly defined and established.

Operating Experience

SLRA Section B2.1.9 summarizes OE related to the Bolting Integrity program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24085A699), the staff conducted an independent search of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the 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.

FSAR Supplement

SLRA Section A1.9 provides the FSAR supplement for the Bolting Integrity program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff noted that the applicant committed (SLRA Appendix A Table.0-1, Commitment No. 9) to implement 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 FSAR 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 indeed consistent. The staff also reviewed the enhancements, and finds that, with the enhancements when implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.8 Steam Generators

SLRA Section B2.1.10 states that the Steam Generators program is an existing program that will be consistent with the program elements in the GALL-SLR Report AMP XI.M19, "Steam Generators," except for the exceptions identified in the SLRA. The applicant amended this SLRA section by letter dated April 1, 2024 (ML24095A207).

Staff Evaluation

During its audit (ML24085A699), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M19.

The staff also reviewed the portions of the "preventive actions," "parameters monitored or inspected," "monitoring and trending," and "acceptance criteria," program elements associated with the exceptions to GALL-SLR Report AMP XI.M19 to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluations of these three exceptions follow.

Exception 1. As amended by letter dated April 1, 2024 (ML24095A207), SLRA Section B2.1.10 includes an exception to the "preventive action," "parameters monitored or inspected," "monitoring and trending," and "acceptance criteria," program elements related to referencing EPRI Report 3002020909, Revision 5 of the EPRI Steam Generator Integrity Assessment Guidelines. This is an exception because GALL-SLR Report AMP XI.M19 references Revision 4 of the guidelines. As stated in AMP XI.M19, the Steam Generators program at every PWR is modeled after NEI 97-06. The NEI 97-06 framework requires licensees to implement the latest version of the referenced EPRI guidelines. Revision 5 of the EPRI guidelines (Reference 2) was issued in 2021, and the staff noted during the audit that Revision 5 has been incorporated into the applicant's plant procedures. The staff finds the exception acceptable because referencing Revision 5 of the guidelines in the Steam Generators program is consistent with the current programmatic guidelines in NEI 97-06.

Exception 2. As amended by letter dated April 1, 2024 (ML24095A207), SLRA Section B2.1.10 includes an exception to the "parameters monitored or inspected," program element related to referencing EPRI Report 3002018267, Revision 5 of the EPRI Steam Generator Primary-to-Secondary Leakage Guidelines. This is an exception because GALL-SLR Report AMP XI.M19 references Revision 4 of the guidelines. As stated in AMP XI.M19, the Steam Generator program at every PWR is modeled after NEI 97-06. The NEI 97-06 framework requires licensees to implement the latest version of the referenced EPRI guidelines. Revision 5 of the EPRI guidelines was issued in 2020. The staff finds the exception acceptable because referencing Revision 5 of the guidelines in the Steam Generators program is consistent with the current programmatic guidelines in NEI 97-06.

Exception 3. As amended by letter dated April 1, 2024 (ML24095A207), SLRA Section B2.1.10 includes an exception to the "acceptance criteria," program element related to referencing EPRI Report 3002007856, Revision 5 of the EPRI Steam Generator In-Situ Pressure Test Guidelines. This is an exception because GALL-SLR Report AMP XI.M19 references Revision 4 of the guidelines. As stated in AMP XI.M19, the Steam Generator program at every PWR is modeled after NEI 97-06. The NEI 97-06 framework requires licensees to implement the latest version of the referenced EPRI guidelines. Revision 5 of the guidelines was issued in 2016, and the staff noted during the audit that Revision 5 has been incorporated into the applicant's plant procedures. The staff finds the exception acceptable because referencing Revision 5 of the guidelines in the Steam Generators program is consistent with the current programmatic guidelines in NEI 97-06.

Based on a review of the SLRA, the staff finds that the "scope of program," 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 Report AMP XI.M19. The staff also reviewed the exceptions associated with the "preventive actions," "parameters monitored or inspected," "monitoring and trending," and "acceptance criteria" program elements, and their justifications, and finds that the AMP, with the exceptions, is adequate to manage the applicable aging effects.

Operating Experience

SLRA Section B2.1.10 summarizes OE related to the Steam Generators program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24085A699), the staff conducted an independent search of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the 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 Steam Generators program was evaluated.

FSAR Supplement

SLRA Section A1.10 provides the FSAR supplement for the Steam Generators program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing Steam Generators program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.2.9 Open-Cycle Cooling Water System

SLRA Section B2.1.11 states that the Open-Cycle Cooling Water System is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M20, "Open-Cycle Cooling Water System."

Staff Evaluation

During its audit (ML24085A699), 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 "scope of program," "detection of aging effects," and "corrective actions" program elements associated with enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these four enhancements is as follows.

Enhancement 1. SLRA Section B2.1.11 includes an enhancement to the "scope of program," program element, which relates to the safety-related portion of service water piping in the Service Water Pump House that provides cooling water to the cooling coils to eliminate concerns with recurring internal corrosion, via either isolating and draining, or physically removing the safety-related portion of service water piping that is no longer in use. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M20 and finds it acceptable because, when it is implemented, the Open-Cycle Cooling Water AMP will be consistent with the recommendations in the GALL-SLR Report.

Enhancement 2. SLRA Section B2.1.11 includes an enhancement to the "scope of program," program element, which relates to a plant modification to replace the carbon steel service water return valves from the diesel generator coolers with stainless steel valves and fittings to be more resistant to cavitation damage, and to modify the piping configuration to reduce cavitation. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M20 and finds it acceptable because, when it is implemented, the Open-Cycle Cooling Water AMP will be consistent with the recommendations in the GALL-SLR Report.

Enhancement 3. SLRA Section B2.1.11 includes an enhancement to the "detection of aging effects," program element, which relates to revising procedures to specify that inspections and tests be performed by personnel qualified in accordance with site procedures and programs to perform the specified task. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M20 and finds it acceptable because, when it is implemented, the Open-Cycle Cooling Water AMP will be consistent with the recommendations in the GALL-SLR Report.

Enhancement 4. SLRA Section B2.1.11 includes an enhancement to the "corrective actions" program element, which relates to revising procedures to specify that additional inspections will be performed if any inspection results do not meet the acceptance criteria unless the cause of the aging effect for each applicable material and environment is corrected by repair or replacement. There will be no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging effect combination are 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 it is implemented, the Open-Cycle Cooling Water AMP will be consistent with the recommendations in the GALL-SLR Report.

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

<u>Operating Experience</u>

SLRA Section B2.1.11 summarizes OE related to the Open-Cycle Cooling Water System. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24085A699), 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.

FSAR Supplement

SLRA Section A1.11 provides the FSAR supplement for the Open-Cycle Cooling Water System AMP. The staff reviewed this FSAR 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 implementation of program enhancements to the existing Open-Cycle Cooling Water System for managing the effects of aging for applicable components, 6 months prior to the subsequent period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.2.10 Closed Treated Water Systems

SLRA Section B2.1.12 states that the Closed Treated Water Systems is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M21A, "Closed Treated Water Systems," as modified by SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of the Subsequent License Renewal Guidance."

Staff Evaluation

During its audit (ML24085A699), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report, as modified by SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of the Subsequent License Renewal Guidance." 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, as modified by SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of the Subsequent License Renewal Guidance."

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

Enhancement 1. SLRA Section B2.1.12 includes an enhancement to the "detection of aging effects," program element, which relates to revising procedures to specify that in each 10-year period during the subsequent period of extended operation that the minimum number of inspections be completed for the various sample populations, and if opportunistic inspections will not fulfill the minimum number of inspections, work orders will be initiated to request additional inspections. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when it is implemented, the Closed Treated Water Systems AMP will be consistent with the recommendations in the GALL-SLR Report.

Enhancement 2. SLRA Section B2.1.12 includes an enhancement to the “detection of aging effects,” program element, which relates to revising procedures to specify inspection and tests be performed by personnel qualified in accordance with site procedures and programs to perform the specific task. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when it is implemented, the Closed Treated Water Systems AMP will be consistent with the recommendations in the GALL-SLR Report.

Enhancement 3. SLRA Section B2.1.12 includes an enhancement to the “monitoring and trending,” program element, which relates to revising procedures to specify that, where practical, the rate of any degradation is evaluated and projected until the end of the subsequent period of extended operation or the next scheduled inspection, whichever is shorter. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when it is implemented, the Closed Treated Water Systems AMP will be consistent with the recommendations in the GALL-SLR Report.

Enhancement 4. SLRA Section B2.1.12 includes an enhancement to the “corrective actions” program element, which relates to revising procedures to specify that additional inspections will be performed if any inspection results do not meet the acceptance criteria unless the cause of the aging effect for each applicable material and environment is corrected by repair or replacement. There will be no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging effect combination are inspected, whichever is less. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M21A and finds it acceptable because, when it is implemented, the Closed Treated Water Systems AMP will be consistent with the recommendations in 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, as modified by SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of the Subsequent License Renewal Guidance," are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M21A. In addition, the staff reviewed the enhancements associated with the “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 B2.1.12 summarizes OE related to the Closed Treated Water Systems. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the 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 was evaluated.

FSAR Supplement

SLRA Section A1.12 provides the FSAR supplement for the Closed Treated Water Systems. The staff reviewed this FSAR 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 implementation of enhancements to the existing Closed Treated Water Systems for managing the effects of aging for applicable components 6 months prior to the subsequent period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

Based on its review of the applicant's Closed Treated Water Systems AMP, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report, as modified by SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of the Subsequent License Renewal Guidance," are consistent. The staff also reviewed the enhancements, and finds that, with the enhancements, when implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

SLRA Section B2.1.13 states that the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems."

Staff Evaluation

During its audit (ML24085A699), 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 "scope of program," "parameters monitored/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 the enhancement is follows.

Enhancement. SLRA Section B2.1.13 includes an enhancement to the “scope of program, “parameters monitored/inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria,” program elements which relates to updating the V.C. Summer procedures to require:

- Visual inspections of rails, bridges, structural members, and structural components for loss of material due to general corrosion; deformation; cracking; and wear.
- Visual inspections of rails, bolted connections for loss of material due to general corrosion; cracking; and loose or missing bolts or nuts, and other conditions indicative of loss of preload.

The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M23 and found it acceptable because upon implementation, it will be consistent with the GALL-SLR Report recommendation for performing visual inspection rails, bridges, bolted connections, structural members, and structural components for loss of material due to corrosion, deformation, and other conditions indicative of loss of preload, etc.

In supplement dated May 6, 2024 (ML24129A200), the applicant indicated that the enhancement of the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP (GALL-SLR Section XI.M23) has been implemented. The applicant stated that the crane inspection procedures have been revised to (1) specify visual inspections for the effects of general corrosion, deformation, cracking, and wear on the rails, bridges, structural members, and structural components of the system and to (2) provide guidance for monitoring the structural connections for looseness, missing or loose bolts and/or nuts, loss of material due to general corrosion, cracking, loss of preload and other conditions indicative of loss of preload.

The staff reviewed the applicant’s update to the application and has found the completion of the enhancement to be acceptable. The enhancement has been deleted, and the commitment has been updated to show its completion.

<u>Operating Experience</u>

SLRA Section B2.1.13 summarizes OE related to the Inspection of Overhead Heavy Load Handling Systems AMPs. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24085A699), 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 Overhead Heavy Load Handling Systems AMP was evaluated.

<u>FSAR Supplement</u>

SLRA Appendix A, Section A1.13, provides the FSAR supplement for the Inspection of Overhead Heavy Load Handling Systems AMP. The staff reviewed this FSAR 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 (SLRA Appendix A Table A4.0-1, Commitment No. 13) to implement 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 finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.2.12 Compressed Air Monitoring

SLRA Section B2.1.14 states that the Compressed Air Monitoring program is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M24, "Compressed Air Monitoring."

Staff Evaluation

During its audit (ML24085A699), 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 "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 is as follows.

Enhancement 1. SLRA Section B2.1.14 includes an enhancement to the "detection of aging effects," "monitoring and trending" and "corrective actions," program elements which relates to procedures that will be revised to require Turbine Building instrument air dryer outlet dew point readings greater than zero to be documented in the Corrective Action Program and evaluations performed for results that do not satisfy established criteria as identified in the applicable procedures. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M24 and finds it acceptable because when it is implemented it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 2. SLRA Section B2.1.14 includes an enhancement to the "detection of aging effects" program element which relates to procedures that will be revised to specify inspections and tests be performed by personnel qualified in accordance with site procedures and programs to perform the specified task. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because when it is implemented it will be consistent with the recommendations of 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 “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 B2.1.14 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 (ML24085A699), the staff reviewed search results of the plant OE information to (1) to identify examples of age-related degradation, as documented in the applicant’s corrective action program database and (2) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the 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 Compressed Air Monitoring program was evaluated.

FSAR Supplement

SLRA Appendix A Section A1.14 provides the FSAR supplement for the Compressed Air Monitoring program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in 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 FSAR 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 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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.13 Fire Protection

SLRA Section B2.1.15 states that the Fire Protection AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M26, “Fire Protection,” as modified by SLR-ISG-2021-02-MECHANICAL, “Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance”

(ML20181A434). The applicant amended this SLRA section by letters dated May 6, 2024, and June 17, 2024 (ML24129A200 and ML24171A015, respectively).

Staff Evaluation

During its audit (ML24085A699), 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 program element, the staff needed additional information regarding the applicable aging effects for fire barriers and trending of the CO_2 fire suppression system periodic test results. The staff's requests and the applicant's responses to RAI B2.1.15-1 and RCIs 3.3.1-1 and 3.3.1-2 are documented in ADAMS Accession Nos. ML24171A015 and ML24155A144.

In its responses to RAI B2.1.15-1, the applicant revised Enhancement 3 to include the aging effects of loss of material and cracking and revised Enhancement 4 to include trending the results of the CO_2 fire suppression system periodic tests. The staff finds the response acceptable because it is consistent with GALL-SLR recommendations for managing loss of material and cracking of fire barriers and trending the results of the CO_2 fire suppression system periodic tests. For additional information see the discussion of Enhancements 3 and 4 below.

In its response to RCI 3.3.1-1, the applicant confirmed that the effects of aging for the (1) concrete "concrete elements" with a fire barrier intended function (except concrete "concrete elements" associated with the Containment Structure) are managed by both the Fire Protection and Structures Monitoring programs, (2) concrete "concrete elements" with a fire barrier intended function associated with the Containment Structure are managed by both the Fire Protection and ASME Section XI, Subsection IWL programs, and (3) concrete block "masonry block walls" with a fire barrier intended function are managed by both the Fire Protection and Masonry Walls programs. The staff finds the response acceptable because (1) managing the effects of aging for structural fire barriers by both the Fire Protection and Structures Monitoring programs is consistent with the GALL-SLR, (2) the periodic visual examinations in accordance with ASME Section XI, Subsection IWL can identify cracking and loss of material before a loss of intended function and the use of the Fire Protection program to manage cracking and loss of material is consistent with the GALL-SLR, and (3) managing the effects of aging for masonry walls that are considered fire barriers by both the Fire Protection and Masonry Walls programs is consistent with the GALL-SLR.

In its response to RCI 3.3.1-2, the applicant confirmed that the Fire Protection program will manage the effects of aging for all "elastomer" and "elastomer, rubber and other similar materials" penetration seals and seismic gap filler material with a fire barrier intended function. In addition, the applicant confirmed that both the Fire Protection and Structures Monitoring program will manage the effects of aging for "elastomer" and "elastomer, rubber and other similar materials" penetration seals and seismic gap filler material with other intended functions (i.e., enclosure protection, flood barrier, and/or pressure boundary), in addition to the fire barrier intended function. The staff finds the response acceptable because the periodic inspections performed by the Structures Monitoring program can identify the effects of aging associated with the intended functions other than the fire barrier intended function, and the periodic inspections performed by the Fire Protection program are capable of identifying the effects of aging associated with the fire barrier intended function before a loss of intended function.

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

Enhancement 1. As supplemented by letter dated May 6, 2024 (ML24129A200), SLRA Section B2.1.15 includes an enhancement to the “parameters monitored or inspected,” “detection of aging effects,” and “acceptance criteria” program elements that relates to revising fire damper procedures to inspect for loss of material, cracking, holes, and gaps, document deficiencies on a condition report, and to determine the acceptability of the findings. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M26 and finds it acceptable because when it is implemented it will (1) require fire dampers to be inspected for loss of material and cracking, which is consistent with GALL-SLR Report AMP XI.M26; (2) require fire dampers to be inspected for holes and gaps, which the visual inspections performed by the Fire Protection program are capable of detecting; (3) document deficiencies on a condition report, which is consistent with GALL-SLR Report AMP XI.M26; and (4) determine the acceptability of the inspection findings, which is consistent with GALL-SLR Report AMP XI.M26.

Enhancement 2. As supplemented by letter dated May 6, 2024 (ML24129A200), SLRA Section B2.1.15 includes an enhancement to the “parameters monitored or inspected,” “detection of aging effects,” and “acceptance criteria” program elements that relates to revising inspection procedures for fire barrier elastomeric penetration seals and seismic gap filler to inspect for shrinkage, loss of strength, hardening, or any other signs of degradation. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M26 and finds it acceptable because when it is implemented it will inspect for aging effects consistent with GALL-SLR Report AMP XI.M26.

Enhancement 3. As supplemented by letters dated May 6, 2024 (ML24129A200), and June 17, 2024 (ML24171A015), SLRA Section B2.1.15 includes an enhancement to the “monitoring and trending” program element that relates to evaluating, projecting, and trending inspection results. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M26 and finds it acceptable because when it is implemented it will require (1) trending of inspection results for fire protection components so that appropriate corrective actions can be taken; (2) when practical, projecting inspection results until the next scheduled inspection; and (3) inspection results are evaluated against acceptance criteria to confirm the timing of subsequent inspections will maintain intended functions throughout the subsequent period of extended operations based on projected rate of degradation; which are consistent with GALL-SLR Report AMP XI.M26. For additional information, see the discussion of RAI B2.1.15-1 above.

Enhancement 4. As supplemented by letters dated May 6, 2024 (ML24129A200), and June 17, 2024 (ML24171A015), SLRA Section B2.1.15 includes an enhancement to the “monitoring and trending” program element that relates to CO_2 fire protection system components inspections, projections, and trending results. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M26 and finds it acceptable because when it is implemented it will require (1) CO_2 fire protection system components be inspected for cracking and loss of material, (2) trending of inspection and test results so that appropriate corrective actions can be taken; (3) when practical, projecting inspection results until the next scheduled inspection; and (4) inspection results are evaluated against acceptance criteria to confirm the timing of subsequent inspections will maintain intended functions throughout the subsequent period of extended operations based on projected rate of degradation; which are consistent with GALL-SLR Report AMP XI.M26. For additional information, see the discussion of RAI B2.1.15-1 above.

Enhancement 5. As supplemented by letter dated May 6, 2024 (ML24129A200), SLRA Section B2.1.15 includes an enhancement to the "corrective actions" program element that relates to revising procedures to adjust inspection frequencies as determined by the corrective action program when 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.M26 and finds it acceptable because, when it is implemented, it will be consistent with the recommendation in the GALL-SLR Report AMP XI.M26.

Based on a review of the SLRA, amendments, and the applicant's responses to RAIs B2.1.15-1 and RCIs 3.3.1-1 and 3.3.1-2, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M26, as modified by SLR-ISG-2021-02-MECHANICAL. 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 B2.1.15 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 (ML24085A699), 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.

FSAR Supplement

As supplemented by letter dated May 6, 2024 (ML24129A200), SLRA Section A1.15 provides the UFSAR supplement for Fire Protection AMP. The staff reviewed the UFSAR 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 in SLRA Table A4.0-1 that the applicant committed to continue the existing Fire Protection AMP including implementation of Enhancements 1 through 5, stated above, no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.2.14 Fire Water System

SLRA Section B2.1.16 states that the Fire Water System program is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M27, "Fire Water System."

Staff Evaluation

During its audit (ML24085A699), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report, Revision 0. 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.

During the audit of the Fire Water System program, the staff asked whether heat exchanger components associated with the diesel driven fire pump engine are subject to aging management review and whether there has been any OE associated with the heat exchanger components. As noted in the letter dated May 6, 2024 (ML24129A200), in January 2024 a heat exchanger core was replaced due to a tube leak. As a result, the applicant included Commitment No. 50 in Table A4.0-1 to replace the diesel fire pump engine jacket water heat exchanger core at least once every 20 years. The 20-year replacement frequency is based on a review of electronic maintenance records from 1997 that showed the heat exchanger core had been in service the entire time, approximately 27 years, prior to the tube leak. The staff found this information sufficient to justify the 20-year replacement frequency of the diesel fire pump engine jacket water heat exchanger core.

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

Enhancement 1. SLRA Section B2.1.16 includes an enhancement to the "parameters monitored or inspected" program element related to follow-up volumetric wall thickness examinations when surface irregularities are detected. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, it will be consistent with the recommendation to perform follow-up volumetric wall thickness examinations when surface irregularities are detected in GALL-SLR Report AMP XI.M27.

Enhancement 2. SLRA Section B2.1.16 includes an enhancement to the “detection of aging effects” program element related to replacing or testing sprinklers that have been in service for 75 years. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because when it is implemented it will replace or test sprinklers that have been in service for 75 years, consistent with Section 5.3.1 in the 2011 Edition of NFPA 25, which is recommended in Table XI.M27-1 of GALL-SLR Report AMP XI.M27.

Enhancement 3. SLRA Section B2.1.16 includes an enhancement to the “detection of aging effects” program element related to a one-time test of sprinklers that have been exposed to water. The enhancement states that a one-time inspection will be conducted with either a sample size of 3 percent or a maximum of 10 sprinklers at each unit, with no more than four sprinklers per structure being tested. Testing will be based on a minimum time in service of 50 years and the severity of operating conditions for each population. The staff notes that Section 5.3.1.2 in the 2011 Edition of NFPA 25 states that a representative sample for testing consists of a minimum of not less than four sprinklers, or 1 percent of the number of sprinklers per individual sprinkler sample, whichever is greater. The staff also notes that testing or inspecting components at 50 years of service is consistent with the recommendations in GALL-SLR Report AMP XI.M32, “One-Time Inspection.” The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, consistent with Table XI.M27-1 in GALL-SLR Report AMP XI.M27, it will perform a one-time test of sprinklers that have been exposed to water to determine if the fire water system water is corrosive enough to impact the intended function of the sprinklers, and it provides a sufficient sample size (3 percent up to a maximum of 20 sprinklers between the units), sample selection (severity of operating conditions), and minimum time in service (50 years).

Enhancement 4. SLRA Section B2.1.16 includes an enhancement to the “detection of aging effects” program element related to main drain tests on standpipe systems with automatic water supplies. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, it will be consistent with the recommendations to perform main drain testing in GALL-SLR Report AMP XI.M27.

Enhancement 5. SLRA Section B2.1.16 includes an enhancement to the “detection of aging effects” program element related standpipe flow tests. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, it will be consistent with the recommendations for standpipe flow tests in GALL-SLR Report AMP XI.M27.

Enhancement 6. SLRA Section B2.1.16 includes an enhancement to the “detection of aging effects” program element related to main drain tests at each water-based fire protection system riser. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, it will be consistent with the recommendations in GALL-SLR Report AMP XI.M27 related to performing annual main drain tests at each water-based fire protection system riser, acceptance criteria based on monitoring flow pressure from test to test (10 percent reduction), and follow-up actions determined by the corrective action program.

Enhancement 7. SLRA Section B2.1.16 includes an enhancement to the “detection of aging effects” program element related to personnel being qualified in accordance with site procedures and programs. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, it will be consistent with the recommendations in GALL-SLR AMP XI.M27 associated with inspections and tests being performed by qualified personnel.

Enhancement 8. SLRA Section B2.1.16 includes an enhancement to the “detection of aging effects” program element related inspection parameters. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, it will be consistent with the recommendations in GALL-SLR Report AMP XI.M27 related to lighting, distance, and offset.

Enhancement 9. SLRA Section B2.1.16 includes an enhancement to the “detection of aging effects” program element related to augmented tests and inspections of water-based fire protection system components that have been wetted but are normally dry. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because, when it is implemented, it will be consistent with the recommendations in GALL-SLR Report AMP XI.M27 for augmented tests and inspections of water-based fire protection system components that have been wetted but are normally dry.

Enhancement 10. SLRA Section B2.1.16 includes an enhancement to the “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements 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 it is implemented, recurring internal corrosion will be managed for the fire water system, and the extent of wall thickness screening (e.g., low frequency electromagnetic testing), follow-up localized wall thickness measurements based on inspection results, and periodicity of the inspections can provide data that can be trended to detect the potential for degraded wall thickness.

Enhancement 11. SLRA Section B2.1.16 includes an enhancement to the “detection of aging effects,” “acceptance criteria,” and “corrective actions” program elements related to internal visual inspections of wet pipe and pre-action sprinkler systems and deluge system piping, follow-up actions related to internal visual inspections, and criteria for conducting an obstruction investigation. The staff reviewed this enhancement against the corresponding program elements in the associated AMP and finds it acceptable because, when it is implemented, internal visual inspections will be consistent with the recommendations in GALL-SLR Report AMP XI.M27.

Enhancement 12. SLRA Section B2.1.16 includes an enhancement to the “monitoring and trending” program element related to evaluating the bases for sampling-based inspections. The staff reviewed this enhancement against the corresponding program element in the associated AMP and finds it acceptable because when it is implemented it will be consistent with the recommendations for evaluating the results of sampling-based inspections against acceptance criteria to confirm the sampling bases will maintain the components’ intended function in GALL-SLR Report AMP XI.M27.

Enhancement 13. SLRA Section B2.1.16 includes an enhancement to the “corrective actions” program element related to updating 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 which provide that (1) additional tests will be conducted if flow tests or main drain tests do not meet acceptance criteria due to current or projected degradation, (2) no fewer than two additional tests will be performed for each test not meeting acceptance criteria, (3) additional inspections will be completed within the same interval as the original test, and (4) if subsequent tests do not meet acceptance criteria, an extent of condition and extent of cause analysis will be performed to determine the extent of further tests.

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 AMP XI.M27 are indeed consistent with the corresponding program elements of GALL-SLR Report AMP XI.M27. In addition, the staff reviewed the enhancements associated with the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience

SLRA Section B2.1.16 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 (ML24085A699), 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.

FSAR Supplement

Section A1.16 of SLRA Appendix A provides the UFSAR supplement for the Fire Water System program. The staff reviewed the UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to enhancing the Fire Water System program by implementing the enhancements discussed above 5 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. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion

Based on its review of the applicant’s Fire Water System program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report AMP XI.M27 are consistent. The staff also reviewed the enhancements and finds that, with the enhancements 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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.15 Fuel Oil Chemistry

SLRA Section B2.1.18 describes the existing Fuel Oil Chemistry program as consistent with GALL-SLR Report AMP XI.M30. existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M30.

Staff Evaluation

During its audit (ML24085A699), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M30.

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

Enhancement 1. SLRA Section B2.1.18 includes an enhancement to the "preventive actions," "parameters monitored and inspected," "detection of aging effects," "monitoring and trending" and "acceptance criteria" program elements which relates to revision of procedure(s) to include drain, clean internally to the extend practical, visually inspect internal surfaces (if physically possible,) and perform tank bottom thickness measurements for the following tanks: diesel driven fire pump fuel oil day tank, diesel generator fuel oil day tanks, and diesel generator fuel oil storage tanks. The procedure(s) will require that if evidence of degradation is observed during visual inspection, or if visual inspection is not possible, volumetric inspections will be performed. The draining, cleaning and inspection of each tank will be performed at least once during the 10-year period prior to the subsequent period of extended operation and at least once every 10 years during the subsequent period of extended operation. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because when it is implemented it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 2. SLRA Section B2.1.18 includes an enhancement to the "preventive actions," "parameters monitored and inspected," "detection of aging effects," "monitoring and trending" and "acceptance criteria" program element which relates to revision of procedure(s) to require an Engineering evaluation be performed to evaluate and trend visual volumetric (if degradation is detected during inspections) tank inspection results. Unacceptable inspection results will be documented in the Corrective Action Program. Thickness measurements will be evaluated against the design thickness and corrosion allowance. The rate of degradation will be evaluated and projected until the end of the subsequent period of extended operation or the next schedule inspection, whichever is shorter. The inspection frequency will be adjusted, as necessary, based on the projection. The staff reviewed this enhancement, against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because when it is implemented it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 3. SLRA Section B2.1.18 includes an enhancement to the “preventive actions,” program element which relates to revision of procedure(s) to periodically drain accumulator water from the diesel driven fire pump fuel oil 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 it is implemented it will be consistent with the recommendations of 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 VCSNS claimed consistency with the GALL-SLR Report are indeed 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,” “detection of aging effects,” “monitoring and trending” and “acceptance criteria” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience

SLRA Section B2.1.18 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 (ML24085A699), 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.

FSAR Supplement

SLRA Appendix A Section A1.18 provides the FSAR supplement for the Fuel Oil Chemistry program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Table 3.0-1. 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 FSAR 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 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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.16 ASME Code Class 1 Small-Bore Piping

SLRA Section B2.1.22 states that the ASME Code Class 1 Small-Bore Piping program is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR AMP XI.M35, “ASME Code Class 1 Small-Bore Piping.”

Staff Evaluation

During its audit (ML24085A699), 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.M35.

Enhancement 1. SLRA Section B2.1.22 includes an enhancement to the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements which relate to revising procedures 1) to perform one-time inspections of small-bore piping, 2) to perform periodic inspections of reactor coolant pump seal injection to thermal barrier nozzle welds, 3) to evaluate results to determine if additional or periodic examinations are required, and 4) to perform any required additional or periodic inspections.

Enhancement 2. SLRA Section B2.1.22 includes an enhancement to the “monitoring and trending” program element which relates to revising procedures to require a subsequent re-examination after any component containing flaws is accepted for continued service by analytical evaluation.

Enhancement 3. SLRA Section B2.1.22 includes an enhancement to the “acceptance criteria” program element which relates to revising procedures to evaluate examination results in accordance with ASME Code, Section XI, Paragraph IWB-3132.

Enhancement 4. SLRA Section B2.1.22 includes an enhancement to the “corrective actions” program element which relates to revising procedures to require additional weld examinations to meet the intent of ASME Code, Section XI, Subarticle IWB-2430.

The staff reviewed the enhancements against the corresponding program elements in the GALL-SLR Report AMP and finds them acceptable because the inspection procedures will be updated in accordance with the requirements of the related ASME Code, Section XI Subarticles and these inspections are adequate to identify and manage age-related degradation during the subsequent period of extended operation.

The staff conducted an audit to verify the applicant’s claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements are consistent with the corresponding program elements of GALL-SLR AMP XI.M35. 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 B2.1.22 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 (ML24085A699), 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 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.

FSAR Supplement

SLRA Section A1.22 provides the FSAR supplement for the ASME Code Class 1 Small-Bore Piping program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the ASME Code Class 1 Small-Bore Piping program with enhancements for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.2.17 External Surfaces Monitoring of Mechanical Components

SLRA Section B2.1.23 states that the External Surfaces Monitoring of Mechanical Components is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components."

Staff Evaluation

During its audit (ML24085A699), 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 “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 evaluations of these five enhancements are described below.

Enhancement 1. SLRA Section B2.1.23 includes an enhancement to the “detection of aging effects” program element which relates to revising procedures to specify that walkdowns will be performed at a frequency not to exceed one refueling cycle. Because some surfaces are not readily visible during both plant operations and refueling outages, surfaces will be inspected when they are made accessible and at intervals that would ensure the components' intended functions are maintained. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M36 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report AMP XI.M36.

Enhancement 2. SLRA Section B2.1.23 includes an enhancement to the “detection of aging effects” program element which relates to revising procedures to specify that visual inspections of elastomers and flexible polymers will cover 100 percent of accessible component surfaces. The minimum surface area for tactile inspections of elastomers and flexible polymers will be at least 10 percent of the accessible surface area. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M36 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report AMP XI.M36.

Enhancement 3. SLRA Section B2.1.23 includes an enhancement to the “detection of aging effects,” and “corrective actions” program elements which relates to revising procedures to manage cracking of copper alloy (>15-percent zinc) components and cracking and loss of material of insulated outdoor/indoor components exposed to condensation populations. Additionally, the enhancements are also relating to revising procedures to include the following:

- In each 10-year period during the subsequent period of extended operation, the minimum number of inspections is completed. Examinations for cracking will be performed from the copper alloy (>15-percent zinc) component population every 10 years. Examinations are conducted on 20 percent of the surface area unless the component is measured in linear feet, such as piping. Alternatively, any combination of a minimum of 25 1-foot axial length sections and components is inspected. For insulated outdoor components and indoor components exposed to condensation, following insulation removal, 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 one-foot axial length determination is inspected for loss of material and cracking. Alternatively, any combination of a minimum of 25 1-foot axial length sections and components for each material type is inspected. The new procedure will specify that the inspections focus on the components most susceptible to aging because of time in service, severity of operating conditions, and lowest design margin.
- Additional inspections will be performed if any sampling-based inspections to detect cracking in copper alloy (>15-percent zinc) components do not meet the acceptance criteria, unless the cause of the aging effect for each applicable material and environment is corrected by repair or replacement. There will be no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20 percent of each

applicable material, environment, and aging effect combination inspected, whichever is less. If any subsequent inspections do not meet acceptance criteria, an extent of condition and extent of cause analysis will be conducted to determine the further extent of inspections required. Additional samples will be inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. The additional inspections will include inspections of components with the same material, environment, and aging effect combination. The additional inspections will be completed within the interval (e.g., refueling outage interval, 10-year inspection interval) in which the original inspection was conducted.

The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M36 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report AMP XI.M36.

Enhancement 4. SLRA Section B2.1.23 includes an enhancement to the “monitoring and trending,” and “corrective actions” program elements which relates to revising procedures to evaluate and project the rate of degradation until the end of the subsequent period of extended operation or the next scheduled inspection, whichever is shorter. The inspection sampling bases (e.g., selection, size, frequency) will be adjusted as necessary based on the projection. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M36 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report AMP XI.M36.

Enhancement 5. SLRA Section B2.1.23 includes an enhancement to the “acceptance criteria” program element which relates to revising procedures to specify that, where practical, acceptance criteria are quantitative (e.g., minimum wall thickness). For quantitative analyses, the required minimum wall thickness to meet applicable design standards will be used. For qualitative evaluations, applicable parameters such as ductility, color, and other indicators will be addressed to ensure a decision is based on observed conditions. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M36 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report AMP XI.M36.

Operating Experience

SLRA Section B2.1.23 summarizes OE related to the External Surfaces Monitoring of Mechanical Components. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database and (2) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the 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 External Surfaces Monitoring of Mechanical Components was evaluated.

FSAR Supplement

SLRA Section A1.23 provides the FSAR supplement for the External Surfaces Monitoring of Mechanical Components. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to implementing the program enhancements 6 months prior to the subsequent period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

Based on its review of the applicant's External Surfaces Monitoring of Mechanical Components, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are indeed 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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.18 Flux Thimble Tube Inspection

SLRA Section B2.1.24 states that the Flux Thimble Tube Inspection is an existing program with enhancement that will be consistent with the program elements in the GALL-SLR Report AMP XI.M37 "Flux Thimble Tube Inspection." The applicant amended this SLRA section by letter dated April 1, 2024.

Staff Evaluation

During its audit (ML24085A699), the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M37.

The staff also reviewed the portions of the "detection of aging effects" and "monitoring and trending" 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 one enhancement is as follows.

Enhancement. SLRA Section B2.1.24 includes an enhancement to the "detection of aging effects" and "monitoring and trending" program elements which relates to the revision of the implementation procedure to institute a minimum inspection frequency when no wear is measured in a flux thimble tube wall during inspection. When no wear is measured in a flux thimble tube wall, the minimum detectable wear value will be recorded and used to establish the future inspection frequency. Inspection frequency will be a maximum of 15 calendar years between inspections. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M37 and finds it acceptable because, when it is implemented, it will ensure the examination frequency is based upon conservative estimates of wear prediction based upon plant-specific wear data.

Based on a review of the SLRA and the April 1, 2024, amendment letter, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M37. In addition, the staff reviewed the enhancement associated with the "detection of aging effects" and "monitoring and trending" program elements and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience

SLRA Section B2.1.24 summarizes OE related to the Flux Thimble Tube Inspection program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24085A699), the staff reviewed the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent period of extended operation.

The staff noted two instances of OE when leakage or wear was found in flux thimble tubes by visual or eddy current inspection. In both cases, the aging effect was addressed by the applicant's corrective action program. 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 Flux Thimble Tube Inspection program was evaluated.

FSAR Supplement

SLRA Section A1.24 provides the FSAR supplement for the Flux Thimble Tube Inspection program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.2.19 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

SLRA Section B2.1.25 states that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components."

Staff Evaluation

During its audit (ML24085A699), 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.M38.

The staff also reviewed the portions of the "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 evaluations of these enhancements are described below.

Enhancement 1. SLRA Section B2.1.25 includes an enhancement to the "detection of aging effects" program element which relates to revising procedures to specify that inspections and tests are performed by personnel qualified in accordance with site procedures and programs to perform the specified task. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 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.M38.

Enhancement 2. SLRA Section B2.1.25 includes an enhancement to the "detection of aging effects" program element which relates to revising procedures to provide non-ASME Code inspection guidance related to lighting, distance, offset, surface coverage, presence of protective coatings, and cleaning processes. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 1 and 3 implemented, the "detection of aging effects" program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M38.

Enhancement 3. SLRA Section B2.1.25 includes an enhancement to the "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements which relates to revising procedures to specify (1) the minimum number of inspections to be completed for the various sample populations; (2) that the rate of degradation will be evaluated and projected until the end of the subsequent period of extended operation or the next scheduled inspection, whichever is shorter; and (3) that additional inspections will be performed if any sampling-based inspections do not meet the acceptance criteria, unless the cause of the aging effect for each applicable material and environment is corrected by repair or replacement. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement Nos. 1, 2, and 4 are implemented, the "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements will be consistent with the corresponding program elements in GALL-SLR Report AMP XI.M38.

Enhancement 4. SLRA Section B2.1.25 includes an enhancement to the "acceptance criteria" program element that relate to revising procedures to specify that (1) where practical, acceptance criteria are quantitative (e.g., minimum wall thickness), (2) for quantitative analyses, the required minimum wall thickness to meet applicable design standards will be used, and (3) for qualitative evaluations, applicable parameters such as ductility, color, and other indicators will be addressed to ensure a decision is based on observed conditions. The staff reviewed this enhancement and finds it acceptable because when this enhancement and Enhancement No. 3 are implemented, the "acceptance criteria" program element will be consistent with the corresponding program element in 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 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M38. 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, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience

SLRA Section B2.1.25 summarizes OE related to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24085A699), 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 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program was evaluated.

FSAR Supplement

SLRA Section A1.25 provides the FSAR supplement for the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted the applicant committed to implement the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program enhancements 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 FSAR supplement is an adequate summary description of the program.

Conclusion

Based on its review of the applicant’s Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-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 functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.20 Lubricating Oil Analysis

SLRA Section B2.1.26 describes existing Lubricating Oil Analysis program as consistent with the GALL-SLR Report AMP XI.M39.

<u>Staff Evaluation</u>

During its audit (ML24085A699), 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.M39.

The staff also reviewed the portions of the "scope of the program," "preventive actions," "parameters monitored/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 evaluations of these six enhancements are described below.

<u>Enhancement 1.</u> SLRA Section B2.1.26 states an enhancement to the "scope of program," "preventive actions," "detection of aging effects" and "acceptance criteria" program elements which relates to revision of procedures to require periodic sampling and testing of the reactor building chiller water and particles. Procedure(s) will include water and particle limits. The staff reviewed this enhancement, against the corresponding program elements in GALL-SLR Report AMP XI.M39 and finds it acceptable because when it is implemented it will be consistent with the recommendations of the GALL-SLR Report.

<u>Enhancement 2.</u> SLRA Section B2.1.26 states an enhancement to the "preventive actions," "detection of aging effects" and "acceptance criteria" program elements which relates to revision of procedure(s) related to water testing to include that the water in oil will be monitored with the Visual Crackle Test or other first level water content test. The target value for water content is nominally greater than 500 ppm (i.e., it fails the crackle test or other first level water contest with ASTM D6304 [Karl-Fisher titration test], or equivalent method will be performed to determine if the water content is within the limits specified in plant procedures). Phase separated water in any amount is not acceptable. Also, the particle limits procedure(s) will be revised to establish particulate limits that are based on equipment manufacturer's recommendations or industry standards. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M39 and finds it acceptable because when it is implemented it will be consistent with the recommendations of the GALL-SLR Report.

<u>Enhancement 3.</u> SLRA Section B2.1.26 states an enhancement to the "parameters monitored/inspected" program element which relates to revision of procedures to require sampling lubricating oil for particulate and performance of a particle account analysis. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M39 and finds it acceptable because when it is implemented it will be consistent with the recommendations of the GALL-SLR Report.

<u>Enhancement 4</u>. SLRA Section B2.1.26 states an enhancement to the "detection of aging effects" program element which relates to revision of procedures to require sampling and testing following periodic oil changes or on schedule consistent with equivalent manufacturer's recommendations or industry standards. The staff reviewed this

enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M39 and finds it acceptable because when it is implemented it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 5. SLRA Section B2.1.26 states an enhancement to the “monitoring and trending” program element which relates to revision of procedures to require that water and particulates test results are monitored to identify adverse trends that require corrective action(s). The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M39 and finds it acceptable because when it is implemented it will be consistent with the recommendations of the GALL-SLR Report.

Enhancement 6. SLRA Section B2.1.26 states an enhancement to the “corrective actions” program element which relates to revision of procedures to require initiating a condition report if the data collected exceed an alert limit or indicate an unexpected negative trend. Corrective actions will be determined by the Corrective Action Program, and may include increased monitoring, corrective maintenance, further laboratory analysis, and engineering evaluation of the system. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M39 and finds it acceptable because when it is implemented it will be consistent with the recommendations of 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 VCSNS 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 “scope of the program,” “preventive actions,” “parameters monitored/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 B2.1.26 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 (ML24085A699), 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 Lubricating Oil Analysis program was evaluated.

FSAR Supplement

SLRA Appendix A Section A1.26 provides the FSAR supplement for the Lubricating Oil Analysis program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-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 FSAR 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 indeed consistent. Also, the staff 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 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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.21 Buried and Underground Piping and Tanks

SLRA Section B2.1.28 states that the Buried and Underground Piping and Tanks program is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks."

Staff Evaluation

During its audit (ML24085A699), 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 noted during its audit that soil sample results indicating corrosivity greater than 10 points using the "carbon steel" column in Table 9-4, "Soil Corrosivity Index from BPWORKS," of EPRI Report 3002005294, "Soil Sampling and Testing Methods to Evaluate the Corrosivity of the Environment for Buried Piping and Tanks at Nuclear Power Plants," will require evaluation of potential scope expansion or category transition (i.e., a potential increase in inspection sample size based on a Preventive Action Category E to F transition as described in GALL-SLR Report Table XI.M41-2, "Inspection of Buried and Underground Piping and Tanks"). Although this methodology is not included in Revision 0 to the GALL-SLR Report issued in 2017, the staff finds this methodology acceptable for the following reasons: (1) the staff included this methodology as an additional method to determine soil corrosivity with the issuance of draft Revision 1 to the GALL-SLR Report in 2023 and (2) the staff accepted this methodology for a prior SLR applicant (see Section 3.0.3.2.21, "Buried and Underground Piping and Tanks," of the *Safety Evaluation Report Related to the Subsequent License Renewal of Surry Power Station, Units 1 and 2* (ML20052F523)).

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

Enhancement 1. SLRA Section B2.1.28 includes an enhancement to the "preventive actions" and "parameters monitored or inspected" program elements which relates to revising procedures to specify that the limiting critical potential for the cathodic protection system should not be more negative than -1,200 mV to prevent damage to the coating. The staff reviewed this enhancement and finds it acceptable because it is consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 2. SLRA Section B2.1.28 includes an enhancement to the "preventive actions," "detection of aging effects," and "corrective actions" program elements which relates to refurbishing and upgrading the nine cathodic protection systems 5 years prior to entering the subsequent period of extended operation. The staff reviewed this enhancement finds it acceptable because providing cathodic protection for buried piping at least 5 years prior to the subsequent period of extended operation is consistent with GALL-SLR Report AMP XI.M41 recommendations.

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.M41. In addition, the staff reviewed the enhancements associated with the "preventive actions," "parameters monitored or inspected," "detection of aging effects," and "corrective actions" program elements, and finds that when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience

SLRA Section B2.1.28 summarizes OE related to the Buried and Underground Piping and Tanks program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report (ML24085A699), 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.

During its audit, the staff noted a buried piping leak in 2011 (i.e., CR-11-01620) where several holes developed in the piping wall and that the probable cause was either internal or external corrosion. Although there was a singular instance of through-wall corrosion of buried piping (possibly due to external corrosion), the staff finds that the conditions and OE at the plant are bounded by those for which the Buried and Underground Piping and Tanks program was evaluated based on the following reasons: (1) as confirmed by the applicant through RCI B2.1.28-1 (ML24155A146), the other buried piping leaks noted by the staff during its audit (i.e., CR-17-01949 and CR-21-01475) were not due to age-related degradation of in-scope materials (i.e., the cause was due to mechanical damage of PVC piping, which is not a material within the scope of the applicant's Buried and Underground Piping and Tanks program) and (2) external corrosion of in-scope buried piping during the subsequent period of extended operation would be mitigated by the refurbished and upgraded cathodic protection systems (see Enhancement No. 2 above).

FSAR Supplement

SLRA Section A1.28 provides the FSAR supplement for the Buried and Underground Piping and Tanks program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted the applicant committed to implement the Buried and Underground Piping and Tanks program and begin inspections 10 years before the subsequent period of extended operation for managing the effects of aging for applicable components. The staff also noted that for inspections that are to be completed prior to the subsequent period of extended operation, the applicant committed to perform these inspection 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 FSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.2.22 ASME XI, Subsection IWE

SLRA Section B2.1.30, states that the ASME Section XI, Subsection IWE Aging Management Program (AMP) is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.S1, "ASME Section XI, Subsection IWE," as modified by "SLR-ISG-2021-03-Structures, Updated Aging Management Criteria for Structures Portions of the Subsequent License Renewal Guidance."

Staff Evaluation

During its audit (ML24085A699), 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 above NUREG-2191 consistency statement in the SLRA states that the VCSNS Subsection IWE AMP, with enhancements, will be consistent with the 10 elements of NUREG-2191 AMP XI.S1. The staff found the consistency statement acceptable because there were no changes made to the GALL-SLR AMP XI.S1 in the draft interim staff guidance (ISG) SLR-ISG-2021-03-Structures (ML20156A338) referenced in the SLRA and therefore the consistency statement was correct.

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

Enhancement 1. SLRA Section B2.1.30 includes an enhancement to the "parameters monitored/inspected" program element which relates to procedure(s) to be revised to require one-time supplemental surface examinations of the Containment pressure-retaining portions of the stainless steel fuel transfer tube assembly and 20% of the stainless steel or dissimilar metal welds associated with high temperature piping penetration sleeves hotter than 140^{o}F prior to the SPEO to confirm absence of cracking due to SCC. If SCC is detected, additional inspections will be conducted in accordance with the Corrective Action Program. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S1. The staff finds the inspection acceptable because even though the GALL-SLR program element for this AMP does not specifically recommend a one-time inspection to examine cracking due to SCC, when it is implemented it will ensure the surface examination for cracking due to SCC of the Containment pressure-retaining portion and of stainless steel/dissimilar metal welds is consistent with the review principles and recommendations of GALL-SLR Report AMP XI.S1.

Enhancement 2. SLRA Section B2.1.30 includes an enhancement to the "detection of aging effects" program element which relates to procedure(s) to be revised to require a one-time supplemental volumetric examination of inaccessible-from-one-side metal liner surfaces based on plant-specific operating experience indicating material loss exceeding 10% of nominal plate thickness on the inaccessible side or areas, identified since the date of issuance of the initial renewed license are to be examined in accordance with the review principles of detection of aging effects" program element. There has been no triggering operating experience for liner corrosion since the date of issuance of the initial renewed license. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S1 and finds it acceptable because when it is implemented it will provide inspections of volumetric examination of metal liner surfaces that are inaccessible from one side, only if triggered by plant-specific operating experience, consistent with recommendations in GALL-SLR Report AMP XI.S1.

Enhancement 3. SLRA Section B2.1.30 includes an enhancement to the "monitoring and trending" program element which relates to procedure(s) to be revised to specify that successive ISI and examinations be sequenced, evaluated, and re-examined in accordance with ASME Code, Section XI, Subsection IWE, Article IWE-2420. The results are then compared with those previously recorded evaluated for acceptance in accordance with ASME Code, Section XI, Subsection IWE, Article IWE-3120. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S1 and finds it acceptable because when it is implemented it will ensure the program would provide successive inspections in accordance with ASME Code, Section XI, Subsection IWE, Article IWE-2420 and results are assessed against those previously recorded, consistent with 10 CFR 50.55a, "Codes and Standards," requirements and the supplemental recommendations in GALL-SLR Report XI.S1.

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 Section B2.1.30, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent, or will be consistent, with enhancement(s) of the corresponding program elements of GALL-SLR Report AMP XI.S1. In addition, the staff reviewed the enhancements associated with the “parameters monitored or inspected,” “detection of aging effects,” and “monitoring and trending” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience

SLRA Section B2.1.30 summarizes operating experience related to the ASME Section XI IWE AMP. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ML24085A699), the staff reviewed search results of the plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database; and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed 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. Based on its audit and review of the application SLRA, the staff finds that the conditions and operating experience at the plant are bounded by those for which the ASME Section XI, Subsection IWE AMP was evaluated.

FSAR Supplement

SLRA Section A1.30, provides the FSAR supplement for the ASME Section XI, Subsection IWE AMP. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR AMP Report Table XI-01. The staff also noted that the applicant committed (Commitment No. 30) to revise procedures reciprocal to the above noted enhancements to the ASME Section XI, Subsection IWE AMP for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant is committed to implement the three SLRA AMP enhancements no later 6 months prior to the subsequent period of extended operation and, if triggered by plant-specific operating experience, perform a one-time supplemental examination discussed in the enhancements 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 FSAR is an adequate summary description of the program.

Conclusion

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

3.0.3.2.23 ASME XI, Subsection IWF

SLRA Section B2.1.30, states that the ASME Section XI, Subsection IWF Aging Management Program (AMP) is an existing program with exception and enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.S3, “ASME Section XI, Subsection IWF,” except for the exception identified in the SLRA. The applicant amended this SLRA section by letter dated October 24, 2024 (ML24302A144).

<u>Staff Evaluation</u>

During its audit (ML24177A137), 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 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 five enhancements are as follows.

<u>*Exception 1*</u>. SLRA Section B2.1.32 includes an exception to “parameters monitored or inspected” and “detection of aging effects,” program elements related to a GALL-SLR XI.S3 recommended guidance for volumetric examination to be performed once per interval to detect SCC (cracking), in addition to the VT-3 visual examination, on a sample of high-strength bolting greater than 1-inch nominal diameter with actual measured yield strength greater than or equal to 150 ksi (1,034 MPa). The staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable on the basis that “(1) the necessary conditions for the development of SCC in high strength bolts do not exist at VCSNS and (2) there has been no plant-specific operating experience related to SCC of high strength bolts” and, as an additional consideration, the staff ruled out inspections SCC of high strength bolts used in Class 1 supports in NUREG-1787.

<u>*Enhancement 1*</u>. SLRA Section B2.1.32 includes an enhancement to the “scope of program” program element which states that procedure(s) will be revised to include evaluation of class MC component supports. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because when it is implemented in the procedures it will make the “scope of program” program element consistent with that of the GALL Report AMP XI.S3.

<u>*Enhancement 2*</u>. SLRA Section B2.1.32 includes another enhancement to the “scope of program” program element which states that procedure(s) will be revised to evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because when it is implemented in the program procedures the acceptability of inaccessible areas will be evaluated based on conditions in accessible areas, rendering the “scope of program” program element consistent with that in the GALL-SLR AMP XI.S3.

Enhancement 3. SLRA Section B2.1.32 includes an enhancement to the “preventive actions,” program element which states that procedure(s) will be revised to require ASTM A325 and ASTM A490 bolts and associated nuts and washers to be stored in closed containers to protect them from dirt and corrosion. Additionally, the closed containers will be required to be stored in a protected shelter (Storage Level B or C) until use. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because when it is implemented the program procedures will call for preventive actions of ASTM A325 and ASTM A490 bolts, nuts, and washers to include their storage and protection from dirt and corrosion, rendering the “preventive actions,” program element consistent that in the GALL-SLR AMP XI.S3.

Enhancement 4. SLRA Section B2.1.32 includes an enhancement to the “detection of aging effects” program element which states that procedure(s) will be revised to specify a one-time inspection within five years prior to entering the subsequent period of extended operation of an additional 5% of the sample populations for Class 1, 2, and 3 piping supports selected from the remaining population of IWF piping supports and include components that are most susceptible to age-related degradation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because when it is implemented it will provide inspection of component supports not previously inspected by the program ensuring the routinely inspected sample is representative of the aging of the remaining population of supports, rendering the “detection of aging effects” program element consistent with that in the GALL-SLR Report XI.S3.

Enhancement 5. SLRA Section B2.1.32 as amended by letter dated October 24, 2024 (ML24302A144), in Supplement 4, includes an enhancement to the “detection of aging effects” program element which states that procedure(s) will be revised to require that at least one RV support will be inspected every five years during the SPEO. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because it increases the frequency of inspections and examination with regard to potential degradation of the RV supports (see also FE Section 3.5.2.2.2.6 in this SE) making it consistent with the guidance of the XI.S3 program element which states the “extent, frequency, and examination methods are designed to detect, evaluate, or repair age-related degradation before there is a loss of component support intended function.”

Enhancement 6. SLRA Section B2.1.32 includes an enhancement to the “monitoring and trending,” program element which states that procedure(s) will be revised to require that if a component support does not exceed the acceptance standards of IWF-3400 but is repaired to as-new condition, the sample will be increased or modified to include another support that is representative of the remaining population of supports that were not repaired. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because when it is implemented in the procedures it will ensure the program inspects a sample that is representative of the aging effects of the remaining population of supports, consistent with recommendations in GALL-SLR Report XI.S3.

Enhancement 7. SLRA Section B2.1.32 includes an enhancement to the “acceptance criteria” program element which states that procedure(s) will be revised to include inspections and examinations for the additional unacceptable conditions for (a) loss of material due to corrosion or wear; (b) debris, dirt, or excessive wear that could prevent or restrict sliding of the sliding surfaces as intended in the design basis of the support; (c) cracked or sheared bolts, including high-strength bolts, and anchors, and (d) cracks. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because when procedures are revised to include these in addition to those mandated by ASME Section XI, Subsection IWF, it will make the “acceptance criteria” program element consistent with GALL-SLR Report AMP XI.S3.

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 Section B2.1.32, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent or will be consistent with enhancement(s) with the corresponding program elements of GALL-SLR Report AMP XI.S3. The staff also reviewed the exception associated with the “scope of program,” and “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,” “preventive actions,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria,” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience

SLRA Section B2.1.32 summarizes operating experience related to the ASME Section XI, Subsection IWF program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ML24177A137), the staff reviewed search results of the plant OE 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. Based on its audit and review of the application SLRA, the staff finds that the conditions and operating experience at the plant are bounded by those for which the ASME Section XI, Subsection IWF program was evaluated.

FSAR Supplement

SLRA Section A1.32, provides the ASME Section XI, Subsection IWF program. The staff reviewed this FSAR supplement as amended by letter dated October 24, 2024, (ML24302A144) description of the program and noted that it is consistent with the recommended description in GALL-SLR AMP Report Table XI-01. The staff also noted that the applicant committed (Commitment 32) to revise procedures reciprocal to the above noted enhancements to the 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 implement the seven SLRA AMP 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 and start the one-time inspections no earlier than five years prior to the subsequent period of extended operation. The staff finds that the information in the FSAR is an adequate summary description of the program.

Conclusion

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

3.0.3.2.24 Masonry Walls

SLRA Section B2.1.34 states that the Masonry Walls is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.S5, “Masonry Walls.”

Staff Evaluation

During its audit (ML24085A699), 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 “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 evaluations of these three enhancements are described below.

Enhancement 1. SLRA Section B2.1.34 includes an enhancement to the “scope of program” program element which relates to including masonry walls in the Auxiliary Service Building and Water Treatment Building into the scope of the program. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S5 and finds it acceptable because when it is implemented it will fulfill the requirement of 10 CFR 54.4 to include in-scope all nonsafety-related SCs whose failure could prevent satisfactory function of safety-related systems.

Enhancement 2. SLRA Section B2.1.34 includes an enhancement to the “parameters monitored or inspected” and “monitoring and trending” program elements which relates to revising the procedure(s) to require inspection for potential shrinkage and/or separation, cracking of masonry walls, cracking or loss of material at the mortar joints and gaps between the supports and masonry walls that could impact the intended function or invalidate its evaluation basis. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S5 and finds it acceptable because when it is implemented it will cover all parameters to be inspected corresponding to “parameters monitored or inspected” element, and the additional parameters included in the enhancement will be monitored and trended as part of the enhanced “monitoring and trending” element.

Enhancement 3. SLRA Section B2.1.34 includes an enhancement to the “detection of aging effects” program element which relates to revising the procedure(s) to specify that the interval between inspections does not exceed 5 years. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S5 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to visually inspect masonry walls every 5 years.

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.S5. In addition, the staff reviewed the enhancements associated with the “scope of program,” “parameters monitored or inspected,” “detection of aging effects,” and “monitoring and trending,” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience

SLRA Section B2.1.34 summarizes OE related to the Masonry Walls program. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff 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 Masonry Walls AMP was evaluated.

FSAR Supplement

SLRA Section A1.34 provides the FSAR supplement for the Masonry Walls AMP. The staff reviewed this FSAR 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 Masonry Walls AMP for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.2.25 Structures Monitoring

SLRA Section B2.1.35 states that the Structures Monitoring program is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.S6, “Structures Monitoring.”

Staff Evaluation

During its audit (ML24085A699), 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,” 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 evaluations of these 13 enhancements are described below.

Enhancement 1. SLRA Section B2.1.35 includes an enhancement to the “scope of program” program element which relates to revising the implementing procedure to include inspection of the following structures within the scope of SLR: Auxiliary Service Building; alternate seal injection diesel generator (XEG0101) and control panel (XPN5587) (foundations and anchors); carbon dioxide tank (foundation and anchors); Circulating Water Intake Structure (includes Fire Service Pumphouse); the concrete pad supporting piping and equipment for filling Emergency Diesel Generator fuel oil tanks; 115 kV yard equipment (supports, foundations and anchors) from the plant including transformer XTF-4 and voltage regulator, XTF-6 and electrical switch XES-8, through and including electrical circuit switcher XES-4; electrical manholes EMH(s) 9, 11, 31, 32, 46, 47, 70, 72, 74, 75, and 76; sodium hydroxide tank (foundation and anchors); Unit 1 Relay House; and the Water Treatment Building. Baseline inspections for the added structures will be performed under the enhanced program to establish quantitative inspection data prior to conduct of periodic inspections in the subsequent period of extended operation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when it is implemented, it will expand the scope of the program to include these additional components and commodities determined to be in-scope of SLR.

Enhancement 2. SLRA Section B2.1.35 includes an enhancement to the “scope of program” and “parameters monitored or inspected” program elements which relate to revising implementing procedures to include inspection of the following structural components:

- battery racks
- cable bus enclosures and tap box enclosures (external surfaces and supports and support foundations)
- cable trays and conduits
- cable trenches and covers (between Unit 1 Relay House, the Substation Relay House, and the 230-kV breaker XCB-8892)
- 230-kV substation lightning arrestor poles and foundations

- doors
- elastomeric materials
- electrical duct banks
- louvers
- masonry wall edge support and bracing members
- panels and other enclosures
- penetration seals
- pipe whip restraints and jet impingement shields (includes guard pipes used as shields against spray or jet impingement)
- sump and pool liners
- switchyard bus supports
- transmission towers
- racks
- trash racks (for Circulating Water Intake Structure
- tube tracks

The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when it is implemented, it will expand the scope of the program to include these additional components and commodities determined to be in-scope of SLR.

Enhancement 3. SLRA Section B2.1.35 includes an enhancement to the “preventive actions” program element which relates to revising the implementing procedure to require storage of ASTM A325 and ASTM A490 bolts and associated nuts and washers be in closed containers to protect them from dirt and corrosion and the closed containers be stored in a protected shelter (Storage Level B or C) until use. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report 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 B2.1.35 includes an enhancement to the “parameters monitored or inspected” program element which relates to revising the implementing procedure to require inspection of structural steel bracing and edge supports associated with masonry walls for deflection or distortion, loose bolts, and loss of material due to corrosion. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to monitor and trend for deflection or distortion, loose bolts, and loss of material due to corrosion of structural steel associated with masonry walls.

Enhancement 5. SLRA Section B2.1.35 includes an enhancement to the “parameters monitored or inspected” and “detection of aging effects” program elements which relates to revising the implementing procedure to require inspection of elastomeric materials including structural sealants for cracking, loss of material, and hardening include the use of tactile inspection to detect hardening if the intended function is suspect. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report 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 B2.1.35 includes an enhancement to the “parameters monitored or inspected” and “detection of aging effects” program elements which relates to revising the implementing procedure to require, where leakage volumes allow, monitoring and trending of through-wall leakage or water infiltration and leaching deposits for volume and chemistry (for pH, mineral, calcium, chloride, sulfate and iron content) to evaluate any potential effect on the concrete or reinforcing steel. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report 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 B2.1.35 includes an enhancement to the “parameters monitored or inspected” and “detection of aging effects” program elements which relates to revising the implementing procedure to require monitoring of aluminum and stainless steel structural components such as louvers, cable trays, conduits, and structural supports for loss of material and cracking due to SCC that could lead to the reduction or loss of their intended function. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to monitor and trend for loss of material and cracking due to SCC that could lead to the reduction or loss of their intended function.

Enhancement 8. SLRA Section B2.1.35 includes an enhancement to the “detection of aging effects” program element which relates to revising the implementing procedure to require accounting for seasonal variations in the sampling of groundwater (e.g., quarterly monitoring every fifth year). The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to ensure that seasonal variations of the groundwater are non-aggressive.

Enhancement 9. SLRA Section B2.1.35 includes an enhancement to the “detection of aging effects” program element which relates to revising the implementing procedure to indicate excavation and focused examination of a sample of below-grade concrete exposed to groundwater, or other measures, may be necessary every 5 years to detect potential concrete degradation if the groundwater in contact with the structures is determined to be aggressive. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report 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 B2.1.35 includes an enhancement to the “detection of aging effects” program element which relates to revising the implementing procedure to require indications of groundwater infiltration or through-concrete leakage require assessment for aging effects which may include engineering evaluation, more frequent inspections, or destructive testing of affected concrete to validate existing concrete properties, including concrete pH levels. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to ensure that qualifications of inspection and evaluation personnel are recorded and trended for findings that exceed the acceptance criteria for all applicable parameters monitored or trended.

Enhancement 11. SLRA Section B2.1.35 includes an enhancement to the “acceptance criteria” program element which relates to revising the implementing procedure to incorporate the ACI 349.3R Chapter 5 ‘second-tier' evaluation criteria as quantitative acceptance criteria for concrete surfaces. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to ensure that acceptance criteria for concrete surfaces are based on the “second-tier” evaluation criteria provided in ACI 349.3R.

Enhancement 12. SLRA Section B2.1.35 includes an enhancement to the “acceptance criteria” program element which relates to revising the implementing procedure to require evaluation criteria for steel structures be based on the judgment of a qualified structural engineer using the AISC Specification for Structural Steel Buildings and Code of Standard Practice. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to evaluation criteria for steel structures be based on the judgment of a qualified structural engineer using the AISC Specification for Structural Steel Buildings and Code of Standard Practice

Enhancement 13. SLRA Section B2.1.35 includes an enhancement to the “acceptance criteria” program element which relates to revising the implementing procedure to specify:

- Loose nuts and bolts are not acceptable (unless accepted by engineering evaluation).
- Structural sealants are acceptable if observed loss of material, cracking, and hardening will not result in loss of sealing.
- Sliding surfaces are acceptable if (1) no indications of excessive loss of material due to corrosion or wear and (2) no debris or dirt that could restrict or prevent sliding of the surfaces as required by design.

The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will include acceptance criteria for inspections of these additional components and commodities determined to be in-scope of SLR.

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,” 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.S6. In addition, the staff reviewed the enhancements associated with the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience

SLRA Section B2.1.35 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 (ML24085A699), 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 operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, as amended, the staff finds that the conditions and OE at the plant are bounded by those for which the Structures Monitoring program was evaluated.

FSAR Supplement

SLRA Appendix A Section A1.35 provides the FSAR supplement for the Structures Monitoring program. The staff reviewed this FSAR 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 (SLRA Appendix A Table A4.0-1, Commitment No. 35) to implement the program enhancements by no later than 6 months prior to the subsequent period of extended operation. 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 finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

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

3.0.3.2.26 Inspection of Water-Control Structures Associated with Nuclear Power Plants

SLRA Section B2.1.36 states that the Inspection of Water-Control Structures Associated with Nuclear Power Plants program is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants."

Staff Evaluation

During its audit (ML24085A699), 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 “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 evaluations of 15 enhancements are described below.

Enhancement 1. SLRA Section B2.1.36 includes an enhancement to the “scope of program” program element which relates to revising the implementing procedure to include inspection of steel elements including miscellaneous steel, and structural bolting associated with water-control structures. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because when it is implemented it will expand the scope of the program to include these additional components and commodities determined to be in-scope of SLR.

Enhancement 2. SLRA Section B2.1.36 includes an enhancement to the “preventive actions” program element which relates to revising the implementing procedure to require ASTM A325 and ASTM A490 bolts and associated nuts and washers to be stored in closed containers to protect them from dirt and corrosion. Additionally, the closed containers will be required to be stored in a protected shelter (Storage Level B or C) until use. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because when it is 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 3. SLRA Section B2.1.36 includes an enhancement to the “parameters monitored/inspected” program element to revising the implementing procedure to specify the parameters to be monitored and inspected for concrete structures include those described in ACI-201.1R and ACI-349.3R and include monitoring conditions at junctions with abutments and embankments, loss of material, increase in porosity and permeability, seepage, and leakage. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to ensure that parameters monitored/inspected criteria for concrete structures are based on the ACI-201.1R and ACI-349.3R evaluation criteria.

Enhancement 4. SLRA Section B2.1.36 includes an enhancement to the “parameters monitored/inspected” program element to revising the implementing procedure to specify steel components and bolting are inspected for loss of material due to corrosion, loose bolts, missing or loose nuts, other conditions indicative of loss of bolt preload, and cracked concrete around anchor bolts. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to ensure that parameters monitored/inspected for steel and bolting components are evaluated in accordance with applicable industry guidelines.

Enhancement 5. SLRA Section B2.1.36 includes an enhancement to the “parameters monitored/inspected” program element to revising the implementing procedure to specify earthen structures are inspected for depressions, sinkholes, slope stability, and animal burrows. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to ensure that parameters monitored/inspected for earthen structures where degradation are projected or observed to provide reasonable assurance that there is no loss of intended function between inspections.

Enhancement 6. SLRA Section B2.1.36 includes an enhancement to the “parameters monitored/inspected” program element to revise the implementing procedure to require periodic determination and assessment of the bottom elevations of the Service Water Pond to ensure required water volume is maintained. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to ensure that parameters monitored/inspected are in accordance with applicable industry guidelines.

Enhancement 7. SLRA Section B2.1.36 includes an enhancement to the “detection of aging effects” program element which relates to enhancing the implementing procedure to be revised to require qualifications of inspection and evaluation personnel are consistent with ACI 349.3R for reinforced concrete water-control structures. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to ensure that qualifications of inspection and evaluation personnel are consistent with ACI 349.3R.

Enhancement 8. SLRA Section B2.1.36 includes an enhancement to the “detection of aging effects” program element which relates to enhancing the implementing procedure to specify special inspections immediately following the occurrence of significant natural phenomena, such as large floods, hurricanes, tornadoes, or intense local rainfalls. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because, when it is implemented, it will be consistent with GALL-SLR Report recommendations to ensure that detection of aging effects is in accordance with applicable industry guidelines.

Enhancement 9. SLRA Section B2.1.36 includes an enhancement to the “detection of aging effects” program element which relates to enhancing the implementing procedure to require indications of groundwater infiltration or through-concrete leakage be assessed for aging effects. 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, assessments may include analysis of the leakage pH, along with mineral, chloride, sulfate and iron content in the water. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to ensure that qualifications of inspection and evaluation personnel are recorded and trended for findings that exceed the acceptance criteria for all applicable parameters monitored or trended.

Enhancement 10. SLRA Section B2.1.36 includes an enhancement to the “detection of aging effects” program element which relates to enhancing the implementing procedure to require the underwater portions of the Service Water Pumphouse be included in the underwater structural inspections using a diver or dewatering, performed on a frequency not to exceed

5 years. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to ensure that underwater portions of the Service Water Pumphouse be included in the underwater structural inspections using a diver or dewatering, performed on a frequency not to exceed 5 years.

Enhancement 11. SLRA Section B2.1.36 includes an enhancement to the “detection of aging effects” program element which relates to enhancing the implementing procedure to require the potential for aging affects for inaccessible, below-grade concrete structural elements be evaluated when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because when it is 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 12. SLRA Section B2.1.36 includes an enhancement to the “detection of aging effects” program element which relates to enhancing the implementing procedure to specify examination of representative samples of the exposed portions of the below-grade concrete when excavated for any reason. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to ensure that detection of aging effects are in accordance with applicable industry guidelines.

Enhancement 13. SLRA Section B2.1.36 includes an enhancement to the “monitoring and trending” program element which relates to enhancing the implementing procedure to specify quantitative measurements and qualitative information be recorded and trended for findings exceeding the acceptance criteria for the applicable parameters monitored or inspected. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to ensure that quantitative measurements and qualitative information be recorded and trended for findings that exceed the acceptance criteria for all applicable parameters monitored or trended.

Enhancement 14. SLRA Section B2.1.36 includes an enhancement to the “acceptance criteria” program element which relates to enhancing the implementing procedure to incorporate the ACI 349.3R Chapter 5 ‘second tier' evaluation criteria as quantitative acceptance criteria for concrete surfaces. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because when it is 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 provided in ACI 349.3R.

Enhancement 15. SLRA Section B2.1.36 includes an enhancement to the “acceptance criteria” program element which relates to enhancing the implementing procedure to specify engineering evaluations are documented and based on codes, specifications, and standards such as AISC Specifications and those referenced in the plant's CLB. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S7 and finds it acceptable because when it is implemented it will be consistent with the

GALL-SLR Report recommendations to ensure that acceptance criteria are based on codes, specifications, and standards such as AISC Specifications.

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.S7. In addition, the staff reviewed the enhancements associated with the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria,” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience

SLRA Section B2.1.36 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 site audit. As discussed in the Audit Report (ML24085A699), the staff conducted a review of the plant OE search results to (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database, and (2) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience indicating that the applicant should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and OE at the plant are bounded by those for which the Inspection of Water-Control Structures Associated with Nuclear Power Structures program was evaluated.

FSAR Supplement

SLRA Appendix A Section A1.36 provides the FSAR supplement for the Inspection of Water-Control Structures Associated with Nuclear Power Plants Program. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff noted that the applicant committed (SLRA Appendix A Table A4.0-1, Commitment No. 36) to implement 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 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 finds that the information in the FSAR supplement is an adequate summary description of the program.

Conclusion

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

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

SLRA Section B2.1.38 notes that the Electrical Insulation for Electrical Cables and 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.E1, “Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.”

<u>Staff Evaluation</u>

During its audit (ML24085A699), 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 the GALL-SLR Report AMP XI.E1.

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

<u>Enhancement 1</u>. SLRA Section B2.1.38 includes an enhancement to the “parameters monitored or inspected” program element which relates to identifying adverse localized environments through operational experience reviews, communication with maintenance, operations, and radiation protection personnel, and the use of environmental surveys for determining each of the most limiting cable and connection electrical insulation plant environments. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E1 and finds it acceptable because when it is implemented it will be consistent with AMP XI.E1 and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of the electrical insulation components within the scope of the AMP will be maintained consistent with the CLB.

<u>Enhancement 2</u>. SLRA Section B2.1.38 includes an enhancement to the “parameters monitored or inspected” program element which relates to the revision of procedures to include a list of structures/areas to perform/conduct the visual inspections of cables and connections. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E1 and finds it acceptable because when it is implemented it will be consistent with AMP XI.E1 and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of the electrical insulation components within the scope of the AMP will be maintained consistent with the CLB.

<u>Enhancement 3</u>. SLRA Section B2.1.38 includes an enhancement to the “parameters monitored or inspected” and “detection of aging effects” program elements which relates to the revision of procedures to require a review of previously identified and mitigated adverse localized environments cumulative aging effects applicable to in-scope cable and connection electrical

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

Enhancement 4. SLRA Section B2.1.38 includes an enhancement to the "detection of aging effects" program element which relates to the revision of procedures to add a description of the testing methodology to include sample size to be tested, factors to be considered, and acceptable test methods. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E1 and finds it acceptable because when it is implemented it will be consistent with AMP XI.E1 and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of electrical insulation components within the scope of the AMP will be maintained consistent with the CLB.

Enhancement 5. SLRA Section B2.1.38 includes an enhancement to the "detection of aging effects" program element which relates to the revision of procedures to specify that the visual inspection is to be performed prior to the period of extended operation and at least once every 10 years thereafter. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E1 and finds it acceptable because when it is implemented it will be consistent with AMP XI.E1 and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of electrical insulation components within the scope of the AMP will be maintained consistent with the CLB.

Enhancement 6. SLRA Section B2.1.38 includes an enhancement to the "acceptance criteria" program element which relates to the revision of procedures to require the test results for electrical cable and connection insulation material be verified to confirm it is within the acceptance criteria identified in the procedures. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E1 and finds it acceptable because when it is implemented it will be consistent with AMP XI.E1 and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of electrical insulation components within the scope of the AMP will be maintained consistent with the CLB.

Enhancement 7. SLRA Section B2.1.38 includes an enhancement to the "corrective actions" program element which relates to the revision of procedures to include the performance of an engineering evaluation of unacceptable test results and visual indications of cable and connection electrical insulation abnormalities. The procedures will also be revised to clarify that the evaluation will include certain considerations and to specify that corrective actions should include testing, shielding, or mitigating the environment or relocation or replacement of the affected cables or connections. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E1 and finds it acceptable because when it is implemented it will be consistent with AMP XI.E1 and will provide reasonable assurance that the effects of aging will be managed so that the intended functions of electrical insulation 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 XI.E1. In addition, the staff reviewed the enhancements associated with the "parameters monitored or inspected," "detection of aging effects," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience

SLRA Section B2.1.38 summarizes OE related to the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant's corrective action program database and (2) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs to manage the effects of aging in the 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 was evaluated.

FSAR Supplement

SLRA Section A1.38 provides the FSAR supplement for the Electrical Insulation for Electrical Cables and Connections not Subject to 10 CFR 50.49 Environmental Qualification Requirements. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01.

The staff also noted that the applicant committed in Commitment No. 38 of SLRA Table A4.0-1 to implement the following enhancements to the existing Electrical Insulation for Electrical Cable and Connections Not Subject to 10 CFR 50.49 Environmental Requirement AMP 6 months prior to the subsequent period of extended operation:

- Procedure(s) will be revised to add the requirement to identify adverse localized environments through plant operational experience reviews, communication with maintenance, operations, and radiation protection personnel, and the use of environmental surveys for determining each of the most limiting cable and connection electrical insulation plant environments (e.g., caused by temperature, radiation, moisture, or contamination.)
- Procedure(s) will be revised to include a list of structures/areas to perform/conduct the visual inspections of cables and connections.
- Procedure(s) will be revised to add the requirement to perform a review of previously identified and mitigated adverse localized environments cumulative aging effects applicable to in-scope cable and connection electrical insulation.
- Procedure(s) will be revised to add a description of testing methodology: Should testing be deemed necessary based on unacceptable visual indications of surface anomalies, a sample size of 20 percent of each cable and connection insulation material type found within the adverse localized environment with a maximum sample size of 25 will be tested. The following factors will be considered in the development of the cable and connection insulation test sample: environment including identified adverse localized environments (high temperature, high humidity, vibration, etc.), voltage level, circuit loading, connection type, location (high temperature, high humidity, vibration, etc.), and insulation material. 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. The technical basis for the sample selected is provided.

- Procedure(s) will be revised to specify the visual inspection be performed prior to the period of extended operation and at least once every 10 years thereafter.
- Procedure(s) will be revised to require the test results for electrical cable and connection insulation material be verified to confirm they are within the acceptance criteria identified in the procedure(s).
- Procedure(s) will be revised to add the requirement to include the performance of an Engineering evaluation of unacceptable test results and visual indications of cable and connection electrical insulation abnormalities. The evaluation will consider the age and operating environment of the component, as well as the severity of the abnormality and whether such an abnormality has previously been correlated to degradation of cable or connection insulation. Corrective actions include, but are not limited to, testing, shielding, or otherwise mitigating the environment or relocation or replacement of the affected cables or connections. When an unacceptable condition or situation is identified, a determination is made as to whether the same condition or situation is applicable to additional in-scope accessible and inaccessible cables or connections (extent of condition).

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

Conclusion

Based on its review of the applicant's Electrical Insulation for Electrical Cables and Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are indeed 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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

SLRA Section B2.1.40 notes that the Electrical Insulation for Inaccessible Medium-Voltage Power Cables 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.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, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance." The applicant amended this SLRA section by letter dated April 1, 2024 (ML24095A207) (Supplement 1).

<u>Staff Evaluation</u>

During its audit (ML24085A699), 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 program elements of GALL-SLR Report AMP XI.E3A, as modified by SLR-ISG-2021-04-ELECTRICAL.

The staff also reviewed the portions of the "preventive actions" 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 evaluations of these three enhancements are described below.

<u>Enhancement 1</u>. SLRA Section B2.1.40 includes an enhancement to the "preventive actions" program element which relates to the revision of procedures to inspect and dewater, if required, the in-scope manholes 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 as modified by SLR-ISG-2021-04-ELECTRICAL and finds it acceptable because when it is implemented it will be consistent with 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.

<u>Enhancement 2</u>. SLRA Section B2.1.40 includes an enhancement to the "preventive actions" program element which relates to the revision of procedures to clarify that the frequency of manhole inspections will occur at least once a year. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E3A as modified by SLR-ISG-2021-04-ELECTRICAL and finds it acceptable because when it is implemented it will be consistent with 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.

<u>Enhancement 3</u>. SLRA Section B2.1.40, as modified by Supplement 1, includes an enhancement to the "preventive actions" program element which relates to the revision of procedures to specify that condition monitoring cable test and inspections results that utilize visual inspection and test methods that are trendable and repeatable, will be trended to provide additional information on the rate of cable or connection insulation degradation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E3A as modified by SLR-ISG-2021-04-ELECTRICAL and finds it acceptable because when it is implemented it will be consistent with 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 conductor insulation 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 as modified by SLR-ISG-2021-04-ELECTRICAL 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 “preventive actions” program element and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience

SLRA Section B2.1.40, as modified by Supplement 1, summarizes OE related to the Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. The staff reviewed OE information in the application and during the audit. As discussed in the Audit Report, the staff reviewed search results of the plant OE information to (1) identify examples of age-related degradation, as documented in the applicant’s corrective action program database and (2) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs to manage the effects of aging in the 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 was evaluated.

FSAR Supplement

SLRA Section A1.40 provides the FSAR supplement for the Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. The staff reviewed this FSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01, as modified by SLR-ISG-2021-04-ELECTRICAL.

The staff also noted that the applicant committed in Commitment No. 40 of SLRA Table A4.0-1 to implement the following enhancements to the existing Electrical Insulation for Electrical Cable and Connections Not Subject to 10 CFR 50.49 Environmental Requirement AMP 6 months prior to the subsequent period of extended operation:

- Procedure(s) will be revised to inspect and dewater, if required, the in-scope manholes after event driven occurrences, such as heavy rain, rapid thawing of ice and snow, or flooding.
- Procedure(s) will be revised to clarify that the frequency of manhole inspections will occur at least once a year.
- Procedure(s) will be revised to specify that condition monitoring cable test and inspection results that utilize inspection and test methods that are trendable and repeatable, will be trended to provide additional information on the rate of cable or connection insulation degradation. (Added-Supplement 1).

The staff finds that the information in the FSAR supplement, as amended by letter dated April 1, 2024 (Supplement 1), 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, 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 indeed 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 FSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.4 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 nonsafety-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 corrective actions, confirmation process, and 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, “FSAR Supplement,” Section A1, “Summary Descriptions of Aging Management Programs,” and SLRA Appendix B, “Aging Management Programs,” Section B1.3, “Quality Assurance Program and Administrative Controls,” describe the elements of corrective actions, confirmation process, and administrative controls applied to the AMPs for both safety-related and nonsafety-related components.

SLRA Appendix A, Section A1, states, in part, the following:

> The Quality Assurance (QA) Program is described in Topical Report DOM-QA-1, "Dominion Energy Nuclear Facility Quality Assurance Program Description," which implements the requirements of 10 CFR 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." The QA Program is consistent with the summary in Appendix A.2, "Quality Assurance for Aging Management Programs (Branch Technical Position IQMB-1)," of NUREG-2192. The QA Program provides the basis for the corrective actions, confirmation process, and administrative controls elements of aging management programs (AMPs). The scope of the existing QA Program is expanded to also include safety-related and nonsafety-related structures and components subject to AMPs.

SLRA Appendix B, Section B1.3, states, in part, the following:

> The Quality Assurance (QA) Program is described in Topical Report DOM-QA-1, “Dominion Energy Nuclear Facility Quality Assurance Program Description,” which implements the requirements of 10 CFR 50, Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants.” The QA Program includes the three elements of Corrective Actions, Confirmation Process, and Administrative Controls, which are applicable to the safety-related and nonsafety-related systems, structures, and components (SSCs) that are subject to aging management review. The QA Program is consistent with NUREG-2191, Appendix A, “Quality Assurance for Aging Management Programs,” and the summary in NUREG-2192, Appendix A.2, “Quality Assurance for Aging Management Programs (Branch Technical Position IQMB-1).”

<u>Staff Evaluation</u>

The staff reviewed SLRA Appendix A, Section A1, and SLRA Appendix B, Section B1.3, which describe how the applicant’s existing QA program includes the QA-related elements (corrective actions, confirmation process, and administrative controls) for AMPs, consistent with the staff’s guidance described in BTP IQMB-1 and is applicable to safety-related and nonsafety-related SSCs and commodity groups within the scope of AMPs. Based on the review, the staff determined that the QA attributes presented in the AMP basis documents and the associated AMPs are consistent with the staff’s position on QA for aging management.

<u>Conclusion</u>

On the basis of the staff’s review of SLRA Appendix A, Section A1, and SLRA Appendix B, Section B1.3, 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

SLRA Appendix A, Section A1 and SLRA Appendix B, Section B1.4, "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.

Staff Evaluation

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.

Consideration of Future Operating Experience

The staff reviewed SLRA Appendix A, Section A1, and SLRA Appendix B, Section B1.4, 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.

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 A1, and SLRA Appendix B, Section B1.4, 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.

Areas of Further Review

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

SLRA Appendix A, Section A1, and SLRA Appendix B, Section B1.4, 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 nonsafety-related SCs.

SLRA Appendix A, Section A1, and SLRA Appendix B, Section B1.3, state that the applicant's QA program includes nonsafety-related SCs, which the staff finds consistent with the guidance in SRP-SLR Section A.2 and therefore consistent with SRP-SLR Section A.4.2 as well. SE Section 3.0.4 documents the staff's evaluation of SLRA Appendix A, Section A1, and SLRA Appendix B, Section B1.3, relative to the application of the QA program to nonsafety-related SSCs.

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

SLRA Appendix B, Section B1.4, 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 A1, and SLRA Appendix B, Section B1.4, 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 B1.4, 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 A1, and SLRA Appendix B, Section B1.4, 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 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 B1.4, 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 A1.4, and SLRA Appendix B, Section B1.4, 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 A1, and SLRA Appendix B, Section B1.4 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 A1, and SLRA Appendix B, Section B1.4, 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 B1.4, states that the applicant's self-assessment process provides for periodic evaluation of the effectiveness of the OE program described in the FSAR supplement. SLRA Appendix A, Section A1, and SLRA Appendix B, Section B1.4, state that the OE program will be implemented on an ongoing basis throughout the term of the subsequent renewed license. SLRA Appendix A, Section A1, provides the FSAR 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.

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.

FSAR Supplement

In accordance with 10 CFR 54.21(d), the FSAR supplement must, in part, contain a summary description of the programs and activities for managing the effects of aging. SLRA Appendix A, Section A1, provides the FSAR 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 is also 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 FSAR supplement summary description acceptable.

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 FSAR supplement for these activities and finds that it provides an adequate summary description, as required by 10 CFR 54.21(d).

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

3.1.1 Summary of Technical Information in the Application

The SLRA Report Section 3.1 provides AMR results for those components the applicant identified in SLRA Section 2.3.1, "Reactor Vessel, Internals, and Reactor Coolant System" (RCS), as being subject to an AMR. SLRA Table 3.1.1, "Summary of Aging Management Programs for Reactor Vessel, Internals, and Reactor Coolant System Evaluated in Chapter IV of the GALL-SLR Report,” 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 SE Section 3.1.2.2.1)
3.1.1-002	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.1)
3.1.1-003	Not applicable to V.C. Summer (see SE Section 3.1.2.2.1)
3.1.1-004	Not applicable to V.C. Summer (see SE Section 3.1.2.2.1)
3.1.1-005	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.1)
3.1.1-006	Not applicable to pressurized water reactors (PWRs) (see SE Section 3.1.2.2.1)
3.1.1-007	Not applicable to PWRs (see SE Section 3.1.2.2.1)
3.1.1-008	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.1)
3.1.1-009	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.1)
3.1.1-010	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.1)
3.1.1-011	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.1)
3.1.1-012	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.2, item 1 and item 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 V.C. Summer (see SE Section 3.1.2.2.3, item 3)
3.1.1-016	Not applicable to PWRs (see SE Section 3.1.2.2.4, item 1)
3.1.1-017	Not applicable to PWRs (see SE Section 3.1.2.2.4, item 2)
3.1.1-018	Not applicable to V.C. Summer (see SE Section 3.1.2.2.5)
3.1.1-019	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.6, item 1)
3.1.1-020	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.6, item 2)
3.1.1-021	Not applicable to PWRs (see SE Section 3.1.2.2.7)
3.1.1-022	Not applicable to V.C. Summer (see SE Section 3.1.2.2.8)
3.1.1-023	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-024	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-025	Consistent with the GALL-SLR Report (see SE Sections 3.1.2.2.11, items 1 and 2)
3.1.1-026	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-027	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-028	Not used (addressed by 3.1.1-055c) (see SE Section 3.1.2.2.9)
3.1.1-029	Not applicable to PWRs (see SE Section 3.1.2.2.12)
3.1.1-030	Not applicable to PWRs
3.1.1-031	Not applicable to PWRs

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1.1-032	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-033	Consistent with the GALL-SLR Report (see SE Section 3.1.2.1.2)
3.1.1-034	Not applicable to V.C. Summer
3.1.1-035	Consistent with the GALL-SLR Report
3.1.1-036	Consistent with the GALL-SLR Report
3.1.1-037	Consistent with the GALL-SLR Report
3.1.1-038	Not applicable to V.C. Summer
3.1.1-039	Consistent with the GALL-SLR Report
3.1.1-040	Consistent with the GALL-SLR Report
3.1.1-040a	Consistent with the GALL-SLR Report
3.1.1-041	Not applicable to PWRs (see SE Section 3.1.2.2.12)
3.1.1-042	Consistent with the GALL-SLR Report
3.1.1-043	Not applicable to PWRs
3.1.1-044	Consistent with the GALL-SLR Report
3.1.1-045	Consistent with the GALL-SLR Report
3.1.1-046	Consistent with the GALL-SLR Report
3.1.1-047	Consistent with the GALL-SLR Report
3.1.1-048	Consistent with the GALL-SLR Report
3.1.1-049	Consistent with the GALL-SLR Report
3.1.1-050	Consistent with the GALL-SLR Report
3.1.1-051a	Not applicable to V.C. Summer (see SE Section 3.1.2.2.9)
3.1.1-051b	Not applicable to V.C. Summer (see SE Section 3.1.2.2.9)
3.1.1-052a	Not applicable to V.C. Summer (see SE Section 3.1.2.2.9)
3.1.1-052b	Not applicable to V.C. Summer (see SE Section 3.1.2.2.9)
3.1.1-052c	Not applicable to V.C. Summer (see SE Section 3.1.2.2.9)
3.1.1-053a	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.9)
3.1.1-053b	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.9)
3.1.1-053c	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.9)
3.1.1-054	Consistent with the GALL-SLR Report
3.1.1-055a	Not applicable to V.C. Summer (see SE Section 3.1.2.2.9)
3.1.1-055b	Not applicable to V.C. Summer (see SE Section 3.1.2.2.9)
3.1.1-055c	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.9)
3.1.1-056a	Not applicable to V.C. Summer (see SE Section 3.1.2.2.9)
3.1.1-056b	Not applicable to V.C. Summer (see SE Section 3.1.2.2.9)
3.1.1-056c	Not applicable to V.C. Summer (see SE Section 3.1.2.2.9)
3.1.1-057	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-058a	Not applicable to V.C. Summer (see SE Section 3.1.2.2.9)
3.1.1-058b	Not applicable to V.C. Summer (see SE Section 3.1.2.2.9)
3.1.1-059a	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.9)
3.1.1-059b	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.9)
3.1.1-059c	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.9)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1.1-060	Not applicable to PWRs
3.1.1-061	Consistent with the GALL-SLR Report
3.1.1-062	Not applicable to V.C. Summer
3.1.1-063	Not applicable to PWRs
3.1.1-064	Consistent with the GALL-SLR Report
3.1.1-065	Not applicable to V.C. Summer
3.1.1-066	Consistent with the GALL-SLR Report
3.1.1-067	Consistent with the GALL-SLR Report
3.1.1-068	Not applicable to V.C. Summer
3.1.1-069	Consistent with the GALL-SLR Report
3.1.1-070	Consistent with the GALL-SLR Report
3.1.1-071	Consistent with the GALL-SLR Report (see SE Sections 3.1.2.1.2 and 3.1.2.1.5)
3.1.1-072	Consistent with the GALL-SLR Report
3.1.1-073	Not applicable to V.C. Summer
3.1.1-074	Consistent with the GALL-SLR Report
3.1.1-075	Not applicable to V.C. Summer
3.1.1-076	Consistent with the GALL-SLR Report (see SE Section 3.1.2.1.3)
3.1.1-077	Consistent with the GALL-SLR Report (see SE Section 3.1.2.1.3)
3.1.1-078	Not applicable to V.C. Summer
3.1.1-079	Not applicable to PWRs
3.1.1-080	Not applicable to V.C. Summer
3.1.1-081	Not applicable to V.C. Summer
3.1.1-082	Consistent with the GALL-SLR Report
3.1.1-083	Not applicable to V.C. Summer
3.1.1-084	Not applicable to PWRs
3.1.1-085	Not applicable to PWRs
3.1.1-086	Not applicable to V.C. Summer
3.1.1-087	Consistent with the GALL-SLR Report
3.1.1-088	Consistent with the GALL-SLR Report
3.1.1-089	Consistent with the GALL-SLR Report
3.1.1-090	Consistent with the GALL-SLR Report
3.1.1-091	Not applicable to PWRs
3.1.1-092	Consistent with the GALL-SLR Report
3.1.1-093	Not applicable to V.C. Summer
3.1.1-094	Not applicable to PWRs
3.1.1-095	Not applicable to PWRs
3.1.1-096	Not applicable to PWRs
3.1.1-097	Not applicable to PWRs
3.1.1-098	Not applicable to PWRs
3.1.1-099	Not applicable to PWRs (see SE Section 3.1.2.2.13)
3.1.1-100	Not applicable to PWRs

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1.1-101	Not applicable to PWRs
3.1.1-102	Not applicable to PWRs
3.1.1-103	Not applicable to PWRs (see SE Section 3.1.2.2.12)
3.1.1-104	Not applicable to PWRs
3.1.1-105	Not applicable to V.C. Summer (see SE Section 3.1.2.2.15)
3.1.1-106	Not applicable to V.C. Summer
3.1.1-107	Consistent with the GALL-SLR Report
3.1.1-108	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-109	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-110	Not applicable to PWRs
3.1.1-111	Consistent with the GALL-SLR Report
3.1.1-112	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-113	Not applicable to PWRs
3.1.1-114	Not used (addressed by 3.1.1-020, 3.1.1-033, 3.1.1-035, 3.1.1-036, 3.1.1-037, 3.1.1-039, 3.1.1-042, 3.1.1-045, 3.1.1-088, and 3.1.1-116)
3.1.1-115	Not applicable to V.C. Summer (see SE Section 3.1.2.2.15)
3.1.1-116	Not applicable to V.C. Summer (see SE Section 3.1.2.2.10)
3.1.1-117	Not applicable to V.C. Summer (see SE Section 3.1.2.2.10)
3.1.1-118	Not used (addressed by 3.1.1-053a, 3.1.1-053b, and 3.1.1-053c) (see SE Section 3.1.2.2.9)
3.1.1-119	Not Used (addressed by 3.1.1-053a, 3.1.1-053b, and 3.1.1-053c) (see SE Section 3.1.2.2.9)
3.1.1-120	Not applicable to PWRs (see SE Section 3.1.2.2.14)
3.1.1-121	Not applicable to PWRs
3.1.1-122	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-123	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-124	Consistent with the GALL-SLR Report
3.1.1-125	Consistent with the GALL-SLR Report
3.1.1-126	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-127	Consistent with the GALL-SLR Report (see SE Section 3.1.2.1.4)
3.1.1-128	Not applicable to PWRs
3.1.1-129	Not applicable to PWRs
3.1.1-130	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-131	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-132	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-133	Not applicable to PWRs
3.1.1-134	Not applicable to V.C. Summer
3.1.1-135	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-136	Consistent with the GALL-SLR Report (see SE Section 3.1.2.2.16)
3.1.1-137	Not applicable to V.C. Summer
3.1.1-138	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1.1-139	Consistent with the GALL-SLR Report (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 V.C. Summer 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 Request for Information (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 further 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 3.1.2-4 that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat its review of the matters described in the GALL-SLR Report; however, the staff did verify that the material presented in the SLRA was applicable and that the applicant identified the appropriate GALL-SLR Report for 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 3.11, and no separate write-up 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 3.1.2.1.5 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- 003, 3.1.1- 004, 3.1.1- 015, 3.1.1- 018, 3.1.1- 022, 3.1.1-034, 3.1.1- 038, 3.1.1-051a, 3.1.1-051b, 3.1.1-052a, 3.1.1-052b, 3.1.1-052c, 3.1.1-055a, 3.1.1-055b, 3.1.1-056a, 3.1.1-056b, 3.1.1-056c, 3.1.1-058a, 3.1.1-058b, 3.1.1- 062, 3.1.1- 065, 3.1.1-068, 3.1.1- 073, 3.1.1- 075, 3.1.1- 078, 3.1.1- 080, 3.1.1- 081, 3.1.1- 083, 3.1.1- 086, 3.1.1-093, 3.1.1-105, 3.1.1-106, 3.1.1-115, 3.1.1-116, 3.1.1-117, 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 V.C. Summer. The NRC staff reviewed the SLRA and FSAR and confirmed that the applicant's SLRA does not have any AMR results that are applicable for these items.

For SLRA Table 3.1.1 items 3.1.1-006, 3.1.1-007, 3.1.1-016, 3.1.1-017, 3.1.1-021, 3.1.1-029, 3.1.1-030, 3.1.1-031, 3.1.1-041, 3.1.1-043, 3.1.1-060, 3.1.1-063, 3.1.1-079, 3.1.1-084, 3.1.1-085, 3.1.1-091, 3.1.1-094, 3.1.1-095, 3.1.1-096, 3.1.1-097, 3.1.1-098, 3.1.1-099, 3.1.1-100, 3.1.1-101, 3.1.1-102, 3.1.1-103, 3.1.1-104, 3.1.1-110, 3.1.1-113, 3.1.1-120, 3.1.1-121, 3.1.1-128, 3.1.1-129, and 3.1.1-133, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable because the associated items are only applicable to boiling water reactors (BWR) while V.C. Summer is a PWR unit. The NRC staff reviewed the SRP-SLR Report, confirmed that these items only apply to BWRs, and finds that these items are not applicable to V.C. Summer because the nuclear power plant is a PWR.

For the following SLRA Table 3.1.1 items, the applicant claims that the corresponding items in the GALL-SLR Report are not used because they are addressed by other SLRA Table 1 items: 3.1.1-028 (addressed by 3.1.1-055c), 3.1.1-114 (addressed by 3.1.1-020, 3.1.1-033, 3.1.1-035, 3.1.1-036, 3.1.1-037, 3.1.1-039, 3.1.1-042, 3.1.1-045, 3.1.1-088, and 3.1.1-116), 3.1.1-118 (addressed by 3.1.1-053a, 3.1.1-053b, and 3.1.1-053c), and 3.1.1-119 (addressed by 3.1.1-053a, 3.1.1-053b, and 3.1.1-053c). The NRC 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 Cracking Due to Stress Corrosion Cracking

SLRA Table 3.1.1, AMR item 3.1.1-033 addresses cracking due to stress corrosion cracking (SCC) for stainless steel and steel with stainless steel cladding Class 1 reactor coolant pressure boundary components exposed to reactor coolant. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Steam Generators program and the Water Chemistry program to manage cracking due to SCC for the steel with stainless steel cladding channel heads and stainless steel channel head drain tubes exposed to reactor coolant. The AMR item cites plant-specific note 2, which states, in part, "The Steam Generators (B2.1.10) program is used instead of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) program to manage cracking due to SCC for the channel head stainless steel cladding and the channel head drain tube."

Based on its review of components associated with AMR item 3.1.1-033 for which the applicant cited generic note E, the NRC staff finds the applicant's proposal to manage the effects of aging using the Steam Generators and Water Chemistry programs acceptable. Specifically, the NRC staff finds that the Steam Generators program monitors the condition of the steam generator (SG) channel head cladding and drain tube, and the use of the Water Chemistry program manages cracking of stainless-steel due to SCC in reactor coolant, which is consistent with the GALL-SLR Report.

SLRA Table 3.1.1, AMR item 3.1.1-071 addresses, in part, cracking due to SCC for steel, chrome plated steel, stainless steel, and nickel-alloy SG U-bend supports, including anti-vibration bars exposed to secondary feedwater or steam. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (ASME Section XI) program and the Water Chemistry program to manage cracking for the nickel-alloy feedwater nozzle thermal sleeves and auxiliary feedwater nozzle thermal sleeves exposed to treated water >60°C (>140°F). The AMR item cites plant-specific note 1, which states, "The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) program is used instead of the Steam Generators (B2.1.10) program to manage cracking and loss of material for the for the feedwater nozzle thermal sleeve and auxiliary feedwater nozzle thermal sleeve."

Based on its review of components associated with AMR item 3.1.1-071 for which the applicant cited generic note E, the NRC staff finds that the applicant's proposal to manage cracking due to SCC for the nickel-alloy feedwater nozzle thermal sleeves and auxiliary feedwater nozzle thermal sleeves using the ASME Section XI program and the Water Chemistry program to be acceptable. This is based on the use of the Water Chemistry program to manage cracking due to SCC to treated water >60°C (>140°F) being consistent with the GALL-SLR Report, and because the ASME Section XI program includes visual inspections which are also capable of detecting cracking.

3.1.2.1.3 Loss of Material Due to Wear and Fretting

SLRA Table 3.1.1, AMR item 3.1.1-076 addresses loss of material due to wear and fretting for steel, chrome plated steel, stainless steel, nickel-alloy SG U-bend supports including anti-vibration bars exposed to secondary feedwater or steam. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the ASME Section XI program to manage loss of material due to wear and fretting for the nickel-alloy feedwater nozzle thermal sleeves and auxiliary feedwater nozzle thermal sleeves exposed to treated water >60°C (>140°F). The AMR item cites plant-specific note 1, which states, “The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) program is used instead of the Steam Generators (B2.1.10) program to manage cracking and loss of material for the for the feedwater nozzle thermal sleeve and auxiliary feedwater nozzle thermal sleeve.”

Based on its review of components associated with AMR item 3.1.1-076 for which the applicant cited generic note E, the NRC staff finds the applicant’s proposal to manage loss of material due to wear and fretting for the nickel-alloy feedwater nozzle thermal sleeves and auxiliary feedwater thermal sleeves using the ASME Section XI program acceptable because the ASME Section XI program includes visual inspections that are capable of detecting loss of material.

SLRA Table 3.1.1, AMR item 3.1.1-077 and time-limited aging analysis (TLAA) 4.7.4, “Steam Generator Tube Wear Evaluation,” address loss of material due to wear and fretting for nickel-alloy SG tubes and sleeves exposed to secondary feedwater or steam. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Steam Generators program and the plant-specific TLAA Steam Generator Tube Wear Evaluation to manage loss of material for nickel-alloy tubes exposed to treated water >60°C (>140°F). The AMR item cites plant-specific note 4, which states, “Wear of steam generator tubes at the tube support plates is a plant-specific TLAA, evaluated in Steam Generator Tube Wear Evaluation (4.7.4).”

Based on its review of components associated with AMR item 3.1.1-077 for which the applicant cited generic note E, the NRC staff finds the applicant’s proposal to manage loss of material for the nickel-alloy tubes using the Steam Generators program and the plant-specific TLAA Steam Generator Tube Wear Evaluation acceptable because the applicant has evaluated tube wear in the plant-specific TLAA, and also because the applicant uses the Steam Generators program to manage loss of material, which is consistent with the GALL-SLR Report.

3.1.2.1.4 Loss of Material Due to Boric Acid Corrosion

SLRA Table 3.1.1, AMR item 3.1.1-127 addresses loss of material due to boric acid corrosion for steel (with stainless-steel or nickel-alloy cladding) SG heads as well as tube sheets exposed internally to reactor coolant. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the ASME Section XI program and the Water Chemistry program to manage loss of material for the steel with stainless steel cladding primary inlet and outlet nozzles, as well as the stainless steel primary inlet and outlet nozzle safe ends exposed internally to reactor coolant. The AMR items cite plant-specific note 3, which states, “The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) program is used instead of the Steam Generators (B2.1.10) program to manage loss of material due to boric acid corrosion for the primary inlet and outlet nozzle and safe end.” The NRC staff notes that loss of material for these components exposed externally to boric acid leakage is managed using the Boric Acid Corrosion program.

Based on its review of components associated with AMR item 3.1.1-127 for which the applicant cited generic note E, the NRC staff finds the applicant's proposal to manage loss of material for the steel with stainless steel cladding primary inlet and outlet nozzles and the stainless steel primary inlet and outlet nozzle safe ends using the ASME Section XI program and the Water Chemistry program acceptable. The staff finds the applicant's proposal acceptable because the use of the Water Chemistry program to manage loss of material in reactor coolant is consistent with the GALL-SLR Report, and because the ASME Section XI program includes inspections that are capable of detecting loss of material.

3.1.2.1.5 Loss of Material due to General, Pitting, and Crevice Corrosion

SLRA Table 3.1.1, AMR item 3.1.1-071 addresses, in part, loss of material due to general, pitting, and crevice corrosion for steel, chrome plated steel, stainless steel, nickel-alloy SG U-bend supports including anti-vibration bars exposed to secondary feedwater or steam. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the ASME Section XI program and the Water Chemistry program to manage loss of material for the nickel-alloy feedwater nozzle thermal sleeves and auxiliary feedwater nozzle thermal sleeves exposed to treated water >60°C (>140°F). The AMR item cites plant-specific note 1, which states, "The ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) program is used instead of the Steam Generators (B2.1.10) program to manage cracking and loss of material for the for the feedwater nozzle thermal sleeve and auxiliary feedwater nozzle thermal sleeve."

Based on its review of components associated with AMR item 3.1.1-071 for which the applicant cited generic note E, the NRC staff finds the applicant's proposal to manage loss of material for the nickel-alloy feedwater nozzle thermal sleeves and auxiliary feedwater nozzle thermal sleeves using the ASME Section XI program and the Water Chemistry program acceptable. This is based on the use of the Water Chemistry program to manage loss of material in treated water >60°C (>140°F) being consistent with the GALL-SLR Report, and because the ASME Section XI program includes visual inspections that are capable of detecting loss of material.

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 the applicant also provides information concerning how it will manage the applicable aging effects. The NRC staff reviewed the applicant's evaluation of these component groups against the criteria contained in SRP-SLR Section 3.1.2.2. The following subsections document the staff's review.

3.1.2.2.1 Cumulative Fatigue Damage

SLRA Section 3.1.2.2.1 is associated with SLRA items 3.1.1-001, 3.1.1-002, 3.1.1-005, 3.1.1-008, 3.1.1-009, 3.1.1-010 and 3.1.1-011. This section indicates that the TLAAs on cumulative fatigue damage in RCS components are evaluated in accordance with 10 CFR 54.21(c)(1) and are further addressed in SLRA Section 4.3. This is consistent with SRP-SLR Section 3.1.2.2.1 and is, therefore, acceptable. The NRC staff's evaluation of the TLAAs for RCS components is documented in SE 4.3.

SLRA Section 3.1.2.2.1, as supplemented by the applicant's response (ML24155A146) to RAI 3.1.2.2.1-1, discusses FSAR Section 3.9.3.6 which addresses the blowdown and seismic displacement and stress analyses for reactor vessel internal (RVI) components. The applicant's discussion related to FSAR Section 3.9.3.6 and RVI components is acceptable for the following reasons:

1. FSAR Section 3.9.3.6 addresses the faulted condition transients (i.e., blowdown transient due to large break Loss-of-Coolant Accident (LOCA) and the seismic transient due to safe shutdown earthquake) which do not involve or require a fatigue analysis for RVI components.
2. Accordingly, the design basis documents referenced in FSAR Section 3.9.3.6 do not include a fatigue analysis for the RVI components.

As discussed above, the NRC staff noted that the fatigue analyses in the current licensing basis (CLB) for V.C. Summer do not include a fatigue analysis for the RVI components; therefore, SLRA item 3.1.1-003 for RVI components is not applicable to the V.C. Summer.

In addition, the applicant determined that SLRA item 3.1.1-004 for reactor vessel support skirts is not applicable to the V.C. Summer because there is no support skirt. Instead, the reactor vessel is supported by six reactor vessel supports, one beneath each reactor vessel nozzle, as described in FSAR Section 5.2.1.10.6.4. The NRC staff evaluated the applicant's determination in accordance with SRP-SLR Section 3.1.2.2.1 and finds it acceptable because the staff noted that there is no support skirt for the reactor vessel based on a review of the FSAR.

The NRC staff reviewed SLRA Section 3.1.2.2.1 against the criteria in SRP-SLR Section 3.1.2.2.1. The applicant stated that item 3.1.1-006 and 3.1.1-007 is not applicable to V.C. Summer, which is a PWR unit, because the associated item in SLRA Table 3.1.1 is applicable to BWR units only. The staff confirmed that this item is associated only with BWRs and, therefore, finds the applicant's claim acceptable.

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

<u>Items 1 and 2</u>. SLRA Section 3.1.2.2.2, items 1 and 2 are associated with SLRA Table 3.1.1, AMR item 3.1.1-012, which addresses loss of material due to general, pitting, and crevice corrosion for Westinghouse Model 44 and 51 SGs. The SRP-SLR recommends an augmented inspection to manage these aging effects. Additionally, for applicants that have replaced the bottom part of their recirculating SGs, the SPR-SLR recommends volumetric examinations. The applicant stated that these items are not applicable since the applicant's SGs are Westinghouse Model Delta 75, therefore, the augmented inspections recommended in the SRP-SLR are not necessary. The applicant stated that it will manage loss of material for the SG upper and lower shell and the transition cone exposed to steam and treated water, with the Water Chemistry (B2.1.2) and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) programs.

Based on the programs identified, the NRC staff concludes that the applicant's programs meet the SRP-SLR Section 3.1.2.2.2 items 1 and 2 further evaluation requirements. For those AMR items associated with SLRA Section 3.1.2.2.2 items 1 and 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).

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 neutron irradiation embrittlement is a TLAA as defined in 10 CFR 54.3 and is evaluated in SLRA Section 4.2, “Reactor Vessel Neutron Embrittlement Analysis.” This is consistent with SRP-SLR Section 3.1.2.2.3, item 1, and is therefore acceptable. SE Section 4.2 documents the NRC staff’s evaluation of the TLAA for embrittlement of the reactor pressure vessel.

Item 2. SLRA Section 3.1.2.2.3, item 2, associated with SLRA Table 3.1.1, item 3.1.1-014, states loss of fracture toughness due to neutron irradiation embrittlement could occur in the reactor vessel shell, primary nozzle, and support pad. The applicant explained that its Reactor Vessel Material Surveillance Program and its Neutron Fluence Monitoring Program manages reduction in fracture toughness due to neutron embrittlement of reactor vessel beltline and extended beltline materials. The NRC staff’s evaluation of the Reactor Vessel Material Surveillance Program and the Neutron Fluence Monitoring Program are documented in SE Section 3.0.3.1.8 and SE Section 3.0.3.2.2, respectively. The staff finds the applicants use of its Reactor Vessel Material Surveillance Program and its Neutron Fluence Monitoring Program is acceptable because it is consistent with AMR item IV.A2.RP-229, in the GALL-SLR Report.

Based on the AMPs identified, the NRC staff concludes that the applicant meets SRP-SLR Section 3.1.2.2.3, item 2 criteria, 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 period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. SLRA Section 3.1.2.2.3, Subsection 3, associated with SLRA Table 3.1.1, AMR item 3.1.1-015, addresses reduction in fracture toughness due to neutron irradiation in stainless steel or nickel-alloy PWR design RVI components exposed to a reactor coolant with neutron flux environment, in which the basis for aging management is justified through use of a TLAA. SRP-SLR Section 3.1.2.2.3, item 3 identifies that the applicable AMR item (item 15 in SRP-SLR Table 3.1-1) and TLAA only apply to RVI components in Babcock and Wilcox (B&W)-designed PWRs, where the applicable TLAA is defined in B&W Owners Group Report No. BAW-2248-A, “Demonstration of the Management of Aging Effects for the Reactor Vessel Internals” (March 2000; ML003708443).

The applicant stated that this item is not applicable to V.C. Summer. The NRC staff evaluated the applicant’s claim against the criteria in SRP-SLR Section 3.1.2.2.3, item 3 and item 15 in SRP-SLR Table 3.1-1. Based on this review, the staff finds the applicant’s claim to be acceptable because FSAR Section 1.1.2 identifies that the RVI components at V.C. Summer were designed by the Westinghouse Electric Company and thus provides sufficient demonstration that the generic TLAA in B&W Owners Group Report No. BAW-2248-A is not applicable to the CLB for V.C. Summer.

3.1.2.2.4 Cracking due to Stress Corrosion Cracking (SCC) and Intergranular Stress Corrosion Cracking

Item 1. SLRA Section 3.1.2.2.4, item 1, associated with SLRA Table 3.1.1 AMR item 3.1.1-016, addresses cracking due to SCC and Intergranular Stress Corrosion Cracking for the stainless steel and nickel-alloy reactor vessel top head enclosure flange leakage detection lines exposed to air-indoor uncontrolled and reactor coolant leakage. The applicant stated that this item is not applicable because it applies to a BWR unit only. The NRC staff evaluated the applicant’s claim against the criteria in SRP-SLR Section 3.1.2.2.4 item 1 and finds it acceptable because, as stated in the SRP-SLR, this issue is only associated with a BWR plant.

Item 2. The applicant stated that item 3.1.1-017 is not applicable to V.C. Summer, which is a PWR unit. The NRC staff noted that the associated item in the applicant's SLRA is applicable to BWR units only. The staff confirmed that this item is associated only with BWRs and, therefore, finds the applicant's claim to be acceptable.

3.1.2.2.5 Crack Growth Due to Cyclic Loading

SLRA Section 3.1.2.2.5, associated with SLRA Table 3.1.1, AMR item 3.1.1-018, addresses crack growth due to cyclic loading that could occur in reactor pressure vessel (RPV) shell forgings clad with stainless-steel using a high-heat-input welding process exposed to reactor coolant. SLRA Section 3.1.2.2.5 states the reactor vessel shell flange and the primary inlet and outlet nozzle forgings are the reactor vessel components constructed of SA-508, Class 2 material. Furthermore, applicable welding procedure specifications were reviewed, and the applicant determined that low-heat input techniques were used during cladding of the reactor vessel SA-508, Class 2 forgings, which would avoid the formation of underclad cracking. As a result, the applicant stated there is no TLAA for underclad cracking at V.C. Summer; therefore, this item is not applicable.

FSAR Appendix 3A further discusses conformance with NRC Regulatory Guides applicable to V.C. Summer. Section 1.43 of FSAR Appendix 3A indicates, in part, that the reactor vessel flanges and the primary nozzles (constructed of SA-508, Class 2 forging material) were clad using the shielded metal arc and the two-wire submerged arc processes, which are considered low-heat input processes. Because low-heat input processes were used in cladding the reactor vessel shell flange and the primary inlet and outlet nozzle forgings, the NRC staff finds that underclad cracking is not applicable to these components; therefore, SLRA Table 3.1.1 item 3.1.1-018 is not applicable.

3.1.2.2.6 Cracking Due to Stress Corrosion Cracking

Item 1. SLRA Section 3.1.2.2.6, item 1, associated with SLRA Table 3.1.1, item 3.1.1-019, addresses the management of SCC in PWR stainless steel reactor vessel bottom mounted instrument (BMI) guide tubes exposed to a reactor coolant environment. SRP-SLR recommends an evaluation of a plant-specific program to manage aging effects. The SLRA states that SCC for the stainless steel BMI guide tubes will be managed by the Water Chemistry (B2.1.2) and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) programs. The applicant stated that the Water Chemistry program provides controls to minimize contaminants that may lead to SCC, and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) program uses VT-2 inspections that can identify degradation of the BMIs.

Based on the AMPs identified, the NRC staff determined that the applicant's programs meet the SRP-SLR Section 3.1.2.2.6, item 1 criteria. Specifically, the Water Chemistry (B2.1.2) program can mitigate the effects of the SCC by reducing contaminants that can lead to SCC, while the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) program is capable of performing condition monitoring of the stainless steel BMIs.

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 cast austenitic stainless steel (CASS) Class 1 reactor coolant piping as well as piping components exposed to the reactor coolant, which will be managed by the Water Chemistry program. All components of V. C. Summer's CASS Class 1 reactor coolant piping and fittings meet the guidance contained in NRC NUREG-0313, "Technical Report on Material Selection and Process Guidelines for BWR Coolant Pressure Boundary Piping," and the recommendations regarding ferrite contents (i.e., greater than or equal to 7.5 percent) but not carbon contents (i.e., less than or equal to 0.035 percent).

SRP-SLR Section 3.1.2.2.6, item 2 states that although the Water Chemistry program is generally effective in mitigating SCC, cracking due to SCC could occur in CASS that do not meet NRC NUREG-0313 guidance regarding ferrite and carbon contents. SRP-SLR recommends further evaluation of a plant-specific program for CASS Class 1 reactor coolant piping and piping components in order to ensure that this aging effect is adequately managed. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.6, item 2. In its review of components associated with AMR item 3.1.1-020, the staff finds that the applicant has met the further evaluation criteria, and determined that its proposal is acceptable because:

1. The Water Chemistry program has demonstrated its ability to control the coolant chemistry to manage for SCC of the CASS;
2. The inservice inspections performed periodically monitors the CASS components for potential cracking due to SCC; and
3. The inservice inspections performed previously did not identify any recordable indications.

Item 3. SLRA Section 3.1.2.2.6, associated with SLRA Table 3.1.1, AMR item 3.1.1-139, addresses cracking due to SCC in stainless steel or nickel-alloy reactor vessel flange leak detection lines. The applicant stated that a review of plant-specific operational experience (OE) did not identify any instances of reactor vessel flange detection line degradation and that a One-Time Inspection will be performed under the One-Time Inspection program to demonstrate that cracking is not occurring. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.6 item 3 and finds it acceptable because the OE review did not identify a history of SCC in the leak detection lines and the One-Time Inspection program will be used to verify that SCC is not occurring. Based on the program identified, the staff concludes that the applicant's program meets SRP-SLR Section 3.1.2.2.6, item 3.

For those AMR items associated with SLRA Section 3.1.2.2.6, items 1, 2 and 3, the NRC staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.1.2.2.7 Cracking Due to Cyclic Loading

SLRA Section 3.1.2.2.7, associated with SLRA Table 3.1.1, AMR item 3.1.1-021, addresses cracking due to cyclic loading for steel and stainless steel isolation condenser components exposed to reactor coolant. The applicant stated that this AMR item is not applicable to V.C. Summer, which is a PWR unit, because the associated item in SLRA Table 3.1.1 is applicable to BWR units only. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.7 and confirmed that this item is associated only with BWRs and, therefore, finds the applicant's claim to be acceptable.

3.1.2.2.8 Loss of Material Due to Erosion

SLRA Section 3.1.2.2.8, associated with SLRA Table 3.1.1, AMR item 3.1.1-022, addresses loss of material due to erosion for steel SG feedwater impingement plates and supports exposed to secondary feedwater. The applicant stated that this AMR item is not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.8 and finds it acceptable because the applicant's SGs do not have feedwater impingement plates and the associated supports.

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, items 3.1.1-053a, 3.1.1-053b, 3.1.1-053c, 3.1.1-055c, 3.1.1-059a, 3.1.1-059b, and 3.1.1-059c, and the corresponding Table 2 AMR items for specified PWR RVI components in SLRA Table 3.1.2-2 (inclusive of changes to the Table 2 AMR items made in SLRA Supplement 3 [ML24155A146]), addresses cracking. Specifically, cracking due to SCC, irradiation-assisted SCC, fatigue, or cyclical loading, loss or material due to wear; loss of fracture toughness due to neutron irradiation embrittlement or thermal embrittlement; changes in dimension due to void swelling or distortion; or loss of preload due to irradiation-enhanced stress relaxation or creep in stainless steel or nickel-alloy RVI components exposed to a reactor coolant with neutron flux environment. The applicant identifies that the RVI components will be managed by the PWR Vessel Internals Program (SLRA AMP B2.1.7), subject to the results of the applicant's RVI gap analysis. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.9.

The SLRA identifies that the PWR Vessel Internals Program is based on the NRC staff's recommended criteria in GALL-SLR AMP XI.M16A, "PWR Vessel Internals," as updated in NRC Interim Staff Guidance Document No. SLR-ISG-2021-01-PWRVI (ML20217L203). Consistent with these criteria, the staff confirmed that the applicant's AMP adopts the augmented aging management criteria in Electric Power Research Institute (EPRI) Topical Report (TR) MRP-227, Revision 1-A (ML20175A112)," in which the TR provides the industry's current set of staff-approved aging management recommendations for Westinghouse Electric Company (WEC)-design PWR RVI components (like those included in the V.C. Summer PWR design). The staff-approved MRP-227, Rev. 1-A for implementation, in the staff's safety evaluation (ML19081A001) dated April 25, 2019, for the TR.

However, the NRC staff also noted that the SLRA identifies that the aging management strategies for specified WEC-design RVI components in MRP-227, Rev. 1-A are limited because the inspection categorization results, and inspection and evaluation criteria for specified PWR RVI component types in the report are based only on the assessment of RVI component-specific aging effects through a 60-year operating period. To address this limitation, the staff verified that the applicant's PWR Vessel Internals Program has been supplemented by the results of an RVI gap analysis, which was (1) included as Enhancement 1 to the PWR Vessel Internals Program, and amended in SLRA Supplement 1 dated April 1, 2024 (ML24095A207), and (2) was performed to identify those enhancements of the PWR Vessel Internals Program (and adjustments of the guidelines in MRP-227, Rev. 1-A) deemed necessary to address supplemental, component-specific aging management needs during an 80-year operating period. The NRC staff confirmed that the applicant is using the following EPRI MRP interim guidance letters as the basis for its RVI gap analysis:

- EPRI Letter MRP 2018-022 (ML19081A061)

- EPRI Letter MRP 2017-009 (ML17087A106)
- EPRI Letter MRP 2023-005 (ML23090A020)
- EPRI Proprietary Report MRP-230, Rev. 3 (ML20244A026)
- EPRI Proprietary Report MRP-191, Rev. 2 (ML19081A060)

Thus, for the AMR objectives of the SLRA, the NRC staff noted that the specific SRP-SLR Table 1 and GALL-SLR Table 2 AMR item references, which provide for specified PWR RVI components in SLRA Table 3.1.2-2, may be based on the gap analysis results for the component types, as managed by the PWR Vessel Internals Program. However, the staff finds this AMR further evaluation of the RVI components to be acceptable because the applicant performed the applicable RVI gap analysis. In addition, the staff finds that the AMR basis is consistent with the following SRP-SLR Section 3.1.2.2.9 guidelines for PWR RVI components (as updated in SLR-ISG-2021-001-PWRVI):

> “As described in GALL-SLR Report AMP XI.M16A, the applicant may use the MRP-227, Revision 1-A based AMP as an initial reference basis for developing and defining the AMP that will be applied to the RVI components for the subsequent period of extended operation. However, to use this alternative basis, GALL-SLR Report AMP XI.M16A recommends that the MRP-227, Revision 1-A based AMP be enhanced to include a gap analysis of the components that are within the scope of the AMP. The gap analysis is a basis for identifying and justifying changes to the MRP-227, Revision 1-A based program that are necessary to provide reasonable assurance that the effects of age-related degradation will be managed during the subsequent period of extended operation. The criteria for the gap analysis are described in GALL-SLR Report AMP XI.M16A.”

The NRC staff confirmed that, in the SLRA Supplement 3 letter dated May 30, 2024 (ML24155A146), the applicant submitted an amended AMR item for the core barrel (CB) upper girth weld (UGW) that defined the weld as a Primary component inspection category for the PWR Vessel Internals Program. The staff noted that the elevation of the CB UGW as a Primary category weld is similar to the manner in which the CB upper flange weld is identified as a Primary category weld for the program in SLRA Table 3.1.2-2. The staff also noted that in EPRI Letter No. MRP 2023-005, EPRI MRP addressed recent OE involving cracking of WEC-design CB UGWs and recommended that WEC-design CB UGWs be elevated as Primary category welds for WEC-design RVI management programs. Therefore, the staff finds the revised AMR item of the CB UGW to be acceptable because: (1) the AMR basis is consistent with the interim guidance in MRP 2023-005; (2) the applicant has elevated the CB UGW to be a Primary category weld for the PWR Vessel Internals Program; and (3) the applicant has addressed and resolved the relevant OE.

Thus, the NRC staff finds the citing and use of SLRA Table 3.1.1, items 3.1.1-053a, 3.1.1-053b, 3.1.1-053c, 3.1.1-059a, 3.1.1-059b, and 3.1.1-059c (and the corresponding GALL-SLR-based AMR items in SLRA Table 3.1.2-2 linked to these SLRA Table 1 AMR items) to be acceptable for managing aging in the RVI components because the staff confirmed that:

1. The applicant is using its PWR Vessel Internals program to manage age-related degradation in the RVI components;
2. The applicable AMR items referenced for RVI components in SLRA Table 3.1.2-2 are consistent with those specified for WEC-design Primary, Expansion, Existing Program, or

No Additional Measures RVI components in SLR-ISG-2021-01-PWRVI, or are based on (and consistent with) the revised MRP-227 inspection categories and inspection and evaluation criteria for specified WEC-design RVI component types in the applicable interim guidance documents used for development of the RVI gap analysis results; and

3. The applicant's AMR basis meets the criteria set forth in 10 CFR 54.21(a)(1) as well as the requirements for aging management in 10 CFR 54.21(a)(3).

SLRA Section 3.1.2.2.9, associated with Table 3.1.1, AMR item 3.1.1-028, addresses loss of material due to wear and cracking due to SCC, Irradiation-Assisted Stress Corrosion Cracking (IASCC), or fatigue in stainless steel or nickel-alloy (including X-750 nickel-alloy materials) control rod guide tube (CRGT) support pins (e.g., split pins) exposed to a reactor coolant in a neutron flux environment. The applicant stated that this item is not used because CRGT split pins are categorized as MRP-227 "No Additional Measures" components for the SLRA's PWR Vessel Internals Program (SLRA AMP B2.1.7), and are adequately managed for the cited aging effect and mechanisms combinations using item 3.1.1-055c for V.C. Summer "No Additional Measures" components in SLRA Table 3.1.1. The NRC staff verified that the V.C. Summer CRGT spilt pins are replaced pins made from Type 316 stainless steel material, which makes the pins less susceptible to loss, and the replacements less susceptible to the wear, SCC, IASCC, and fatigue mechanisms. Therefore, the staff finds the licensee's alternate use of the SLRA's 3.1.1-055c item for V.C. Summer "No Additional Measures" components provides an acceptable basis for concluding that loss of material due to wear and cracking due to SCC, IASCC, or fatigue in the CRGT split pins, do not require aging management in accordance with 10 CFR 54.21(a)(3). The staff further finds that the CRGT split pins can be placed in the "No Additional Measures" category of the PWR Vessel Internals Program.

SLRA Section 3.1.2.2.9, associated with SLRA Table 3.1.1, items 3.1.1-051a, 3.1.1-051b, 3.1.1-052a, 3.1.1-052b, 3.1.1-052c addresses cracking due to SCC, IASCC, or fatigue in PWR RVI components exposed to a reactor coolant with neutron flux environment. The applicant stated that these items are not applicable to the SLRA because they only apply to the management of cracking in Babcock and Wilcox (B&W)-design Primary or Expansion category RVI components, or in Combustion Engineering (CE)-design Primary, Expansion, or Existing Program category RVI components. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.9 and finds it acceptable because the staff has confirmed that:

1. The referenced items only apply to the management of cracking due to SCC, IASCC, or fatigue in B&W-design or CE-design RVI components; and
2. The RVI components at V.C. Summer are designed by WEC, and management of cracking in the V.C. Summer Primary, Expansion, and Existing Program RVI components is adequately addressed by items 3.1.1-053a, 3.1.1-053b, and 3.1.1-053c items in SLRA Table 3.1.1. This includes staff confirmation that the aging management basis for managing cracking due to SCC, IASCC, or fatigue in a given RVI component has been appropriately modified by the results of the applicant's RVI gap analysis for the PWR Vessel Internals Program, as appropriate, for the AMP basis, and as evaluated in the staff's SE Section 3.0.3.2.6 evaluation for the PWR Vessel Internals Program.

SLRA Section 3.1.2.2.9, associated with SLRA Table 3.1.1, items 3.1.1-055a and 055b, addresses B&W-designed and CE-designed RVI components that can be placed in the "No Additional Measures" category of the PWR Vessel Internals Program. The applicant stated that these items are not applicable to the SLRA because they only apply to the B&W-designed

or CE-designed PWR “No Additional Measures” category components. The NRC staff evaluated the applicant’s claim against the criteria in SRP-SLR Section 3.1.2.2.9 and finds it acceptable because the staff has confirmed that:

1. The referenced items only apply to B&W-design or CE-design “No Additional Measures” category RVI components; and
2. The “No Additional Measures” category RVI components at V.C. Summer are adequately addressed by item 3.1.1-055c in SLRA Table 3.1.1.

SLRA Section 3.1.2.2.9, associated with SLRA Table 3.1.1, items 3.1.1-056a, 3.1.1-056b, 3.1.1-056c, 3.1.1-058a, and 3.1.1-058b, addresses loss of material due to wear, loss of fracture toughness due to neutron irradiation embrittlement (IE) or thermal embrittlement (TE), changes in dimension due to void swelling (VS) or distortion, or loss of preload due to irradiation-enhanced stress relaxation or creep (ISR/IC) in PWR RVI components exposed to a reactor coolant with neutron flux environment. The applicant stated that these items are not applicable to the SLRA because they only apply to the management of the referenced non-cracking effect and mechanism combinations in B&W-designed Primary or Expansion category RVI components, or in CE-designed Primary, Expansion, or Existing Program category RVI components. The NRC staff evaluated the applicant’s claim against the criteria in SRP-SLR Section 3.1.2.2.9 and finds it acceptable because the staff has confirmed that:

1. The referenced items only apply to the management of loss of material due to wear, loss of fracture toughness due to IE or TE, changes in dimension due to VS or distortion, or loss of preload due to ISR/IC in either B&W-designed Primary or Expansion category RVI components, or CE-designed Primary, Expansion, or Existing program category RVI components; and
2. The RVI components at V.C. Summer are designed by WEC, and management of the referenced non-cracking effects in the V.C. Summer Primary, Expansion, and Existing program RVI components is adequately addressed by the items 3.1.1-059a, 3.1.1-059b, and 3.1.1-059c items in SLRA Table 3.1.1. This includes staff confirmation that the aging management basis for managing any of these non-cracking effect and mechanism combinations in a given RVI component has been appropriately modified by the results of the applicant’s RVI gap analysis for the PWR Vessel Internals Program, as appropriate, for the AMP basis, and as evaluated in the staff’s SE Section 3.0.3.2.6 evaluation for the PWR Vessel Internals program.

SLRA Section 3.1.2.2.9, associated with Table 3.1.1, AMR item 3.1.1-118, addresses cracking due to SCC, IASCC, fatigue, or cyclical loading in specified stainless steel, nickel-alloy PWR RVI components exposed to a reactor coolant with neutron flux environment, where the basis for managing cracking in the specified component type is adjusted using a site-specific or component-specific basis. The applicant stated that this item is not used because the basis for managing cracking in the V.C. Summer PWR RVI components is adequately managed using one of the alternate AMR items in SLRA Table 3.1.1, items 3.1.1-053a, 3.1.1-053b, or 3.1.1-053c. The NRC staff evaluated the applicant’s claim against the criteria in SRP-SLR Section 3.1.2.2.9 and finds it acceptable because the staff has confirmed that:

1. SLRA item 3.1.1-053a adequately manages cracking in V.C. Summer Primary category RVI components susceptible to SCC, IASCC, or fatigue;
2. SLRA item 3.1.1-053b adequately manages cracking in V.C. Summer Expansion category RVI components susceptible to SCC, IASCC, or fatigue; and

3. SLRA item 3.1.1-053c adequately manages cracking in V.C. Summer Existing Program category RVI components susceptible to SCC, IASCC, or fatigue.

This includes staff confirmation that the aging management basis for managing cracking due to SCC, IASCC, or fatigue in a given RVI component has been appropriately modified by the results of the applicant’s RVI gap analysis for the PWR Vessel Internals Program, as appropriate, for the AMP basis, and as evaluated in the staff’s SE Section 3.0.3.2.6 evaluation for the PWR Vessel Internals Program.

SLRA Section 3.1.2.2.9, associated with Table 3.1.1, AMR item 3.1.1-119, addresses loss of material due to wear; loss of fracture toughness due to IE or TE; changes in dimensions due to VS or distortion; or loss of preload due to ISR/IC in specified stainless steel, nickel-alloy, or Stellite PWR RVI components exposed to a reactor coolant with neutron flux environment, where the basis for managing the applicable non-cracking effect and mechanism combination is adjusted using a site-specific or component-specific basis. The applicant stated that this item is not used because the basis for managing loss of material due to wear, loss of fracture toughness, loss of preload, or dimensional changes in the RVI components is adequately managed using one of the alternate AMR items in SLRA Table 3.1.1, items 053a, 053b, or 053c. The NRC staff evaluated the applicant’s claim against the criteria in SRP-SLR Section 3.1.2.2.9 and finds it acceptable because the staff has confirmed that:

1. SLRA item 3.1.1-059a adequately manages the referenced non-cracking effects in V.C. Summer Primary category RVI components susceptible to wear, IE, TE, VS or distortion, or ISR/IC mechanisms;
2. SLRA item 3.1.1-053b adequately manages the referenced non-cracking effects in V.C. Summer Expansion category RVI components susceptible to wear, IE, TE, VS or distortion, or ISR/IC mechanisms; and
3. SLRA item 3.1.1-053c adequately manages the referenced non-cracking effects in V.C. Summer Existing Program category RVI components susceptible to wear, IE, TE, VS or distortion, or ISR/IC mechanisms.

This includes staff confirmation that the aging management basis for managing any of these non-cracking effect and mechanism combinations in a given RVI component has been appropriately modified by the results of the applicant’s RVI gap analysis for the PWR Vessel Internals Program, as appropriate, for the AMP basis, and as evaluated in the staff’s SE Section 3.0.3.2.6 evaluation for the PWR Vessel Internals Program.

3.1.2.2.10 Loss of Material Due to Wear

<u>Items 1 and 2.</u> SLRA Section 3.1.2.2.10, item 1, associated with SLRA Table 3.1.1 AMR item 3.1.1-116, addresses loss of material due to wear in PWR nickel-alloy control rod drive mechanism (CRDM) penetration adapter tubes and nozzles exposed to reactor coolant environment, which are managed in accordance with a plant-specific aging management program or aging management activities of the applicant’s choosing. Similarly, SLRA Section 3.1.2.2.10, item 2, associated with SLRA Table 3.1.1 AMR item 3.1.1-117, addresses loss of material due to wear in PWR nickel-alloy CRDM penetration nozzle thermal sleeves exposed to reactor coolant environment, which are managed in accordance with a plant-specific aging management program or aging management activities of the applicant’s choosing.

The applicant stated that it did not use SLRA items 3.1.1-116 and 3.1.1-117, as linked to SLRA Section 3.1.2.2.10, items 1 and 2, due to the applicant's design engineering modification of the RPV upper head closure design in 2016. The applicant stated that the design of the replaced RPV upper closure head has eliminated the original CRDM head adapter tube thermal sleeve configuration, which eliminates the potential for nozzle wear at this location. Based on the RPV upper closure head replacement activities, the applicant explained that a plant-specific program is not needed to monitor for potential wear in the replacement RPV upper closure head penetration nozzle locations.

The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.10, items 1 and 2, and additionally as part of the staff's audit activities for reviewing the applicant's PWR Vessel Internals Program, as defined in SLRA AMP Section B2.1.7. A summary of the staff's audit activities is provided and documented in Section B2.1.7, "PWR Vessel Internals," of the staff's Audit Report for V.C. Summer SLRA (ML24085A699). As is discussed in Section B2.1.7 of staff's Audit Report, the staff's audit review included an examination of V.C. Summer-specific design records that summarized the applicant's design change activities for replacing the RPV closure head under the applicant's 10 CFR 50.59 process, which were made available to the staff for the audit review.

The NRC staff's Audit Report section input for SLRA AMP B2.1.7, "PWR Vessel Internals," documents the staff's audit observation that the V.C. Summer-specific design records for the 2016 RPV closure head replacement activity. The Audit Report summarizes how the applicant provided sufficient demonstration that the revised design of CRDM adapter housings, penetration nozzles, and thermal sleeves in the replacement closure head mitigate the specified components from reaching levels of wear that, otherwise, might have potentially impacted the intended functions of the RPV or the CRDM adapter housings, penetration nozzles, and thermal sleeves had the closure head been left in its original design configuration and not replaced in 2016.

Based on its review, the NRC staff finds the applicant's AMR basis to be acceptable because:

1. The staff confirmed that the RPV closure head was satisfactorily replaced in 2016; and
2. The applicant has demonstrated that loss of material due to wear is not an applicable aging effect that requires management for the redesigned configuration of the CRDM adapter housings, nozzles, and thermal sleeves in the RPV replacement closure head, and therefore does not need to be managed in accordance with 10 CFR 54.21(a)(3).

3.1.2.2.11 Cracking Due to Primary Water Stress Corrosion Cracking

SLRA Table 3.1.1, AMR item 3.1.1-025, addresses cracking due to primary water stress corrosion cracking for steel (with nickel-alloy cladding) or nickel-alloy SG primary side components, divider plate and tube-to-tube sheet welds exposed to reactor coolant. SLRA Section 3.1.2.2.11, as supplemented by letter dated April 1, 2024 (ML24095A207), associated with LRA Table 3.1.1, AMR item 3.1.1-025, addresses cracking for nickel-alloy material exposed to reactor coolant, which will be managed by the Steam Generators and Water Chemistry programs. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.11, items 1 and 2.

<u>Item 1</u>. The V.C. Summer SGs are Westinghouse Model D75 and have divider plate assemblies fabricated from Alloy 690 plate materials as well as Alloy 600 weld materials. The applicant stated that based on the checklist provided by EPRI, the industry analyses in EPRI Report

3002002850 (Reference 1) bound the V.C. Summer SGs, and therefore a plant-specific AMP is not necessary. The SRP-SLR states that a plant-specific AMP is not necessary for plants with divider plate assemblies fabricated of Alloy 690 plate and Alloy 690 type weld materials, or for plants with divider plate assemblies fabricated of Alloy 600 or Alloy 600 type weld materials if the industry analyses in EPRI 3002002850 are bounding, in which case primary water SCC can be managed by the Water Chemistry and Steam Generators programs.

The NRC staff finds that the applicant has met the further evaluation criteria for V.C. Summer because the SG divider plate assemblies are fabricated of Alloy 690 plate and Alloy 600 type weld materials, and the industry analyses in EPRI Report 3002002850 are bounding. In addition, the staff reviewed information related to this further evaluation during its audit (ML24085A699). Because the industry analyses are applicable and bounding, a plant-specific AMP is not required.

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

<u>Item 2</u>. The V.C. Summer SGs have thermally treated Alloy 690 tubes with Alloy 600-type tube-sheet cladding materials on the primary side. The applicant stated that, based on the checklist provided by EPRI, the industry analyses in EPRI Report 3002002850 (Reference 1) bound the V.C. Summer SGs, and therefore a plant-specific AMP is not necessary. The applicant also stated that, as part of the Steam Generators program, the tube-sheet region will be visually inspected for evidence of cracking. The SRP-SLR states that a plant-specific AMP is not necessary for plants with thermally treated Alloy 690 SG tubes and tube sheets clad with Alloy 600 type material if the industry analyses in EPRI 3002002850 are bounding and the Steam Generators program includes visual inspections of the tube sheet region for evidence of cracking.

The NRC staff finds that the applicant has met the further evaluation criteria because V.C. Summer SGs are bounded by EPRI 3002002850 and the Steam Generators program includes visual inspection of the tube-sheet region for evidence of cracking, and therefore a plant-specific AMP is not necessary. In addition, the staff reviewed information related to this further evaluation during its audit (ML24085A699).

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

3.1.2.2.12 Cracking Due to Irradiation-Assisted Stress Corrosion Cracking

SLRA Section 3.1.2.2.12, associated with SLRA Table 3.1.1, AMR items 3.1.1-029, 3.1.1-041, and 3.1.1-103, addresses IASCC for nickel-alloy and stainless steel RVI components exposed to a BWR reactor vessel environment. The applicant stated that this item is not applicable since V.C. Summer is a PWR unit, and is therefore not exposed to a BWR environment. 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 applicant's RV design is not a BWR; thus, components are not exposed to a BWR vessel environment.

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

SLRA Section 3.1.2.2.13, associated with SLRA Table 3.1.1, AMR item 3.1.1-099, addresses loss of fracture toughness due to neutron irradiation or thermal aging embrittlement for nickel-alloy and stainless steel RVI components exposed to a BWR vessel environment. The applicant stated that this item is not applicable since V.C. Summer is a PWR unit, and is therefore not exposed to a BWR environment. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.13 and finds it acceptable because the applicant's RV design is not a BWR; thus, components are not exposed to a BWR vessel environment.

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

SLRA Section 3.1.2.2.14, associated with SLRA Table 3.1.1, AMR item 3.1.1-120, addresses loss of preload due to thermal or irradiation-enhanced stress relaxation for BWR core plate rim hold-down bolts exposed to a BWR vessel environment. The applicant stated that this item is not applicable since V.C. Summer is a PWR unit and, therefore, does not have BWR core plate rim hold-down bolts. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.14 and finds it acceptable because the applicant's RV design is not a BWR and, therefore, does not include BWR core plate rim hold-down bolts.

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

SLRA Section 3.1.2.2.15, as supplemented by letter dated April 1, 2024 (ML24095A207), 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); and
2. Loss of material due to crevice or pitting corrosion and cracking due to SCC for stainless steel piping and piping components exposed to concrete (item 3.1.1-115).

The applicant stated that there are no reactor vessel, internals, or RCS steel or stainless steel piping or piping components within the scope of subsequent license renewal exposed to concrete. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.15 and finds it acceptable because, based on a review of the FSAR and SLRA, there are no steel or stainless steel piping or piping components exposed to concrete in the reactor vessel, internals, and 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 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 and nickel-alloy piping and piping components exposed to air and condensation, which will be managed by the One Time Inspection program. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.16. In its review of components associated with AMR item 3.1.1-136, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the One -Time Inspection program is acceptable because the program cannot be used for structures or components with known age-related degradation mechanisms. The One Time Inspection program also relies on established- non-destructive examination techniques, including visual, ultrasonic, and surface techniques. Inspections and tests are performed by personnel qualified in accordance with site procedures and programs to perform the type of examination specified. Additionally, where an aging effect identified during an inspection does not meet acceptance criteria, or projected results of the inspections of a material, environment, and aging effect combination do not meet the acceptance criteria, a periodic inspection program is developed for the specific material, environment, and aging effect combination. The periodic inspection program is implemented at all units on site with the same combination(s) of material, environment, and aging effects.

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 3.1.2-4 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," (ESF) as being subject to an AMR. SLRA Table 3.2.1, "Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report," is a summary comparison of the applicant's AMR results with those provided in the GALL-SLR Report for the 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 the SRP-SLR or the GALL-SLR Report
3.2.1-003	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-004	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.2)
3.2.1-005	Consistent with the GALL-SLR Report
3.2.1-006	Not applicable to PWRs (see SE Section 3.2.2.2.3)
3.2.1-007	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.4)
3.2.1-008	Not applicable to V.C. Summer
3.2.1-009	Consistent with the GALL-SLR Report
3.2.1-010	Not applicable to V.C. Summer
3.2.1-011	Not applicable to V.C. Summer
3.2.1-012	Not applicable to V.C. Summer
3.2.1-013	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-014	Consistent with the GALL-SLR Report
3.2.1-015	Consistent with the GALL-SLR Report
3.2.1-016	Consistent with the GALL-SLR Report
3.2.1-017	Not applicable to V.C. Summer
3.2.1-018	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-019	Consistent with the GALL-SLR Report
3.2.1-020	Consistent with the GALL-SLR Report
3.2.1-021	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-022	Consistent with the GALL-SLR Report
3.2.1-023	Not applicable to V.C. Summer
3.2.1-024	Not applicable to V.C. Summer
3.2.1-025	Not applicable to V.C. Summer
3.2.1-026	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-027	Not applicable to V.C. Summer
3.2.1-028	Not applicable to V.C. Summer
3.2.1-029	Not applicable to V.C. Summer
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 V.C. Summer
3.2.1-033	Consistent with the GALL-SLR Report
3.2.1-034	Not applicable to V.C. Summer
3.2.1-035	Not applicable to V.C. Summer
3.2.1-036	Not applicable to V.C. Summer
3.2.1-037	Not applicable to V.C. Summer
3.2.1-038	Not applicable to V.C. Summer
3.2.1-039	This item number is not used in the SRP-SLR or the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2.1-040	Consistent with the GALL-SLR Report
3.2.1-041	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-042	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.10)
3.2.1-043	Not applicable to V.C. Summer
3.2.1-044	Consistent with the GALL-SLR Report
3.2.1-045	Not applicable to V.C. Summer
3.2.1-046	Not applicable to V.C. Summer
3.2.1-047	Not applicable to V.C. Summer
3.2.1-048	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.2)
3.2.1-049	Not applicable to V.C. Summer
3.2.1-050	Consistent with the GALL-SLR Report
3.2.1-051	Consistent with the GALL-SLR Report
3.2.1-052	Not applicable to V.C. Summer
3.2.1-053	Not applicable to V.C. Summer
3.2.1-054	Not applicable to PWRs
3.2.1-055	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.9)
3.2.1-056	Not applicable to V.C. Summer (see SE Section 3.2.2.2.10)
3.2.1-057	Not applicable to V.C. Summer
3.2.1-058	Not applicable to V.C. Summer
3.2.1-059	Not applicable to V.C. Summer
3.2.1-060	Consistent with the GALL-SLR Report
3.2.1-061	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-062	Not applicable to V.C. Summer
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 V.C. Summer (see SE Section 3.2.2.2.7)
3.2.1-067	Consistent with the GALL-SLR Report
3.2.1-068	Consistent with the GALL-SLR Report
3.2.1-069	Not applicable to V.C. Summer
3.2.1-070	Consistent with the GALL-SLR Report
3.2.1-071	Not applicable to V.C. Summer
3.2.1-072	Not applicable to V.C. Summer
3.2.1-073	Not applicable to V.C. Summer
3.2.1-074	Not applicable to V.C. Summer
3.2.1-075	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-076	Not applicable to V.C. Summer
3.2.1-077	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-078	Not applicable to V.C. Summer
3.2.1-079	Consistent with the GALL-SLR Report
3.2.1-080	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.4)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2.1-081	Not applicable to V.C. Summer
3.2.1-082	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-083	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-084	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-085	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-086	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-087	Consistent with the GALL-SLR Report
3.2.1-088	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-089	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-090	Consistent with the GALL-SLR Report
3.2.1-091	Not applicable to V.C. Summer (see SE Section 3.2.2.2.9)
3.2.1-092	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-093	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-094	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-095	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-096	Not applicable to V.C. Summer
3.2.1-097	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-098	Not applicable to V.C. Summer
3.2.1-099	Not Used (addressed by 3.2.1-106) (see SE Section 3.2.2.2.2)
3.2.1-100	Not applicable to V.C. Summer (see SE Section 3.2.2.2.8)
3.2.1-101	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.8)
3.2.1-102	Not applicable to V.C. Summer (see SE Section 3.2.2.2.8)
3.2.1-103	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.4)
3.2.1-104	Not applicable to V.C. Summer
3.2.1-105	Not applicable to V.C. Summer (see SE Section 3.2.2.2.10)
3.2.1-106	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.2)
3.2.1-107	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.2)
3.2.1-108	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.4)
3.2.1-109	Not applicable to V.C. Summer (see SE Section 3.2.2.2.8)
3.2.1-110	Not applicable to V.C. Summer (see SE Section 3.2.2.2.8)
3.2.1-111	Not applicable to V.C. Summer (see SE Section 3.2.2.2.10)
3.2.1-112	Consistent with the GALL-SLR Report (see SE Section 3.2.2.2.2)
3.2.1-113	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-114	Consistent with the GALL-SLR Report
3.2.1-115	Not applicable to V.C. Summer
3.2.1-116	Not applicable to V.C. Summer
3.2.1-117	Not applicable to V.C. Summer
3.2.1-118	Not applicable to V.C. Summer
3.2.1-119	Not applicable to V.C. Summer (see SE Section 3.2.2.2.10)
3.2.1-120	Not applicable to V.C. Summer
3.2.1-121	Not applicable to V.C. Summer (see SE Section 3.2.2.2.10)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2.1-122	Not applicable to V.C. Summer
3.2.1-123	Not applicable to V.C. Summer
3.2.1-124	Not applicable to V.C. Summer
3.2.1-125	Consistent with the GALL-SLR Report
3.2.1-126	Not applicable to V.C. Summer
3.2.1-127	Not applicable to V.C. Summer
3.2.1-128	Not applicable to V.C. Summer
3.2.1-129	Consistent with the GALL-SLR Report
3.2.1-130	Consistent with the GALL-SLR Report
3.2.1-131	Not applicable to V.C. Summer
3.2.1-132	Not applicable to V.C. Summer
3.2.1-133	Not applicable to V.C. Summer
3.2.1-134	Not applicable to V.C. Summer

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 V.C. Summer 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 as well as the staff's conclusions. The remaining subsections in SE Section 3.2.2.1 document the review of components that required additional information or otherwise required further explanation.
2. SE Section 3.2.2.2 discusses AMR results for which the GALL-SLR Report and SRP-SLR recommend further evaluation.
3. SE Section 3.2.2.3 discusses AMR results for components that the applicant stated are not consistent with, or not addressed in, the GALL-SLR Report. These AMR results typically are identified by generic notes F through J, and plant-specific notes in the SLRA.

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

The following subsections document the NRC staff's review of AMR results listed in SLRA Tables 3.2.2-1 through 3.2.2-4 that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat its review of the matters described in the GALL-SLR Report; however, 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 3.21, and no separate write-up is required or provided.

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

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

For SLRA Table 3.2.1, items 3.2.1-008, 3.2.1-010, 3.2.1-011, 3.2.1-012, 3.2.1-017, 3.2.1-023, 3.2.1-024, 3.2.1-025, 3.2.1-027, 3.2.1-028, 3.2.1-029, 3.2.1-032, 3.2.1-034, 3.2.1-035, 3.2.1-036, 3.2.1-037, 3.2.1-038, 3.2.1-043, 3.2.1-045, 3.2.1-046, 3.2.1-047, 3.2.1-049, 3.2.1-052, 3.2.1-053, 3.2.1-056, 3.2.1-057, 3.2.1-058, 3.2.1-057, 3.2.1-059, 3.2.1-062, 3.2.1-066, 3.2.1-069, 3.2.1-071 through 3.2.1-074, 3.2.1-076, 3.2.1-078, 3.2.1-081, 3.2.1-091, 3.2.1-096, 3.2.1-098, 3.2.1-100, 3.2.1-102, 3.2.1-104, 3.2.1-105, 3.2.1-109, 3.2.1-110, 3.2.1-111, 3.2.1-115 through 3.2.1-124, 3.2.1-126, 3.2.1-127, 3.2.1-128, and 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 V.C. Summer. The NRC staff reviewed the SLRA and FSAR and confirmed that the applicant's SLRA does not have any AMR results that are applicable for these items.

For SLRA Table 3.2.1, items 3.2.1-006 and 3.2.1-054, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable because the associated items are only applicable to BWR units, while V.C. Summer is a PWR unit. The NRC staff reviewed the SRP-SLR Report, confirmed that these items only apply to BWRs, and finds that these items are not applicable to V.C. Summer because it is a PWR.

For the following SLRA Table 3.2.1 item, the applicant claims that the corresponding item in the GALL-SLR Report is not used because it is addressed by other SLRA Table 1 item: 3.2.1-099 (addressed by 3.2.1-106). The NRC 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.

3.2.2.2 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 NRC staff reviewed the applicant's evaluation of these component groups against the criteria contained in SRP-SLR Section 3.2.2.2. The following subsections document the staff's review.

3.2.2.2.1 Cumulative Fatigue Damage

SLRA Section 3.2.2.2.1, associated with SLRA item 3.2.1-001, indicates that the TLAA on cumulative fatigue damage in the components of engineered safety features is evaluated in accordance with 10 CFR 54.21(c)(1), and is addressed in SLRA Section 4.3. The applicant's evaluation of the TLAA is consistent with SRP-SLR Section 3.2.2.2.1 and is, therefore, acceptable. The NRC staff's evaluation of the TLAA for the components of engineered safety features 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, 3.2.1-048, 3.2.1-106, 3.2.1-107, and 3.2.1-112, addresses loss of material due to pitting and crevice corrosion for stainless steel and nickel-alloy piping, piping components, and tanks exposed to air or condensation; stainless steel and nickel-alloy underground piping, piping components, and tanks; stainless steel and nickel-alloy tanks within the scope of GALL-SLR Report AMP

XI.M29 exposed to air or condensation; 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 and the Outdoor and Large Atmospheric Metallic Storage Tanks program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.2.2.2.2.

In its review of components associated with AMR items 3.2.1-004, 3.2.1-048, 3.2.1-106, 3.2.1-107, and 3.2.1-112, the NRC 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 for AMR items 3.2.1-004, 3.2.1-048, 3.2.1-107, and 3.2.1-112, is acceptable because the plant-specific OE does not reveal a history of loss of material for these components, and the proposed One-Time Inspections are capable of detecting loss of material. The staff finds the applicant's proposal to manage the effects of aging using the Outdoor and Large Atmospheric Metallic Storage Tanks program for AMR item 3.2.1-106 is also acceptable because the plant-specific OE does not reveal a history of loss of material for these tanks, and the proposed One-Time Inspections conducted for stainless steel tanks as part of this program are capable of detecting loss of material.

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

SLRA Section 3.2.2.2.2, associated with Table 3.2.1, AMR item 3.2.1-099, addresses loss of material due to pitting and crevice corrosion for stainless steel and nickel-alloy tanks exposed to air or condensation. The applicant stated that this item is not used because stainless steel and nickel-alloy tanks exposed to air or condensation are managed using a different AMR item. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.2 and finds it acceptable. This analysis is based on the applicant's proposal to manage these aging effects for stainless steel and nickel-alloy tanks exposed to air or condensation in the engineered safety features systems using AMR item 3.2.1-106 with the One-Time Inspection program, which includes inspections capable of detecting loss of material.

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, AMR item 3.2.1-006, addresses loss of material and flow blockage in metallic flow orifice and spray nozzles exposed to uncontrolled air-indoor, and condensation. The applicant stated that this item is not applicable because the components are for BWR plants, while V.C. Summer is a PWR plant. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.3 and finds it acceptable because, as stated in the SRP-SLR, the metallic flow orifice and spray nozzles are located in the drywell and suppression chamber spray system, which can be found only in a BWR plant.

3.2.2.2.4 Cracking Due to Stress Corrosion Cracking in Stainless Steel Alloys

SLRA Section 3.2.2.2.4, associated with SLRA Table 3.2.1, AMR items 3.2.1-007, 3.2.1-080, 3.2.1-103, and 3.2.1-108, addresses cracking due to SCC for stainless steel piping, piping components, and tanks exposed to air or condensation; 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, which will be managed by the One-Time Inspection program and the Outdoor and Large Atmospheric Metallic Storage Tanks program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.2.2.2.4.

In its review of components associated with AMR items 3.2.1-007, 3.2.1-080, 3.2.1-103, and 3.2.1-108, the NRC 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 for AMR items 3.2.1-007, 3.2.1-080, and 3.2.1-108, 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. The staff finds the applicant's proposal to manage the effects of aging using the Outdoor and Large Atmospheric Metallic Storage Tanks program for AMR item 3.2.1-103 acceptable because the plant-specific OE does not reveal a history of cracking for these tanks, and the proposed One-Time Inspections conducted for stainless steel tanks as part of this program are capable of detecting cracking.

Based on the programs identified, the NRC 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).

3.2.2.2.5 Quality Assurance for Aging Management of Nonsafety-Related Components

SE Section 3.0.4 documents the NRC staff's evaluation of the applicant's quality assurance (QA) Program.

3.2.2.2.6 Ongoing Review of Operating Experience

SE Section 3.0.5 documents the NRC staff's evaluation of the applicant's ongoing review of OE.

3.2.2.2.7 Loss of Material Due to Recurring Internal Corrosion

SLRA Section 3.2.2.2.7, associated with SLRA Table 3.2.1, AMR item 3.2.1-066, addresses recurring internal corrosion for steel piping and piping components exposed to raw water. The applicant stated that its review of operating experience documentation (from the past 10 years) did not find any instances that met the criteria of recurring internal corrosion in the engineered safety features systems. Based on this review, the applicant stated that item 3.2.1-066 was not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.7 and finds it is acceptable because the staff also did not identify any examples of recurring internal corrosion in engineered safety features systems during its review of the applicant's operating experience information.

3.2.2.2.8 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

SLRA Section 3.2.2.2.8, associated with SLRA Table 3.2.1, AMR item 3.2.1-101, addresses cracking due to SCC for aluminum piping, piping components, or tanks exposed 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 3.2.2.2.8.

In its review of components associated with AMR item 3.2.1-101, the NRC 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 for AMR item 3.2.1-101 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 cracking.

Based on the program identified, the NRC staff concludes that the applicant's program meets SRP-SLR Section 3.2.2.2.8 criteria. For the AMR item associated with SLRA Section 3.2.2.2.8, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

SLRA Section 3.2.2.2.8, associated with Table 3.2.1, AMR items 3.2.1-100, 3.2.1-102, 3.2.1-109, and 3.2.1-110, addresses cracking due to SCC for aluminum piping, piping components, and tanks exposed to air, condensation (internal), raw water, or wastewater; aluminum tanks within the scope of GALL-SLR Report AMP XI.M29 exposed to air, condensation, soil, concrete, raw water, or wastewater; insulated aluminum piping, piping components, and tanks exposed to air and condensation; and underground aluminum piping, piping components and tanks. The applicant stated that these items are not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.8 and finds it acceptable because, based on a review of the FSAR and SLRA, there are no such aluminum component and environment combinations in the engineered safety features systems at V.C. Summer.

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); and
2. Loss of material due to crevice or pitting corrosion and cracking due to SCC in stainless steel piping and piping components exposed to concrete (item 3.2.1-091).

The applicant stated that there are no stainless steel piping or piping components exposed to concrete in the engineered safety features systems at V.C. Summer. In addition, the applicant stated:

1. The steel nitrogen supply piping components are exposed to concrete that conforms to ACI318;
2. Plant OE did not identify degradation of the concrete that could lead to penetration of water to the metal surface of the piping components; and
3. The piping components are not potentially exposed to groundwater because they are within above-ground concrete.

The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.9 and finds it acceptable because, based on a review of the FSAR and SLRA, there are no stainless steel piping or piping components exposed to concrete in the engineered safety features systems at V.C. Summer, and the steel nitrogen supply piping components exposed to concrete meet the three conditions in SRP-SLR Section 3.2.2.2.9. Therefore, loss of material is not an applicable aging effect.

For those AMR items associated with SLRA Section 3.2.2.2.9, the NRC staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended 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 item 3.2.1-042, addresses loss of material due to pitting and crevice corrosion for aluminum piping, piping components, or tanks exposed 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 3.2.2.2.10.

In its review of components associated with AMR item 3.2.1-042, the NRC 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 for AMR item 3.2.1-042 is acceptable because the plant-specific OE does not reveal a history of loss of material for these components, and the proposed One-Time Inspections are capable of detecting loss of material.

Based on the program identified, the NRC staff concludes that the applicant's program meets SRP-SLR Section 3.2.2.2.10 criteria. For the AMR item associated with SLRA Section 3.2.2.2.10, 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).

SLRA Section 3.2.2.2.10, associated with SLRA Table 3.2.1, AMR items 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 piping, piping components, and tanks exposed to air, condensation (internal), raw water, and wastewater; aluminum tanks within the scope of GALL-SLR Report AMP XI.M29 exposed to air or condensation; underground aluminum piping, piping components and tanks; and insulated aluminum piping, piping components, and tanks exposed to air and condensation. The applicant stated that these items are not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.10 and finds it acceptable because, based on a review of the FSAR and SLRA, there are no such aluminum component and environment combinations in the engineered safety features systems at V.C. Summer.

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

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

3.3 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 Evaluated in Chapter VII of the GALL-SLR Report," is a summary comparison of the applicant's 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	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.2)
3.3.1-003a	Not applicable to V.C. Summer (see SE Section 3.3.2.2.2)
3.3.1-004	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.3)
3.3.1-005	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-006	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.4)
3.3.1-007	Consistent with the GALL-SLR Report
3.3.1-008	Consistent with the GALL-SLR Report
3.3.1-009	Consistent with the GALL-SLR Report
3.3.1-010	Not applicable to V.C. Summer
3.3.1-011	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-012	Consistent with the GALL-SLR Report
3.3.1-013	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-014	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-015	Consistent with the GALL-SLR Report
3.3.1-016	Not applicable to PWRs
3.3.1-017	Consistent with the GALL-SLR Report
3.3.1-018	Not applicable to V.C. Summer
3.3.1-019	Not applicable to PWRs
3.3.1-020	Consistent with the GALL-SLR Report
3.3.1-021	Not applicable to PWRs
3.3.1-022	Not applicable to PWRs
3.3.1-023	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-024	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-025	Not applicable to V.C. Summer
3.3.1-026	Not applicable to PWRs

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-027	Not applicable to PWRs
3.3.1-028	Consistent with the GALL-SLR Report
3.3.1-029	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-030	Not applicable to V.C. Summer
3.3.1-030a	Not applicable to V.C. Summer
3.3.1-031	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-032	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-032a	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-033	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-034	Consistent with the GALL-SLR Report
3.3.1-035	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-036	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-037	Consistent with the GALL-SLR Report
3.3.1-038	Consistent with the GALL-SLR Report
3.3.1-039	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-040	Consistent with the GALL-SLR Report
3.3.1-041	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-042	Consistent with the GALL-SLR Report
3.3.1-043	Consistent with the GALL-SLR Report
3.3.1-044	Not applicable to PWRs
3.3.1-045	Consistent with the GALL-SLR Report
3.3.1-046	Consistent with the GALL-SLR Report
3.3.1-047	Not applicable to PWRs
3.3.1-048	Not applicable to V.C. Summer
3.3.1-049	Consistent with the GALL-SLR Report
3.3.1-050	Consistent with the GALL-SLR Report
3.3.1-051	Not applicable to V.C. Summer
3.3.1-052	Consistent with the GALL-SLR Report
3.3.1-053	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-054	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-055	Consistent with the GALL-SLR Report
3.3.1-056	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-057	Consistent with the GALL-SLR Report
3.3.1-058	Consistent with the GALL-SLR Report
3.3.1-059	Consistent with the GALL-SLR Report
3.3.1-060	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.3)
3.3.1-061	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-062	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-063	Consistent with the GALL-SLR Report
3.3.1-064	Consistent with the GALL-SLR Report
3.3.1-065	Not applicable to V.C. Summer

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-066	Consistent with the GALL-SLR Report
3.3.1-067	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-068	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-069	Consistent with the GALL-SLR Report
3.3.1-070	Consistent with the GALL-SLR Report
3.3.1-071	Consistent with the GALL-SLR Report
3.3.1-072	Consistent with the GALL-SLR Report
3.3.1-073	Not applicable to V.C. Summer
3.3.1-074	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-075	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-076	Consistent with the GALL-SLR Report
3.3.1-077	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-078	Consistent with the GALL-SLR Report
3.3.1-079	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-080	Consistent with the GALL-SLR Report
3.3.1-081	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-082	Consistent with the GALL-SLR Report
3.3.1-083	Consistent with the GALL-SLR Report
3.3.1-084	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-085	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.4)
3.3.1-086	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-087	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-088	Consistent with the GALL-SLR Report
3.3.1-089	Not applicable to V.C. Summer
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 the SRP-SLR 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 (see SE Section 3.3.2.1.5)
3.3.1-096	Consistent with the GALL-SLR Report
3.3.1-096a	Consistent with the GALL-SLR Report
3.3.1-096b	Consistent with the GALL-SLR Report
3.3.1-097	Consistent with the GALL-SLR Report
3.3.1-098	Consistent with the GALL-SLR Report
3.3.1-099	Consistent with the GALL-SLR Report
3.3.1-100	Consistent with the GALL-SLR Report
3.3.1-101	Not applicable to V.C. Summer
3.3.1-102	Consistent with the GALL-SLR Report
3.3.1-103	Not applicable to V.C. Summer

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-104	Not applicable to V.C. Summer
3.3.1-105	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-106	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-107	Not applicable to V.C. Summer
3.3.1-108	Consistent with the GALL-SLR Report
3.3.1-109	Consistent with the GALL-SLR Report
3.3.1-109a	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-110	Not applicable to PWRs
3.3.1-111	Not applicable to V.C. Summer
3.3.1-112	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.9)
3.3.1-113	Not applicable to V.C. Summer
3.3.1-114	Consistent with the GALL-SLR Report
3.3.1-115	Not applicable to V.C. Summer
3.3.1-116	Not applicable to V.C. Summer
3.3.1-117	Consistent with the GALL-SLR Report
3.3.1-118	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-119	Consistent with the GALL-SLR Report
3.3.1-120	Consistent with the GALL-SLR Report
3.3.1-121	Consistent with the GALL-SLR Report
3.3.1-122	Not applicable to V.C. Summer
3.3.1-123	Not applicable to V.C. Summer
3.3.1-124	Not Used (addressed by 3.3.1-028)
3.3.1-125	Consistent with the GALL-SLR Report
3.3.1-126	Consistent with the GALL-SLR Report
3.3.1-127	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.7)
3.3.1-128	Not applicable to V.C. Summer
3.3.1-129	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-130	Consistent with the GALL-SLR Report
3.3.1-131	Consistent with the GALL-SLR Report
3.3.1-132	Consistent with the GALL-SLR Report
3.3.1-133	Not applicable to V.C. Summer
3.3.1-134	Consistent with the GALL-SLR Report
3.3.1-135	Consistent with the GALL-SLR Report
3.3.1-136	Not applicable to V.C. Summer
3.3.1-137	Consistent with the GALL-SLR Report
3.3.1-138	Consistent with the GALL-SLR Report
3.3.1-139	Consistent with the GALL-SLR Report
3.3.1-140	Consistent with the GALL-SLR Report
3.3.1-141	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-142	Consistent with the GALL-SLR Report
3.3.1-143	This item number is not used in the SRP-SLR or the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-144	Not applicable to V.C. Summer
3.3.1-145	Consistent with the GALL-SLR Report
3.3.1-146	Not applicable to V.C. Summer (see SE Section 3.3.2.2.3)
3.3.1-147	Consistent with the GALL-SLR Report
3.3.1-148	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-149	Not applicable to V.C. Summer
3.3.1-150	Not applicable to V.C. Summer
3.3.1-151	Not applicable to V.C. Summer
3.3.1-152	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-153	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-154	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-155	Consistent with the GALL-SLR Report
3.3.1-156	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-157	Not applicable to V.C. Summer
3.3.1-158	Not Used (addressed by 3.3.1-130)
3.3.1-159	Not applicable to V.C. Summer
3.3.1-160	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.6)
3.3.1-161	Consistent with the GALL-SLR Report
3.3.1-162	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-163	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-164	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-165	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-166	Not applicable to V.C. Summer
3.3.1-167	Not applicable to V.C. Summer
3.3.1-168	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-169	Consistent with the GALL-SLR Report
3.3.1-170	Consistent with the GALL-SLR Report
3.3.1-171	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-172	Not applicable to V.C. Summer
3.3.1-173	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-174	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-175	Not applicable to V.C. Summer
3.3.1-176	Not applicable to V.C. Summer
3.3.1-177	Not applicable to V.C. Summer
3.3.1-178	Not applicable to V.C. Summer
3.3.1-179	Consistent with the GALL-SLR Report
3.3.1-180	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-181	Not applicable to V.C. Summer
3.3.1-182	Consistent with the GALL-SLR Report
3.3.1-183	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-184	Not applicable to V.C. Summer

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-185	Not applicable to V.C. Summer
3.3.1-186	Not applicable to V.C. Summer (see SE Section 3.3.2.2.8)
3.3.1-187	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-188	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-189	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.8)
3.3.1-190	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-191	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-192	Not applicable to V.C. Summer (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 V.C. Summer
3.3.1-195	Not applicable to V.C. Summer
3.3.1-196	Not applicable to V.C. Summer
3.3.1-197	Not applicable to V.C. Summer
3.3.1-198	Not Used (addressed by 3.3.1-064)
3.3.1-199	Consistent with the GALL-SLR Report
3.3.1-200	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-201	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-202	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.9)
3.3.1-203	Not applicable to PWRs
3.3.1-204	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-205	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.3)
3.3.1-206	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-207	Not applicable to V.C. Summer
3.3.1-208	Not applicable to V.C. Summer
3.3.1-209	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-210	Not applicable to V.C. Summer
3.3.1-211	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-212	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-213	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-214	Not applicable to V.C. Summer
3.3.1-215	Not applicable to V.C. Summer
3.3.1-216	Not applicable to V.C. Summer
3.3.1-217	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-218	Not applicable to V.C. Summer
3.3.1-219	Consistent with the GALL-SLR Report
3.3.1-220	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-221	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-222	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.4)
3.3.1-223	Not applicable to V.C. Summer (see SE Section 3.3.2.2.10)
3.3.1-224	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-225	This item number is not used in the SRP-SLR or the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-226	Not applicable to V.C. Summer
3.3.1-227	Not applicable to V.C. Summer (see SE Section 3.3.2.2.10)
3.3.1-228	Not applicable to V.C. Summer (see SE Section 3.3.2.2.4)
3.3.1-229	Consistent with the GALL-SLR Report
3.3.1-230	Consistent with the GALL-SLR Report
3.3.1-231	Not applicable to V.C. Summer (see SE Section 3.3.2.2.3)
3.3.1-232	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.4)
3.3.1-233	Not Used (addressed by 3.3.1-189) (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 V.C. Summer
3.3.1-237	Not applicable to V.C. Summer
3.3.1-238	Not applicable to V.C. Summer
3.3.1-239	Not applicable to V.C. Summer
3.3.1-240	Not applicable to V.C. Summer (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	Not applicable to V.C. Summer (see SE Section 3.3.2.2.10)
3.3.1-243	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-244	Not applicable to PWRs
3.3.1-245	Not applicable to V.C. Summer (see SE Section 3.3.2.2.10)
3.3.1-246	Not applicable to V.C. Summer (see SE Section 3.3.2.2.4)
3.3.1-247	Consistent with the GALL-SLR Report (see SE Section 3.3.2.2.10)
3.3.1-248	Not applicable to V.C. Summer
3.3.1-249	Consistent with the GALL-SLR Report
3.3.1-250	Not applicable to V.C. Summer
3.3.1-251	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-252	Not applicable to V.C. Summer
3.3.1-253	Not applicable to V.C. Summer
3.3.1-254	Not applicable to V.C. Summer (see SE Section 3.3.2.2.8)
3.3.1-255	Consistent with the GALL-SLR Report
3.3.1-256	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-257	Consistent with the GALL-SLR Report
3.3.1-258	Not Used (addressed by 3.3.1-091 and 3.3.1-095)
3.3.1-259	Not applicable to V.C. Summer
3.3.1-260	Consistent with the GALL-SLR Report
3.3.1-261	Not applicable to V.C. Summer
3.3.1-262	Not applicable to V.C. Summer
3.3.1-263	Consistent with the GALL-SLR Report
3.3.1-264	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-265	Not applicable to V.C. Summer
3.3.1-266	Not applicable to V.C. Summer

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-267	Consistent with the GALL-SLR Report
3.3.1-268	Consistent with the GALL-SLR Report
3.3.1-269	Consistent with the GALL-SLR Report

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

1. SE Section 3.3.2.1 discusses AMR results for components that the applicant states are either not applicable to V.C. Summer 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 as well as 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 further 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 3.3.2-35 which the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat its review of the matters described in the GALL-SLR Report. The staff verified that the material presented in the SLRA was applicable, and that the applicant identified the appropriate GALL-SLR Report AMRs. For those AMR items that the staff found to be consistent with the GALL-SLR Report and for which no additional evaluation or RAI applies, the staff's review and conclusions, as documented in the GALL-SLR Report, are considered to be the basis for acceptability of the AMR items. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SE Table 3.3-1, and a separate write-up is neither required nor provided. For those 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 3.3.2.1.6 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 3.3.1-003a, 3.3.1-010, 3.3.1-018, 3.3.1-025, 3.3.1-030, 3.3.1-030a, 3.3.1-048, 3.3.1-051, 3.3.1-065, 3.3.1-073, 3.3.1-089, 3.3.1-101, 3.3.1-103, 3.3.1-104, 3.3.1-107, 3.3.1-111, 3.3.1-113, 3.3.1-115, 3.3.1-116, 3.3.1-122, 3.3.1-123, 3.3.1-128, 3.3.1-133, 3.3.1-136, 3.3.1-144, 3.3.1-146, 3.3.1-149, 3.3.1-150, 3.3.1-151, 3.3.1-157, 3.3.1-159, 3.3.1-166, 3.3.1-167, 3.3.1-172, 3.3.1-175 through 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 through 3.3.1-197, 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, 3.3.1-223, 3.3.1-226, 3.3.1-227, 3.3.1-228, 3.3.1-231, 3.3.1-236 through 3.3.1-240, 3.3.1-242, 3.3.1-245, 3.3.1-246, 3.3.1-248, 3.3.1-250, 3.3.1-252, 3.3.1-253, 3.3.1-

254, 3.3.1-259, 3.3.1-261, 3.3.1-262, 3.3.1-265 and 3.3.1-266, the applicant claims that the corresponding AMR items in the GALL-SLR Report are neither used nor applicable to V.C. Summer. The staff reviewed the SLRA and FSAR and confirmed that the applicant’s SLRA does not have any AMR results that are applicable for these items.

For SLRA Table 3.3.1, items 3.3.1-016, 3.3.1-019, 3.3.1-021, 3.3.1-022, 3.3.1-026, 3.3.1-027, 3.3.1-044, 3.3.1-047, 3.3.1-110, 3.3.1-203 and 3.3.1-244, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable because the associated items are only applicable to BWR units, while V.C. Summer is a PWR unit. The staff reviewed the SRP-SLR Report, confirmed that these items only apply to BWRs, and finds that these items are not applicable to V.C. Summer because it is a PWR.

For the following SLRA Table 3.3.1 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: 3.3.1-124 (addressed by 3.3.1-028), 3.3.1-158 (addressed by 3.3.1-130), 3.3.1-198 (addressed by 3.3.1-064), 3.3.1-233 (addressed by 3.3.1-189), and 3.3.1-258 (addressed by 3.3.1-091 and 3.3.1-095). The NRC staff reviewed the SLRA and confirmed that aging effects will be addressed by other SLRA Table 1 items. Therefore, the staff finds the applicant’s proposal to use alternate items acceptable.

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

SLRA Table 3.4.1, AMR items 3.4.1-012, 3.4.1-014, 3.4.1-015, 3.4.1-083 and 3.4.1-085 address loss of material due to pitting, crevice corrosion and Microbiologically Influenced Corrosion (MIC) for steel, stainless steel and nickel-alloy tanks, piping, piping components and PWR heat exchanger components exposed to treated water and steam. 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 effects of these AMR items.

In SLRA Table 3.3.2-3 “Boron Recycle,” item 3.4.1-085 addresses loss of material due to pitting, crevice corrosion, and MIC for stainless steel piping and piping components (chemical addition), tank (evaporator reagent), and valve body (chemical addition) exposed to a treated water internal environment. Table 3.3.2-3 plant-specific note 1 states, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.25) program has been substituted for the Water Chemistry (B2.1.2) program and the One-Time Inspection (B2.1.20) program to manage the applicable aging effects for chemical treatment components”.

In SLRA Table 3.3.2-6 “Chilled Water,” item 3.4.1-014 addresses loss of material due to pitting, crevice corrosion and MIC for steel piping and piping components and valve body; item 3.4.1-083 addresses loss of material due to pitting, crevice corrosion and MIC for stainless steel tank (chemical feed) exposed to a treated water internal environment; and item 3.4.1-085 addresses loss of material due to pitting, crevice corrosion and MIC for stainless steel valve body, sight glass (body) and pump casing (chemical feed) exposed to a treated water internal environment. Table 3.3.2-6 plant-specific note 2 states, “The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.25) program has been substituted for the Water Chemistry (B2.1.2) and the One-Time Inspection (B2.1.20) programs to manage the applicable aging effects for chemical treatment components.”

In SLRA Table 3.3.2-8 “Component Cooling,” item 3.4.1-083 addresses loss of material due to pitting, crevice corrosion, and MIC for stainless steel tank (chemical injection) exposed to a treated water internal environment, and item 3.4.1-085 addresses loss of material due to pitting, crevice corrosion and MIC for stainless steel piping and piping components, valve body, and pump casing (chemical injection) exposed to a treated water internal environment. Table 3.3.2-8 plant-specific note 1 states, “The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.25) program has been substituted for the Water Chemistry (B2.1.2) and the One-Time Inspection (B2.1.20) programs to manage the applicable aging effects for chemical treatment components.”

In SLRA Table 3.3.2-18 “Industrial Cooler,” item 3.4.1-012 addresses loss of material due to pitting, crevice corrosion, and MIC for steel tank (chemical feed) exposed to a treated water internal environment. Table 3.3.2-18 plant-specific note 2 states, “The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.25) program has been substituted for the Water Chemistry (B2.1.2) and the One-Time Inspection (B2.1.20) programs to manage the applicable aging effects for chemical feed tank.”

In SLRA Table 3.3.2-26 “Nuclear Sampling,” as amended by letter dated April 1, 2024 (ML24095A207), item 3.4.1-014 addresses loss of material due to pitting, crevice corrosion, and MIC for steel pump casing (sample cooler chiller) and steel tank (sample cooler chiller reservoir) exposed to a treated water internal environment; item 3.4.1-015 addresses loss of material due to pitting, crevice corrosion, and MIC for steel heat exchanger (auxiliary sample cooler-shell) exposed to a treated water internal environment; and item 3.4.1-085 addresses loss of material due to pitting, crevice corrosion, and MIC for stainless steel flexible hoses, piping and piping components, pump casing (mannitol), pump casing (nitric acid), pump casing (sodium hydroxide), sample flask, tank (chemical), valve body, heat exchanger (auxiliary sample cooler-shell), and heat exchanger (water bath) exposed to a treated water internal environment. Table 3.3.2-26 plant-specific note 1 states, “The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.25) program has been substituted for the Water Chemistry (B2.1.2) program and the One-Time Inspection (B2.1.20) program to manage the applicable aging effects for chemical treatment components and for auxiliary sample cooler flow-path components.”

In SLRA Table 3.3.2-32 “Service Water,” item 3.4.1-083 addresses loss of material due to pitting, crevice corrosion, and MIC for stainless steel tank (chemical storage) exposed to a treated water internal environment, and item 3.4.1-085 addresses loss of material due to pitting, crevice corrosion, and MIC for calibration column (body), piping and piping components, pump casing (chemical injection), and valve body exposed to a treated water internal environment. Table 3.3.2-32 plant-specific note 1 states, “The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.25) program has been substituted for the Water Chemistry (B2.1.2) and the One-Time Inspection (B2.1.20) programs to manage the applicable aging effects for chemical treatment components.”

The NRC staff notes that the components involved with chemical treatment are exposed to localized treated water environments where chemicals are added to maintain specific treated water environments downstream. These localized treated water environments are not managed by the Water Chemistry program as they are not defined by the primary or secondary water chemistry guidelines.

Based on its review of the components associated with AMR items 3.4.1-012, 3.4.1-014, 3.4.1-015, 3.4.1-083 and 3.4.1-085, which cite generic note E in tables 3.3.2-3, 3.3.2-6, 3.3.2-8, 3.3.2-18, 3.3.2-26 and 3.3.2-32, the NRC staff finds the applicant's proposal of using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because the associated periodic visual inspections are capable of detecting loss of material for these components.

3.3.2.1.3 Cracking due to Chemical Reaction, Weathering, Settlement, or Corrosion of Reinforcement and Loss of Material Due to Delamination, Exfoliation, Spalling, Popout, or Scaling

SLRA Table 3.3.1, AMR item 3.3.1-060 addresses cracking and loss of material for reinforced concrete "concrete elements" exposed externally to air. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the ASME Section XI, Subsection IWL program and the Fire Protection program to manage cracking and loss of material for reinforced concrete "concrete elements" exposed externally to air. Based on its review of components associated with AMR item 3.3.1-060 for which the applicant cited generic note E, the NRC staff finds the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWL program and the Fire Protection program acceptable because periodic visual examinations in accordance with ASME Section XI, Subsection IWL can identify cracking and loss of material before a loss of intended function, and the use of the Fire Protection program to manage cracking and loss of material is consistent with the GALL-SLR. For additional information, see the discussion of RCI 3.3.1-1 in Section 3.0.3.2.13, Fire Protection, of this SE.

3.3.2.1.4 Hardening or Loss of Strength Due to Elastomer Degradation; Flow Blockage Due to Fouling

SLRA Table 3.3.1, AMR item 3.3.1-085 addresses hardening or loss of strength due to elastomer degradation and flow blockage due to fouling (raw water, wastewater only) for elastomer piping, piping components, and seals exposed to air, condensation, closed-cycle cooling water, treated borated water, treated water, raw water, raw water (potable), wastewater, gas, fuel oil, and lubricating oil. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the External Surfaces Monitoring of Mechanical Components program to manage the aging effects for the external surfaces of the elastomer fuel pool gate seals and the reactor cavity seal ring exposed to treated borated water. Based on its review of components associated with AMR items 3.3.1-085 for which the applicant cited generic note E, the NRC staff finds the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components program acceptable because, as noted in SRP-SLR Table 3.3-1, "Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report," (specifically AMR item 076), this program is capable of detecting hardening or loss of strength for elastomeric components.

3.3.2.1.5 Loss of Material Due to General, Pitting, Crevice Corrosion, and MIC; Flow Blockage Due to Fouling

SLRA Table 3.3.1, AMR items 3.3.1-091 and 3.3.1-095 address (a) loss of material due to general, pitting, crevice corrosion, and MIC; and (b) flow blockage due to fouling for steel, copper alloy, stainless steel, and nickel-alloy piping, piping components, heat exchanger components, and tanks exposed to wastewater. During its audit, the NRC staff noted that flow blockage due to fouling is not included as an aging effect requiring management for some components that align to AMR items 3.3.1-091 and 3.3.1-095 where (a) an internal environment is cited; and (b) the intended function is pressure boundary. Prior to the issuance of an RAI, the applicant supplemented the application (Supplement 1 (ML24095A207), Topic No. 14) to clarify that the subject components are not credited with delivery of downstream flow, resolving the staff's concern.

3.3.2.1.6 Cracking Due to Stress Corrosion Cracking of Copper Alloy

SLRA Table 3.3.1, AMR item 3.3.1-160 addresses cracking for strainer elements, valve bodies, and strainer bodies made of copper alloy with >15% Zn and exposed internally and externally to raw water in the fire service system. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage the aging effect for copper alloy with >15% Zn.

Based on its review of components associated with AMR item 3.3.1-160, for which the applicant cited generic note E, the NRC staff finds the applicant's proposal to manage the effects of aging using the Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because the GALL-SLR Report recommends the use of programs similar to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, which use periodic inspections to manage this material-environment-aging effect combination. The NRC staff notes that this AMR item was submitted with a note E, and that crediting the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP could have been submitted as a note A.

3.3.2.2 Aging Management Review Results for which Further Evaluation Is Recommended by the GALL-SLR Report

In SLRA Section 3.3.2.2, the applicant further evaluates aging management for the auxiliary systems components, as recommended by the GALL-SLR Report, and provides information concerning how it will manage the applicable aging effects. The NRC staff reviewed the applicant's evaluation of these component groups against the criteria contained in SRP-SLR Section 3.3.2.2. The following subsections document the staff's review.

3.3.2.2.1 Cumulative Fatigue Damage

SLRA Section 3.3.2.2.1, associated with SLRA item 3.3.1-002, indicates that the TLAA on cumulative fatigue damage in the components of auxiliary systems is evaluated in accordance with 10 CFR 54.21(c)(1) and addressed in SLRA Section 4.3. The applicant's evaluation of the TLAA is consistent with SRP-SLR Section 3.3.2.2.1 and is, therefore, acceptable. The staff's evaluation of the TLAA for the components of auxiliary systems is documented in SE Section 4.3.

In addition, SLRA Section 3.3.2.2.1, associated with SLRA item 3.3.1-001, indicates that the analysis on the load cycles of the reactor building polar crane, spent fuel pit bridge crane (fuel handling machine), reactor cavity manipulator crane (refueling machine), fuel handling building crane (spent fuel cask handling crane), fuel handling building hoist (transfer canal gate hoist), and B loop auxiliary crane is a TLAA, as defined in 10 CFR 54.3. The NRC staff finds that the applicant's evaluation of the TLAA is consistent with SRP-SLR Section 3.3.2.2.1 and is, therefore, acceptable. The staff's evaluation of the TLAA for the cranes and fuel handling building hoist is documented in SE Section 4.7.1.

3.3.2.2.2 Cracking Due to SCC and Cyclic Loading

SLRA Section 3.3.2.2.2, associated with Table 3.3.1 items 3.3.1-003 and 3.3.1-003a, addresses stainless steel heat exchanger tubing exposed to treated borated water greater than 60ºC (140ºF) in the chemical and volume control system (CVCS), which will be managed for SCC by GALL-SLR Report AMP XI. M2 "Water Chemistry," as modified by SLR-ISG-2021-02-MECHANICAL. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.2.

The NRC staff noted that a search of the applicant's corrective action database did not find any evidence of SCC in the stainless steel non-regenerative heat exchanger in the CVCS. In its review of the components associated with item 3.3.1-003, 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 Water Chemistry program is acceptable because no evidence was found to indicate SCC in the stainless steel heat exchanger tubing in the CVCS. This satisfies the requirements of further evaluation item 3.3.2.2.2 in the SRP-SLR.

The NRC staff also noted that SLRA Section 3.3.2.2.2, associated with Table 3.3.1, AMR item 3.3.1-003a, addresses cracking due to SCC and cyclic loading for stainless steel heat exchanger tubing exposed to treated borated water greater than 60ºC (140ºF) in the CVCS. The applicant stated in the SLRA that this item is not applicable and is being addressed by AMR item 3.3.1-003. The staff finds this acceptable because in its review of components associated with AMR item 3.3.1-003a within a search of the applicant's corrective action database, the staff did not find any evidence of SCC in the stainless steel non-regenerative heat exchanger in the CVCS.

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

3.3.2.2.3 Cracking Due to SCC in Stainless Steel Alloys

SLRA Section 3.3.2.2.3, associated with SLRA Table 3.3.1, AMR items 3.3.1-004, 3.3.1-094a, and 3.3.1-205, 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 One-Time Inspection and the Outdoor and Large Atmospheric Metallic Storage Tanks programs. 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, the NRC 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 and the Outdoor and Large Atmospheric Metallic Storage Tanks programs 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 and periodic inspections are capable of detecting cracking.

Based on the programs identified, the NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.3.2.2.3 criteria. For those AMR items associated with SLRA Section

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

SLRA Section 3.3.2.2.3, associated with Table 3.3.1, AMR item 3.3.1-231, addresses cracking due to SCC for stainless steel tanks within the scope of GALL-SLR Report AMP XI.M29 exposed to air or condensation. The applicant stated that this item is not used because cracking of the stainless steel Reactor Makeup Water Storage Tank exposed to outdoor air is managed using a different AMR item. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.3 and finds it acceptable. This finding is based on the applicant's proposal to manage cracking of the Reactor Makeup Water Storage Tank exposed to outdoor air using AMR item 3.3.1-205 with the Outdoor and Large Atmospheric Metallic Storage Tanks program, which includes periodic inspections capable of detecting cracking.

SLRA Section 3.3.2.2.3, associated with Table 3.3.1, AMR item 3.3.1-146, addresses cracking due to SCC for stainless steel underground piping, piping components, and tanks. The applicant stated that this item is not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.3 and finds it acceptable because, based on a review of the FSAR and SLRA, there are no stainless steel underground piping, piping components, or tanks in the auxiliary systems.

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

SLRA Section 3.3.2.2.4, associated with SLRA Table 3.3.1, AMR items 3.3.1-006, 3.3.1-094, 3.3.1-222, 3.3.1-232, and 3.3.1-241, addresses loss of material due to pitting and crevice corrosion for insulated and uninsulated stainless steel and nickel-alloy piping, piping components, and tanks exposed to air or condensation; stainless steel and nickel-alloy heat exchanger components exposed to air or condensation; and stainless steel ducting or ducting 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 3.3.2.2.4.

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 NRC 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 loss of material.

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

SLRA Section 3.3.2.2.4, associated with Table 3.3.1, AMR item 3.3.1-228, addresses loss of material due to pitting or crevice corrosion for stainless steel and nickel-alloy tanks within the scope of GALL-SLR Report AMP XI.M29 exposed to air or condensation. The applicant stated that this item is not used because loss of material of the stainless steel Reactor Makeup Water Storage Tank exposed to outdoor air is managed using a different AMR item. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.4 and finds it acceptable. This is based on the applicant's proposal to manage cracking of the Reactor Makeup Water Storage Tank exposed to outdoor air using AMR item 3.3.1-232 with the Outdoor and Large Atmospheric Metallic Storage Tanks program, which includes periodic inspections capable of detecting loss of material.

SLRA Section 3.3.2.2.4, associated with Table 3.3.1, AMR item 3.3.1-246, addresses loss of material due to pitting or crevice corrosion for stainless steel or nickel-alloy underground piping, piping components, and tanks. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim again the criteria in SRP-SLR Section 3.3.2.2.4 and finds it acceptable because, based on a review of the FSAR and SLRA, there are no stainless steel or nickel-alloy underground piping, piping components, or tanks 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, associated with SLRA Table 3.3.1 AMR item 3.3.1-127, addresses recurring internal corrosion for steel piping and piping components exposed to raw water. The SLRA states that the Open-Cycle Cooling Water System program, the Fire Water System program, and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program will manage recurring internal corrosion. The SLRA provided the information for each of the five aspects identified in SRP-SLR Section 3.3.2.2.7 for the three programs being credited for managing this aging effect and/or mechanism. In addition, the operating experience sections associated with each of these programs identifies corrective actions taken or scheduled to address recurring internal corrosion.

For those AMR items associated with SLRA Section 3.3.2.2.7, the NRC staff finds that the applicant has met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Open-Cycle Cooling Water System, the Fire Water System, and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components programs, as modified by response to RAI # 3.3.2.2.7-1 (ML24171A015), is acceptable because the three programs include the appropriate types of inspections, sample selection methodology, trending, performance monitoring, and use of the corrective action program to identify loss of material prior to the loss of intended function. Based on the programs identified, the staff concludes that the applicant's programs meet SRP-SLR Section 3.3.2.2.7 criteria. For those AMR items associated with SLRA Section 3.3.2.2.7, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

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 item 3.3.1-189, addresses cracking due to SCC for aluminum piping, piping components, and tanks exposed to air, condensation, raw water, raw water (potable), or wastewater, which will be managed by the One-Time Inspection and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components programs. The staff reviewed the applicant’s proposal against the criteria in SRP-SLR Section 3.3.2.2.8.

In its review of components associated with AMR item 3.3.1-189, the NRC 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 and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components programs 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 and periodic inspections are capable of detecting cracking.

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

SLRA Section 3.3.2.2.8, associated with Table 3.3.1, AMR item 3.3.1-233, addresses cracking due to SCC for insulated aluminum piping, piping components, and tanks exposed to air or condensation. The applicant stated that this item is not used because cracking of aluminum components exposed to outdoor air and uncontrolled indoor air is managed using a different AMR item. The NRC staff evaluated the applicant’s claim against the criteria in SRP-SLR Section 3.3.2.2.8 and finds it acceptable. This is based on the applicant’s proposal to manage cracking of aluminum components exposed to outdoor air and uncontrolled indoor air using AMR item 3.3.1-189 with the One-Time Inspection program, which includes inspections capable of detecting cracking.

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 3.3.1-254, addresses cracking due to SCC for aluminum tanks within the scope of GALL-SLR Report AMP XI.M29 exposed to air, condensation, soil, concrete, raw water, or wastewater; underground aluminum piping, piping components and tanks; and aluminum heat exchanger components exposed to air or condensation. The applicant stated that these items are not applicable. The NRC staff evaluated the applicant’s claim against the criteria in SRP-SLR Section 3.3.2.2.8 and finds it acceptable because, based on a review of the FSAR and SLRA, there are no such aluminum component 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, associated with SLRA Table 3.3.1, AMR items 3.3.1-112 and 3.3.1-202, addresses (1) loss of material due to general, crevice, or pitting corrosion in steel piping and piping components exposed to concrete (AMR item 3.3.1-112); and (2) loss of material due to crevice or pitting corrosion and cracking due to SCC in stainless steel piping and piping components exposed to concrete (AMR item 3.3.1-202). The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.9. The applicant stated:

1. The steel piping components in the nuclear and miscellaneous drains system are exposed to concrete that conforms to ACI 318.
2. Plant-operating experience did not identify degradation of the concrete that could lead to penetration of water to the metal surface of the piping components.
3. The piping components are not potentially exposed to groundwater because they are within interior concrete structures.

In addition, the applicant stated that the stainless steel piping components exposed to concrete in the spent fuel cooling system are not potentially exposed to groundwater because they are within interior concrete structures. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.9 and finds it acceptable because the steel piping components in the nuclear and miscellaneous drains system exposed to concrete meet the three conditions in SRP-SLR Section 3.3.2.2.9. Therefore, loss of material is not an applicable aging effect, and the stainless steel piping components exposed to concrete in the spent fuel cooling system are not potentially exposed to groundwater, thus, loss of material and cracking are not applicable aging effects.

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

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

SLRA Section 3.3.2.2.10, associated with SLRA Table 3.3.1, AMR items 3.3.1-234 and 3.3.1-247, addresses loss of material due to pitting and crevice corrosion for aluminum piping, piping components, and tanks exposed to air, condensation, raw water, and wastewater, which will be managed by the One-Time Inspection and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components programs. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.10.

In its review of components associated with AMR items 3.3.1-234 and 3.3.1-247, the NRC 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 and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components 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 and periodic inspections are capable of detecting loss of material.

Based on the programs identified, the NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.3.2.2.10 criteria. For those AMR items associated with SLRA Section 3.3.2.2.10, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended 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 3.3.2.2.10, associated with Table 3.3.1, AMR items 3.3.1-240, 3.3.1-242, and 3.3.1-245, addresses loss of material due to pitting or crevice corrosion for aluminum heat exchanger components exposed to air, condensation, or wastewater, and also for insulated aluminum piping, piping components, and tanks exposed to air or condensation. The applicant stated that these items are not used because those components are managed using different AMR items. The applicant proposed managing aluminum heat exchanger components and insulated aluminum piping, piping components, and tanks exposed to air or condensation in the auxiliary systems using AMR item 3.3.1-234 with the One-Time Inspection program. The applicant also proposed managing aluminum heat exchanger components exposed to wastewater using AMR item 3.3.1-247 with the Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components program. The NRC staff evaluated the applicant’s claim against the criteria in SRP-SLR Section 3.3.2.2.10 and finds it acceptable because the proposed programs include one-time or periodic inspections 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 and 3.3.1-227, addresses loss of material due to pitting or crevice corrosion for aluminum underground piping, piping components, and tanks, and for tanks within the scope of GALL-SLR Report AMP XI.M29 exposed to air or condensation. The applicant stated that these items are not applicable. The NRC staff evaluated the applicant’s claim against the criteria in SRP-SLR Section 3.3.2.2.10 and finds it acceptable because, based on a review of the FSAR 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 SLRA did not identify any AMR results in SLRA Tables 3.3.2-1 through 3.3.2-35 that are not consistent with, or not addressed in, the GALL-SLR Report.

3.4 Aging Management of Steam and Power Conversion Systems

3.4.1 Summary of Technical Information in the Application

SLRA Section 3.4 provides AMR results for those components that the applicant identified in SLRA Section 2.3.4, “Steam and Power Conversion Systems,” as being subject to an AMR. SLRA Table 3.4.1, “Summary of Aging Management Evaluations for the Steam and Power Conversion Systems Evaluated in Chapter VIII of the GALL-SLR Report,” 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	Consistent with the GALL-SLR Report
3.4.1-005	Consistent with the GALL-SLR Report
3.4.1-006	Consistent with the GALL-SLR Report
3.4.1-007	Not applicable to V.C. Summer
3.4.1-008	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-009	Consistent with the GALL-SLR Report
3.4.1-010	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-011	Consistent with the GALL-SLR Report
3.4.1-012	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.2)
3.4.1-013	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-014	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.2)
3.4.1-015	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.2)
3.4.1-016	Consistent with the GALL-SLR Report
3.4.1-017	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-018	Consistent with the GALL-SLR Report
3.4.1-019	Not applicable to V.C. Summer
3.4.1-020	Not applicable to V.C. Summer
3.4.1-021	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-022	Not applicable to V.C. Summer
3.4.1-023	Not applicable to V.C. Summer
3.4.1-024	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-025	Not applicable to V.C. Summer
3.4.1-026	Not applicable to V.C. Summer
3.4.1-027	Not applicable to V.C. Summer
3.4.1-028	Not applicable to V.C. Summer
3.4.1-029	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-030	Consistent with the GALL-SLR Report
3.4.1-031	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-032	Not applicable to V.C. Summer
3.4.1-033	Consistent with the GALL-SLR Report
3.4.1-034	Consistent with the GALL-SLR Report
3.4.1-035	Consistent with the GALL-SLR Report (see SE Section 3.4.2.2.9)
3.4.1-036	Not Used (addressed by 3.4.1-034)
3.4.1-037	Not applicable to V.C. Summer
3.4.1-038	Not applicable to V.C. Summer

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4.1-039	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-040	Consistent with the GALL-SLR Report
3.4.1-041	Not applicable to V.C. Summer
3.4.1-042	Consistent with the GALL-SLR Report
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 V.C. Summer
3.4.1-046	Consistent with the GALL-SLR Report
3.4.1-047	Not applicable to V.C. Summer
3.4.1-048	Not applicable to V.C. Summer
3.4.1-049	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-050	Consistent with the GALL-SLR Report
3.4.1-050a	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-051	Not applicable to V.C. Summer (see SE Section 3.4.2.2.8)
3.4.1-052	Not applicable to V.C. Summer
3.4.1-053	Not applicable to V.C. Summer
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 V.C. Summer
3.4.1-057	Not applicable to V.C. Summer
3.4.1-058	Not applicable to V.C. Summer
3.4.1-059	Not applicable to V.C. Summer
3.4.1-060	Consistent with the GALL-SLR Report
3.4.1-061	Not applicable to V.C. Summer (see SE Section 3.4.2.2.6)
3.4.1-062	Not applicable to V.C. Summer
3.4.1-063	Consistent with the GALL-SLR Report
3.4.1-064	Consistent with the GALL-SLR Report
3.4.1-065	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-066	Consistent with the GALL-SLR Report
3.4.1-067	Consistent with the GALL-SLR Report
3.4.1-068	Not applicable to V.C. Summer
3.4.1-069	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-070	Not applicable to V.C. Summer
3.4.1-071	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-072	Not applicable to V.C. Summer
3.4.1-073	Consistent with the GALL-SLR Report
3.4.1-074	Not applicable to V.C. Summer (see SE Section 3.4.2.2.2)
3.4.1-075	Not applicable to V.C. Summer
3.4.1-076	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-077	Consistent with the GALL-SLR Report
3.4.1-078	Not Used (addressed by 3.4.1-077)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4.1-079	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-080	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-081	Consistent with the GALL-SLR Report
3.4.1-082	Not applicable to V.C. Summer (see SE Section 3.4.2.2.8)
3.4.1-083	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.2 and 3.4.2.1.2)
3.4.1-084	Consistent with the GALL-SLR Report
3.4.1-085	Consistent with the GALL-SLR Report (see SE Section 3.3.2.1.2 and 3.4.2.1.2)
3.4.1-086	Not applicable to V.C. Summer
3.4.1-087	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-088	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-089	Not applicable to V.C. Summer
3.4.1-090	Not applicable to V.C. Summer
3.4.1-091	Not applicable to V.C. Summer
3.4.1-092	Not applicable to V.C. Summer
3.4.1-093	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-094	Not applicable to V.C. Summer (see SE Section 3.4.2.2.9)
3.4.1-095	Not applicable to V.C. Summer (see SE Section 3.4.2.2.3)
3.4.1-096	Not applicable to V.C. Summer
3.4.1-097	Not applicable to V.C. Summer (see SE Section 3.4.2.2.9)
3.4.1-098	Not applicable to V.C. Summer (see SE Section 3.4.2.2.3)
3.4.1-099	Not applicable to V.C. Summer
3.4.1-100	Not applicable to V.C. Summer (see SE Section 3.4.2.2.2)
3.4.1-101	Not applicable to V.C. Summer
3.4.1-102	Not applicable to V.C. Summer (see SE Section 3.4.2.2.7)
3.4.1-103	Not applicable to V.C. Summer (see SE Section 3.4.2.2.3)
3.4.1-104	Not Used (addressed by 3.4.1-002) (see SE Section 3.4.2.2.2)
3.4.1-105	Not Used (addressed by 3.4.1-109) (see SE Section 3.4.2.2.7)
3.4.1-106	Consistent with the GALL-SLR Report
3.4.1-107	Not applicable to V.C. Summer
3.4.1-108	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-109	Consistent with the GALL-SLR Report (see SE Section 3.4.2.2.7)
3.4.1-110	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-111	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-112	Not applicable to V.C. Summer (see SE Section 3.4.2.2.7)
3.4.1-113	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-114	Not applicable to V.C. Summer
3.4.1-115	Not applicable to V.C. Summer
3.4.1-116	Not applicable to V.C. Summer
3.4.1-117	Not applicable to V.C. Summer
3.4.1-118	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-119	Not Used (addressed by 3.4.1-035) (see SE Section 3.4.2.2.9)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4.1-120	Not applicable to V.C. Summer (see SE Section 3.4.2.2.9)
3.4.1-121	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-122	Consistent with the GALL-SLR Report
3.4.1-123	Not Used (addressed by 3.4.1-122)
3.4.1-124	Not applicable to V.C. Summer
3.4.1-125	Not applicable to V.C. Summer
3.4.1-126	Not applicable to V.C. Summer
3.4.1-127	Not applicable to V.C. Summer
3.4.1-128	Not applicable to V.C. Summer
3.4.1-129	Not applicable to V.C. Summer
3.4.1-130	Not applicable to V.C. Summer
3.4.1-131	Consistent with the GALL-SLR Report
3.4.1-132	Not applicable to V.C. Summer
3.4.1-133	Not applicable to V.C. Summer
3.4.1-134	Not applicable to V.C. Summer
3.4.1-135	Not applicable to V.C. Summer
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 V.C. Summer or are consistent with the GALL-SLR Report. Section 3.4.2.1.1 summarizes the staff's review of items that are not applicable or not used and documents any RAIs issued and the staff's conclusions. The remaining subsections in SE Section 3.4.2.1 document the review of components that required additional information or otherwise required further 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 3.4.2-12 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 write-up is required or provided. For AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in Section 3.4.2.1.2 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, 3.4.1-019, 3.4.1-020, 3.4.1-022, 3.4.1-023, 3.4.1-025 through 3.4.1-028, 3.4.1-032, 3.4.1-037, 3.4.1-038, 3.4.1-041, 3.4.1-045, 3.4.1-047, 3.4.1-048, 3.4.1-051, 3.4.1-052, 3.4.1-053, 3.4.1-056 through 3.4.1-059, 3.4.1-061, 3.4.1-062, 3.4.1-068, 3.4.1-070, 3.4.1-072, 3.4.1-074, 3.4.1-075, 3.4.1-082, 3.4.1-086, 3.4.1-089 through 3.4.1-092, 3.4.1-094 through 3.4.1-103, 3.4.1-107, 3.4.1-112, 3.4.1-114 through 3.4.1-117, 3.4.1-120, 3.4.1-124 through 3.4.1-130, and 3.4.1-132 through 3.4.1-135, the applicant claims that the corresponding AMR items in the GALL-SLR Report are neither used nor applicable to V.C. Summer. The NRC staff reviewed the SLRA and FSAR and confirmed that the applicant's SLRA does not have any AMR results that are applicable for these items.

For the following SLRA Table 3.4.1 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; specifically, 3.4.1-036 (addressed by 3.4.1-034), 3.4.1-078 (addressed by 3.4.1-077), 3.4.1-104 (addressed by 3.4.1-002), 3.4.1-105 (addressed by 3.4.1-109), 3.4.1-119 (addressed by 3.4.1-035), and 3.4.1-123 (addressed by 3.4.1-122). The NRC 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.

The NRC 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.

3.4.2.1.2 Loss of Material Due to Pitting, Crevice Corrosion, and MIC

SLRA Table 3.4.1, AMR items 3.4.1-083 and 3.4.1-085 address loss of material due to pitting, crevice corrosion, and MIC for stainless steel and nickel-alloy tanks, piping, piping components and PWR heat exchanger components exposed to treated water systems. For 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 effects of these AMR items. In SLRA Table 3.4.2-11 "Turbine Cycle Chemical Feed," item 3.4.1-083 addresses loss of material due to pitting, crevice corrosion, and MIC for stainless steel tanks (condensate ammonia injection), tanks (condensate hydrazine injection), tanks (SG standby ammonia injection), and tanks (SG standby hydrazine injection) exposed to a treated water internal environment, while item 3.4.1-085 addresses loss of material due to pitting, crevice corrosion, and MIC for stainless steel piping and piping components, level glasses (bodies), oil traps, pump casings (condensate alternate injection), pump casings (condensate ammonia injection), pump casings (condensate hydrazine injection), pump casings (SG ammonia injection), pump casing (SG hydrazine injection), strainer body and valve body exposed to a treated water internal environment. SLRA Table 3.4.2-11 plant-specific note 2 states, "the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.25) program has been substituted for the Water Chemistry (B2.1.2) program and the One-Time Inspection (B2.1.20) program to manage the applicable aging effects for chemical treatment components."

The NRC staff notes that these components are exposed to localized treated water environments where chemicals are added to maintain specific treated water environments downstream. These localized treated water environments are not managed by the Water Chemistry program as they are not defined by the primary or secondary water chemistry guidelines.

Based on its review of the components associated with items 3.4.1-083 and 3.4.1-085, which cite generic note E in SLRA Table 3.4.2-11, the NRC staff finds the applicant’s proposal of using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because the associated periodic visual inspections are capable of detecting loss of material for these components that are exposed to treated water environments not managed by the Water Chemistry program.

3.4.2.2 Aging Management Review Results for which Further Evaluation Is Recommended by the GALL-SLR Report

In SLRA Section 3.4.2.2, the applicant further evaluated aging management for the steam and power conversion systems components, as recommended by the GALL-SLR Report, and provides information concerning how it will manage the applicable aging effects. The NRC staff reviewed the applicant’s evaluation of these component groups against the criteria contained in SRP-SLR Section 3.4.2.2. The following subsections document the staff’s review.

3.4.2.2.1 Cumulative Fatigue Damage

SLRA Section 3.4.2.2.1, associated with SLRA item 3.4.1-001, indicates that the TLAA on cumulative fatigue damage in the components of steam and power conversion systems is evaluated in accordance with 10 CFR 54.21(c)(1) and addressed in SLRA Section 4.3. This is consistent with SRP-SLR Section 3.4.2.2.1 and is, therefore, acceptable. The staff’s evaluation of the TLAA for the components of steam and power conversion systems is documented in SE Section 4.3.

3.4.2.2.2 Cracking Due to Stress Corrosion Cracking in Stainless Steel Alloys

SLRA Section 3.4.2.2.2, associated with SLRA Table 3.4.1, AMR item 3.4.1-002, 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 3.4.2.2.2.

In its review of components associated with AMR item 3.4.1-002, the NRC 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 3.4.1-002 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 cracking.

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

SLRA Section 3.4.2.2.2, associated with Table 3.3.1, AMR item 3.4.1-104, addresses cracking due to SCC for insulated stainless steel piping, piping components, and tanks exposed to air or condensation. The applicant proposed managing insulated stainless steel piping, piping components, and tanks exposed to air or condensation in the steam and power conversion systems using AMR item 3.4.1-002 with the One-Time Inspection program. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.2 and finds it acceptable because the proposed One-Time Inspections are capable of detecting cracking.

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 AMP XI.M29 exposed to air or condensation. The applicant stated that these items are not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.2 and finds it acceptable because, based on a review of the FSAR 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, associated with SLRA Table 3.4.1, AMR item 3.4.1-003, addresses loss of material due to pitting and crevice corrosion for 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 item 3.4.1-003, the NRC 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 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 loss of material.

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

SLRA Section 3.4.2.2.3, associated with Table 3.3.1, AMR item 3.4.1-103, addresses loss of material due to pitting or crevice corrosion for insulated stainless steel or nickel-alloy piping, piping components, and tanks exposed to air or condensation. The applicant stated that this item is not used because these aging effects are managed using a different AMR item. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.3 and finds it acceptable. This is based on the applicant proposing to manage loss of material due to pitting or crevice corrosion for insulated stainless steel or nickel-alloy piping, piping components, and tanks exposed to indoor uncontrolled air or outdoor air using AMR item 3.4.1-003 with the One-Time Inspection program, which includes inspections capable of detecting loss of material.

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, as well as for stainless steel and nickel-alloy tanks within the scope of GALL-SLR Report AMP X.M29 exposed to air or condensation. The applicant stated that this item is not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.3 and finds it acceptable because, based on a review of the FSAR 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, associated with SLRA Table 3.4.1, AMR item 3.4.1-061, addresses recurring internal corrosion for steel piping and piping components exposed to raw water. The applicant stated that its review of operating experience documentation (from the past 10 years) did not find any instances that met the criteria of recurring internal corrosion in the steam and power conversion systems. Based on this review, the applicant stated that item 3.4.1-061 was not applicable. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.6 and finds it is acceptable because the staff also did not identify any examples of recurring internal corrosion in steam and power conversion systems during its review of the applicant's operating experience information.

3.4.2.2.7 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

SLRA Section 3.4.2.2.7, associated with SLRA Table 3.4.1, AMR item 3.4.1-109, addresses cracking due to SCC for aluminum piping, piping components, and tanks exposed to air, condensation, raw water, or wastewater, which will be managed by the One-Time Inspection program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.4.2.2.7.

In its review of components associated with AMR item 3.4.1-109, the NRC staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging for AMR item 3.4.1-109 using the 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 cracking.

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

SLRA Section 3.4.2.2.7, associated with Table 3.3.1, AMR item 3.4.1-105, addresses cracking due to SCC for insulated aluminum piping, piping components, and tanks exposed to air or condensation. The applicant stated that this item is not used because cracking of insulated aluminum piping, piping components, and tanks exposed to indoor uncontrolled air is managed using a different AMR item. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.7 and finds it acceptable. This is based on the applicant's proposal to manage cracking of aluminum components exposed to uncontrolled indoor air using AMR item 3.4.1-109 with the One-Time Inspection program, which includes inspections capable of detecting cracking.

SLRA Section 3.4.2.2.7, associated with SLRA Table 3.4.1, AMR items 3.4.1-102 and 3.4.1-112, addresses cracking due to SCC for aluminum tanks within the scope of GALL-SLR Report AMP X.M29 exposed to air, condensation, soil, concrete, raw water, or wastewater, as well as for aluminum underground piping, piping components, and tanks. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.7 and finds it acceptable because, based on a review of the FSAR and SLRA, there are no such stainless steel or nickel-alloy component and environment combinations in the steam and power conversion systems.

3.4.2.2.8 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 (AMR 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 (AMR item 3.4.1-082). 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 NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.8 and finds it acceptable because, based on a review of the FSAR 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 NRC staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended 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 item 3.4.1-035, addresses loss of material due to pitting and crevice corrosion for aluminum 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 3.4.2.2.9.

In its review of components associated with AMR item 3.4.1-035, the NRC staff finds that the applicant has met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging for AMR item 3.4.1-035 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 loss of material.

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

SLRA Section 3.4.2.2.9, associated with Table 3.3.1, AMR item 3.4.1-119, addresses loss of material due to pitting or crevice corrosion for insulated aluminum piping, piping components, and tanks exposed to air or condensation. The applicant stated that this item is not used because cracking of insulated aluminum piping, piping components, and tanks exposed to indoor uncontrolled air is managed using a different AMR item. The NRC staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.9 and finds it acceptable. This finding is based on the applicant's proposal to manage cracking of aluminum components exposed to uncontrolled indoor air using AMR item 3.4.1-035 with the One-Time Inspection program, which includes inspections capable of detecting loss of material.

SLRA Section 3.4.2.2.9, associated with SLRA Table 3.4.1, AMR items 3.4.1-094, 3.4.1-097, and 3.4.1-120, addresses loss of material due to pitting and crevice corrosion for underground aluminum piping, piping components, and tanks; aluminum tanks within the scope of GALL-SLR Report AMP X.M29 exposed to air or condensation; and aluminum piping, piping components, and tanks exposed to raw water or wastewater. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.9 and finds it acceptable because, based on a review of the FSAR and SLRA, there are no such aluminum component and environment combinations in the steam and power conversion systems.

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

The SLRA did not identify any AMR results in SLRA Tables 3.4.2-1 through 3.4.2-12 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, "Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of the GALL-SLR Report," is a summary comparison of the applicant's AMR results with those provided in the GALL-SLR Report for the 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 V.C. Summer (see SE Section 3.5.2.2.1.1)
3.5.1-002	Not applicable to V.C. Summer (see SE Section 3.5.2.2.1.1)
3.5.1-003	Not applicable to V.C. Summer (see SE Section 3.5.2.2.1.2)
3.5.1-004	Not applicable to PWRs
3.5.1-005	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.3 item 1)
3.5.1-006	Not applicable to PWRs
3.5.1-007	Not applicable to PWRs
3.5.1-008	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.4)
3.5.1-009	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.5)
3.5.1-010	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.6)
3.5.1-011	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.7)
3.5.1-012	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.8)
3.5.1-013	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.5.1-014	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.9)
3.5.1-015	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.5.1-016	Consistent with the GALL-SLR Report
3.5.1-017	This item number is not used in the SRP-SLR nor the GALL-SLR Report
3.5.1-018	Consistent with the GALL-SLR Report
3.5.1-019	Consistent with the GALL-SLR Report
3.5.1-020	Consistent with the GALL-SLR Report
3.5.1-021	Consistent with the GALL-SLR Report
3.5.1-022	This item number is not used in the SRP-SLR nor the GALL-SLR Report
3.5.1-023	Consistent with the GALL-SLR Report
3.5.1-024	Consistent with the GALL-SLR Report
3.5.1-025	This item number is not used in the SRP-SLR nor 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	Consistent with the GALL-SLR Report
3.5.1-033	Consistent with the GALL-SLR Report
3.5.1-034	Consistent with the GALL-SLR Report
3.5.1-035	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.1.3, item 1)
3.5.1-036	Not applicable to PWRs
3.5.1-037	Not applicable to PWRs
3.5.1-038	Not applicable to PWRs
3.5.1-039	Not applicable to PWRs

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.5.1-040	Not applicable to PWRs (see SE Section 3.5.2.2.1.5)
3.5.1-041	Not applicable to PWRs
3.5.1-042	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.1.1)
3.5.1-043	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.1.2)
3.5.1-044	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.1.3)
3.5.1-045	This item number is not used in the SRP-SLR nor the GALL-SLR Report
3.5.1-046	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.1.3)
3.5.1-047	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.1.4)
3.5.1-048	Not applicable to V.C. Summer (see SE Section 3.5.2.2.2.2)
3.5.1-049	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.3.1)
3.5.1-050	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.3.2)
3.5.1-051	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.3.3)
3.5.1-052	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.4)
3.5.1-053	Consistent with the GALL-SLR Report (see SE Section 3.5.2.2.2.5)
3.5.1-054	Consistent with the GALL-SLR Report
3.5.1-055	Consistent with the GALL-SLR Report
3.5.1-056	Consistent with the GALL-SLR Report
3.5.1-057	Consistent with the GALL-SLR Report (see SE Section 3.5.2.1.2)
3.5.1-058	Consistent with the GALL-SLR Report
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 V.C. Summer
3.5.1-063	Consistent with the GALL-SLR Report
3.5.1-064	Consistent with the GALL-SLR Report
3.5.1-065	Consistent with the GALL-SLR Report
3.5.1-066	Consistent with the GALL-SLR Report
3.5.1-067	Consistent with the GALL-SLR Report
3.5.1-068	Consistent with the GALL-SLR Report
3.5.1-069	This item number is not used in the SRP-SLR nor 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	Consistent with the GALL-SLR Report
3.5.1-074	Consistent with the GALL-SLR Report
3.5.1-075	Consistent with the GALL-SLR Report
3.5.1-076	Not applicable to PWRs
3.5.1-077	Consistent with the GALL-SLR Report
3.5.1-078	Consistent with the GALL-SLR Report
3.5.1-079	Not applicable to V.C. Summer
3.5.1-080	Consistent with the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.5.1-081	Consistent with the GALL-SLR Report
3.5.1-082	Not applicable to V.C. Summer
3.5.1-083	Consistent with the GALL-SLR Report
3.5.1-084	This item number is not used in the SRP-SLR nor the GALL-SLR Report
3.5.1-085	Not applicable to V.C. Summer
3.5.1-086	Not Used (addressed by 3.5.1-081)
3.5.1-087	Consistent with the GALL-SLR Report
3.5.1-088	Consistent with the GALL-SLR Report
3.5.1-089	Consistent with the GALL-SLR Report
3.5.1-090	Not applicable to V.C. Summer
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 applicable to V.C. Summer
3.5.1-094	Consistent with the GALL-SLR Report
3.5.1-095	Not applicable to V.C. Summer
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 applicable to V.C. Summer
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 V.C. Summer 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 3.5.2-21 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 conclusions are documented in the GALL-SLR Report. The staff's findings regarding which AMRs are consistent with the GALL-SLR Report are documented in SE Table 3.5-1. For AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented below in Section 3.5.2.1.2.

SE Section 3.5.2.1.1 documents the NRC staff's review of AMR items 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 3.5.1, items 3.5.1-001 through 3.5.1-003, 3.5.1-048, 3.5.1-062, 3.5.1-079, 3.5.1-082, 3.5.1-085, 3.5.1-090, 3.5.1-093, 3.5.1-095, and 3.5.1-098, the applicant states that the corresponding AMR items in the GALL-SLR Report are neither used nor applicable to V.C. Summer. The staff reviewed the SLRA and FSAR 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 3.5.1-004, 3.5.1-006, 3.5.1-007, 3.5.1-036 through 3.5.1-041, and 3.5.1-076, the applicant states that the corresponding AMR items in the GALL-SLR Report are not applicable because the associated items are only applicable to BWRs. The staff reviewed the SRP-SLR Report, confirmed that these items only apply to BWRs, and finds that these items are not applicable to V.C. Summer because the plant is a PWR.

For the following SLRA Table 3.5.1 item, the applicant states that the corresponding item in the GALL-SLR Report is not used because it is addressed by another SLRA Table 1 item: 3.5.1-086 (addressed by 3.5.1-081). The staff reviewed the SLRA and confirmed that aging effects will be addressed by another SLRA Table 1 item. Therefore, the staff finds the applicant's proposal to use alternate items acceptable.

3.5.2.1.2 Loss of Mechanical Function Due to Corrosion, Distortion, Dirt or Debris Accumulation, Overload, or Wear

SLRA Table 3.5.1, AMR item 3.5.1-057 addresses loss of mechanical function for steel spring hangers, guides, and stops that are exposed to air–indoor uncontrolled. For the SLRA Table 2 AMR item that cites generic Note E, the SLRA credits the Structures Monitoring Program to manage the aging effect for steel spring hangers, guides, and stops. The AMR item cites plant-specific Note 4, which states "The Structures Monitoring (B2.1.35) program has been substituted for the ASME Section XI, Subsection IWF (B2.1.32) program to manage the aging effects applicable to this component type, material, and environment combination for non-ASME supports."

Based on its review of components associated with AMR item 3.5.1-057 for which the applicant cited generic Note E, the NRC staff finds the applicant's proposal to manage the effects of aging using the Structures Monitoring Program acceptable because these components are for non-ASME supports and their aging effects will be managed by the Structures Monitoring Program.

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, as recommended by the GALL-SLR Report, and provides information concerning how it will manage the applicable aging effects. The NRC staff reviewed the applicant's evaluation of these component groups against the criteria contained in SRP-SLR Report Section 3.5.2.2. The following subsections document the staff's review.

3.5.2.2.1 PWR and BWR 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, associated with SLRA Table 3.5.1, AMR items 3.5.1-001 and 3.5.1-002, addresses the aging effect of 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. The applicant stated that these items are not applicable. The NRC staff evaluated the applicant's statement against the criteria in SRP-SLR Section 3.5.2.2.1 and finds the statement acceptable because the applicant stated that the Reactor Building foundation mat is supported by fill concrete that extends down to competent rock, and that the foundation does not use porous concrete in the sub-foundation. Additionally, the applicant noted that a dewatering system was installed in proximity to the plant structures experiencing water intrusion in 2008. Although settlement of adjoining structures was monitored during the drawdown of the water table, the plant's current licensing basis does not credit a dewatering system to control settlement. The staff verified that the V.C. Summer structures do not rely on a dewatering system to control settlement, so there is no need for the licensee to verify the continued functionality of a dewatering system. Finally, the staff confirmed from the Updated Final Safety Analysis Report (UFSAR) that the Reactor Building is not founded on a porous concrete sub-foundation; therefore, erosion of porous concrete sub-foundation is unlikely to be an aging effect that could impact the intended function.

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 concrete due to elevated temperature in concrete components (e.g., dome, wall, basemat, ring girders, buttresses, containment, concrete filling 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 statement against the criteria in SRP-SLR Section 3.5.2.2.1.2 and finds the statement acceptable for the following reasons:

1. FSAR Section 3.8.1.3.1.3 notes that the operating temperature range of 50°F–120°F inside the Reactor Building is considered in the design, and that concrete temperature is limited to 200°F, maximum, at such local spots; and
2. FSAR Section 3.8.1.5.1.2 states that the temperature in the Reactor Building concrete is limited to 150°F, except in local areas such as pipe penetration locations where 200°F is the limitation.

Therefore, the Reactor Building concrete will not exceed the ASME Code specified limits of 150°F for general areas and 200°F for local areas and is acceptable.

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

Item 1. SLRA Section 3.5.2.2.1.3 item 1, associated with SLRA Table 3.5.1, AMR items 3.5.1-005 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, which will be managed by the ASME Section XI, Subsection IWE program and the 10 CFR Part 50, Appendix J program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.3 item 1.

The NRC staff noted the applicant's conclusion that a plant-specific program to manage this aging effect in accessible and inaccessible areas of the Reactor Building liner are not required for the following reasons:

1. Review of plant-specific operating experience associated with inaccessible areas has not identified any indications of corrosion, and operating experience associated with accessible areas has identified only minor indications of corrosion, which have been repaired by corrective action.
2. The concrete containments were designed, constructed, and inspected in accordance with ACI and ASTM standards (e.g., ACI 318-71, ACI 301-72, ASTM C260), which provide for controlled good quality, dense, well-cured, air-entrained, and low-permeability concrete.
3. The design satisfies the crack control criteria of ACI 318-71.
4. The ASME Section XI, Subsection IWL program and the Structures Monitoring Program will be used to monitor and manage any cracks in the containment concrete that could potentially provide a pathway for water to reach inaccessible areas of the steel liner.
5. The ASME Section XI, Subsection IWE program will be used to monitor the accessible areas of moisture barrier at the Reactor Building liner/floor perimeter interface.

In its review of components associated with AMR items 3.5.1-005 and 3.5.1-035, the NRC staff finds that the applicant has met the further evaluation criteria. Also, the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWE program and the 10 CFR Part 50, Appendix J program is acceptable for the following reasons:

1. Plant-specific operating experience with regard to corrosion associated with the containment liner has been minor and has been corrected by repairs.
2. The design and construction of containment concrete is in accordance with applicable American Concrete Institute (ACI) and ASTM International (ASTM) standards to produce durable concrete.
3. The containment concrete is monitored for cracks by the ASME Section XI, Subsection IWL AMP.
4. The moisture barrier is monitored by the ASME Section XI, Subsection IWE AMP.
5. Continued monitoring using the proposed AMPs would provide reasonable assurance that any occurrence of corrosion of the containment liner and its integral attachments would be identified and corrected prior to loss of intended function.

Based on the programs identified, the NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.5.2.2.1.3 item 1 criteria. For those AMR items associated with SLRA

Section 3.5.2.2.1.3, the staff concludes that the SLRA is consistent with the GALL-SLR Report, and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis (CLB) during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

Item 2. SLRA Section 3.5.2.2.1.3 item 2, associated with SLRA Table 3.5.1, AMR item 3.5.1-006, addresses loss of material due to general, pitting, and crevice corrosion that could occur in the steel torus shell of Mark I containments exposed to air–indoor uncontrolled, treated water. The applicant stated that this item is not applicable. The staff evaluated the applicant's statement against the criteria in SRP-SLR Section 3.5.2.2.1.3 item 2 and finds it acceptable because AMR item 3.5.1-006 is only applicable to BWRs, and V.C. Summer is a PWR design.

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 due to general, pitting, and crevice corrosion that could occur in the steel torus ring girders and downcomers of Mark I containments, downcomers of Mark II containments, and interior surface of the suppression chamber shell of Mark III exposed to air–indoor uncontrolled, treated water. The applicant stated that this item is not applicable. The staff evaluated the applicant's statement against the criteria in SRP-SLR Section 3.5.2.2.1.3 item 3 and finds it acceptable because AMR item 3.5.1-007 is only applicable to BWRs, and V.C. Summer is a PWR design.

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. The applicant states that the evaluation of this TLAA—loss of force in containment prestress tendons—is addressed in SLRA Section 4.5. The NRC staff reviewed SLRA Section 4.5 and finds that the applicant has met the further evaluation criteria of SRP-SLR Section 3.5.2.2.1.4 because SLRA Section 4.5 evaluated the TLAA in accordance with 10 CFR 54.21(c)(1). The staff's evaluation regarding the TLAA for the containment tendon prestress force losses is documented in SE Section 4.5.

3.5.2.2.1.5 Cumulative Fatigue Damage

SLRA Section 3.5.2.2.1.5, associated with SLRA Table 3.5.1, AMR items 3.5.1-009, 3.5.1-027, and 3.5.1-040, addresses cumulative fatigue damage (when a CLB fatigue analysis exists) and/or cracking due to cyclic loading (when a CLB fatigue analysis does not exist) for containment metal liner, metal plates, penetrations, and other containment pressure retaining boundary components (e.g., equipment hatch, airlock, penetration sleeves, penetration bellows) of steel, stainless-steel, and dissimilar metal weld material exposed to air–indoor uncontrolled or air–outdoor environment. The staff reviewed the applicant's proposal against the criteria for SRP-SLR Section 3.5.2.2.1.5, as proposed to be amended in Interim Staff Guidance SLR-ISG-2021-03-STRUCTURES, Appendix A (ADAMS Accession No. ML20181A381).

For components associated with AMR item 3.5.1-009, SLRA Section 3.5.2.2.1.5 states that TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1) and that the evaluation of this TLAA, fatigue of the containment liner plate (including the equipment hatch), is addressed in SLRA Section 4.6.1. This is consistent with SRP-SLR Section 3.5.2.2.1.5 for TLAA and is, therefore, acceptable. The staff's evaluation regarding the TLAA for containment liner plate is documented in SE Section 4.6.1.

For components associated with AMR item 3.5.1-027 (i.e., electrical penetrations, penetration sleeves, personnel access airlock, personnel escape airlock, equipment hatch, and the residual heat removal and containment spray isolation valve containers) for which CLB fatigue analyses do not exist, the applicant stated in the SLRA 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), which satisfied the six conditions specified in the ASME Code. The fatigue wavier analysis is discussed in SLRA Section 4.6.1 "Containment Liner Plate," and the staff's evaluation regarding this TLAA is documented in SE Section 4.6.1.

In its review of the components associated with AMR item 3.5.1-027, the staff finds that the applicant has met the further evaluation criteria, and the applicant's justification that cracking resulting from 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), which 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.

For components associated with AMR item 3.5.1-040, the applicant stated that this item is not applicable. The staff evaluated the applicant's statement against the criteria in SRP-SLR Section 3.5.2.2.1.5 and finds it acceptable because AMR item 3.5.1-040 is only applicable to BWRs, and V.C. Summer is a PWR design.

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 proposed to be amended by SLR-ISG-2021-03-STRUCTURES, Appendix A). For those AMR items associated with SLRA Section 3.5.2.2.1.5, 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).

3.5.2.2.1.6 Cracking Due to Stress Corrosion Cracking

SLRA Section 3.5.2.2.1.6, associated with SLRA Table 3.5.1, AMR items 3.5.1-010, addresses cracking due to stress corrosion cracking (SCC) for stainless-steel and dissimilar metal welds (DMWs) of penetration assemblies—electrical or mechanical penetrations/bellows and fuel transfer tube assemblies exposed to air–indoor uncontrolled, 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 3.5.2.2.1.6.

In its review of components associated with AMR items 3.5.1-010, the NRC staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J AMPs, is acceptable for the following reasons:

1. The ASME Section XI, Subsection IWE program will be enhanced (SLR Commitment 30(1)) 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 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. The ASME Section XI, Subsection IWE program will be enhanced (SLR Commitment 30(1)) to include additional examinations if SCC is identified as a result of the supplemental one-time inspections to assure that aging effect of cracking due to SCC is adequately managed through the applicant's corrective action program.
4. Plant-specific operating experience has 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 NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.5.2.2.1.6 criteria. For those AMR items associated with SLRA Section 3.5.2.2.1.6, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.5.2.2.1.7 Loss of Material (Scaling, Spalling) and Cracking Due to Freeze-Thaw

SLRA Section 3.5.2.2.1.7, associated with SLRA Table 3.5.1, AMR item 3.5.1-011, addresses the aging effect of loss of material (e.g., scaling, spalling) and cracking due to freeze-thaw, which will be managed by the ASME Section XI, Subsection IWL and Structures Monitoring Programs. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.7.

In its review of components associated with AMR item 3.5.1-011, the NRC staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWL and Structures Monitoring Programs is acceptable for the following reasons:

1. The Reactor Building concrete that contained an air-entraining admixture is capable of entraining 4 to 8 percent air, which is slightly higher than the air content stated in SRP-SLR Section 3.5.3.2.1.7. Furthermore, this air entrainment ratio covers the range specified by ACI 301 for air content required in moderate to extreme freeze-thaw exposure classes.
2. Plant operating experience related to inspections of accessible and inaccessible areas following the ASME Section XI, Subsection IWL and Structures Monitoring Programs have not identified any aging effects related to freeze-thaw.

Therefore, a plant-specific program or plant-specific enhancements to the ASME Section XI, Subsection IWL program and the Structures Monitoring Program are not needed. The Structures Monitoring Program will perform opportunistic inspections of normally inaccessible areas when made accessible by other plant activities, and the inspection results of the inaccessible areas will be evaluated for aging (i.e., loss of material).

Based on the programs identified, the NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.5.2.2.1.7 criteria. For those AMR items associated with SLRA Section 3.5.2.2.1.7, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.1.8 Cracking Due to Expansion from Reaction with Aggregates

SLRA Section 3.5.2.2.1.8, associated with SLRA Table 3.5.1, AMR item 3.5.1-012, addresses the aging effect of cracking due to expansion from reaction with aggregates, which will be managed by the ASME Section XI, Subsection IWL and Structures Monitoring Programs. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.8.

In its review of components associated with AMR item 3.5.1-012, the NRC staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWL program and the Structures Monitoring Program is acceptable for the following reasons:

1. V.C. Summer concrete inspectors are trained to identify conditions indicative of alkali-silica reaction (ASR), and the training includes concrete inspection and evaluation guidelines per ACI 201.1R, "Guide for Conducting a Visual Inspection of Concrete in Service" and ACI 349.3R, "Report on Evaluation and Repair of Existing Nuclear Safety-Related Concrete Structures."
2. V.C. Summer has no plant-specific operating experience on conditions of concrete that indicate ASR.
3. The ASME Section XI, Subsection IWL program and the enhanced Structures Monitoring Program are capable of identify the cracking associated with aggregate reactions such as "craze," "mapping," or "patterned" cracking to determine the presence of alkali-silica gel in the accessible concrete areas, and the Structures Monitoring Program requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas.
4. The Structures Monitoring Program will perform opportunistic inspections of normally inaccessible below grade concrete when excavated for any other reasons. Therefore, a plant-specific aging management program is not needed to manage cracking due to expansion from reaction with aggregates.

Based on the programs identified, the NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.5.2.2.1.8 criteria. For those AMR items associated with SLRA Section 3.5.2.2.1.8, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.1.9 Increase in Porosity and Permeability Due to Leaching of Calcium Hydroxide and Carbonation

SLRA Section 3.5.2.2.1.9, associated with SLRA Table 3.5.1, AMR item 3.5.1-014, addresses the aging effects of increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of concrete components (e.g., dome, wall, basemat, ring girder, buttresses, etc.) of containment structures exposed to a water-flowing environment, which will be managed by the ASME Section XI, Subsection IWL program and the Structures Monitoring Program. The staff reviewed the applicant's proposal against the criteria in SRP-LR Section 3.5.2.2.1.9.

In its review of components associated with AMR item 3.5.1-014, the NRC staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWL and Structures Monitoring Programs is acceptable for the following reasons:

1. The Structures Monitoring Program and the ASME Section XI, Subsection IWL program inspect for evidence of leaching of calcium hydroxide and carbonation in accessible and normally inaccessible structural components when scheduled maintenance work and planned plant modifications permit access.
2. The Structures Monitoring Program requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas.
3. Plant operating experience identified evidence of leaching of calcium hydroxide, but it has been determined that the observed leaching did not adversely impact the structural integrity or result in a loss of intended function of the in-scope structures.

Therefore, a plant-specific program or plant-specific enhancements to the ASME Section XI, Subsection IWL program and the Structures Monitoring Program are not needed to manage the effects of increase in porosity and permeability due to leaching of calcium hydroxide and carbonation.

Based on the programs identified, the NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.5.2.2.1.9 criteria. For those AMR items associated with SLRA Section 3.5.2.2.1.9, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

In SLRA Section 3.5.2.2.2, the applicant further evaluated aging management, as recommended in the GALL-SLR Report, for the containments, structures, and component supports components and provided information concerning how it will manage the applicable aging effects. The NRC staff reviewed the applicant's evaluation of component groups for which the GALL-SLR Report recommends further evaluation against the criteria contained in SRP-SLR Section 3.5.2.2. The following subsections document the staff's review.

3.5.2.2.2.1 Aging Management of Inaccessible Areas

Item 1. SLRA Section 3.5.2.2.2.1, item 1, associated with SLRA Table 3.5.1, AMR item 3.5.1-042, addresses loss of material (e.g., spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Groups 1-5, 7-9 structures exposed to air–outdoor or groundwater/soil environment, which is managed by the Structures Monitoring Program. The staff reviewed the applicant's statements 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 NRC staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring Program is acceptable for the following reasons:

1. The concrete mix designs contain an air-entraining admixture capable of entraining 3 to 6 percent air in accordance with ASTM standards.
2. Plant operating experience 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 NRC staff concludes that 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 that applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Item 2</u>. SLRA Section 3.5.2.2.2.1, item 2, associated with SLRA Table 3.5.1, AMR item 3.5.1-043, addresses cracking due to expansion from reaction with aggregates in inaccessible areas of Groups 1-3 and 5-9 structures exposed to any environment, which will be managed by the Structures Monitoring Program. The staff reviewed the applicant's statements 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 NRC staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring Program is acceptable for the following reasons:

1. Plant operating experience has not identified any indications of ASR for the concrete structures at the site, therefore, a plant-specific aging management program is not needed.
2. The Structures Monitoring, the ASME Section XI, Subsection IWL, and the Inspection of Water-Control Structures Associated with Nuclear Power Plants programs 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 NRC 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 that 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).

<u>Item 3.</u> SLRA Section 3.5.2.2.2.1, item 3, associated with SLRA Table 3.5.1, AMR items 3.5.1-044 and 3.5.1-046, addresses the aging effects of cracking and distortion due to increased stress levels from settlement in below grade inaccessible areas of structures for all

concrete structure groups exposed to soil environment, which will be managed by the Structures Monitoring Program. The staff reviewed the applicant's statements against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 3.

In its review of components associated with AMR items 3.5.1-044 and 3.5.1-046, the NRC staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring Program is acceptable because the applicant does not credit a dewatering system that is relied on for settlement control at V.C. Summer.

Based on the program identified, the NRC 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 that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 4. SLRA Section 3.5.2.2.2.1, item 4, associated with SLRA Table 3.5.1, AMR item 3.5.1-047, addresses increases in porosity and permeability and loss of strength caused by 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 reviewed the applicant's statements against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 4.

In its review of components associated with AMR item 3.5.1-047, the NRC staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring Program is acceptable for the following reasons:

1. 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 requires that the evaluation of inspection results include 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 NRC 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 the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.2 Reduction of Strength and Modulus Due to Elevated Temperature

SLRA Section 3.5.2.2.2.2, associated with SLRA Table 3.5.1, AMR item 3.5.1-048, addresses reduction of strength and modulus of elasticity due to elevated temperature in Groups 1-5 concrete structures exposed to an air–indoor uncontrolled environment. SLRA

Section 3.5.2.2.2.2 also states that the maximum general area air temperature in the structures is less than 150°F. Hot pipe penetrations in some structures may be subject to temperatures higher than 150°F, but not greater than 200°F. Therefore, concrete temperatures are limited to 150°F, except in local areas such as pipe penetration locations where 200°F is the limitation. The applicant stated that AMR item 3.5.1-048 is not applicable. The staff evaluated the applicant's statements against the criteria in SRP-SLR Section 3.5.2.2.2.2 and finds them acceptable because based on the staff's review of the SLRA, V.C. Summer's concrete temperatures are kept below the GALL-SLR Report recommended threshold limits of 150°F for general areas, and are kept below 200°F for local areas. In addition, the staff's review of operating experience has 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, AMR item 3.5.1-049, addresses loss of material (e.g., spalling, scaling) and cracking due to freeze-thaw in below grade inaccessible concrete areas of water-control structures (i.e., Group 6) exposed to air-outdoor or groundwater/soil environment, which is managed by the Structures Monitoring Program. V.C. Summer is in a "severe" weather region as shown in ASTM C33-90, Figure 1. The staff reviewed the applicant's statements against the criteria in SRP-SLR Section 3.5.2.2.2.3, item 1.

In its review of components associated with AMR item 3.5.1-049, the NRC staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring Program is acceptable for the following reasons:

1. The air content of the concrete associated with Group 6 structures is within the bounds of 3 to 8 percent specified in NUREG-2192.
2. 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 NRC 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 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, AMR item 3.5.1-050, addresses cracking due to expansion from reaction with aggregates in inaccessible concrete areas of water-control structures (i.e., Group 6) exposed to any environment, which will be managed by the Structures Monitoring Program. The staff reviewed the applicant's statements 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 NRC staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring Program is acceptable for the following reasons:

1. Plant operating experience has not identified any indications of ASR for the concrete structures at the site; therefore, a plant-specific aging management program is not needed.
2. 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 NRC staff concludes that the applicant's program meets SRP-SLR Section 3.5.2.2.2.3, item 2 criteria. For those AMR items associated with SLRA Section 3.5.2.2.2.3, item 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Item 3</u>. SLRA Section 3.5.2.2.2.3, item 3, associated with SLRA Table 3.5.1, AMR item 3.5.1-051, addresses increases in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of concrete components for water-control structures (i.e., Group 6) exposed to a water-flowing environment, which will be managed by the Structures Monitoring Program. The staff reviewed the applicant's statements against the criteria in SRP-SLR Section 3.5.2.2.2.3, item 3.

In its review of components associated with AMR item 3.5.1-051, the NRC staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring Program is acceptable for the following reasons:

1. The Structures Monitoring Program inspects for evidence of the aging effect in accessible areas and require that the 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.
2. The Structures Monitoring Program will perform opportunistic inspections of inaccessible, below grade concrete when excavated for any reason.

Based on the program identified, the NRC 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 that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.4 Cracking Due to Stress Corrosion Cracking, and Loss of Material Due to Pitting and Crevice Corrosion

SLRA Section 3.5.2.2.2.4, associated with SLRA Table 3.5.1, AMR items 3.5.1-052, 3.5.1-099, and 3.5.1-100, addresses cracking due to SCC and loss of material due to pitting and crevice corrosion for 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 ASME Section XI, Subsection IWE 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 Section 3.5.2.2.2.4.

For SLRA AMR item 3.5.1-052, the applicant states that there are no stainless steel tank liners within the scope of SLRA. The Reactor Building sump liners are stainless steel components exposed to standing water and are aligned to this item. Plant-specific operating experience has not identified loss of material due to pitting or crevice corrosion, or cracking due to SCC for the stainless-steel associated with the Reactor Building sump liners. The ASME Section XI, Subsection IWE program will manage cracking and loss of material of the Reactor Building sump liners. The staff evaluated the applicant's statement 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 FSAR 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 cracking due to SCC, 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 there are no aluminum support components that are within the scope of the ASME Section XI, Subsection IWF program. The applicant also stated that plant-specific operating experience has not identified pitting or crevice corrosion, or cracking for stainless steel components exposed to air or condensation environment. The ASME Section XI, Subsection IWF program will manage the aging of stainless steel component supports to ensure that these components continue to perform their intended functions during the subsequent period of extended operation.

SLRA Table 3.5.1, AMR item 3.5.1-100 addresses loss of material due to pitting or crevice corrosion, or cracking for stainless steel components exposed to air or condensation environment. The applicant stated that plant-specific operating experience has not identified pitting or crevice corrosion, or cracking for stainless-steel components exposed to air or condensation environment. The Structures Monitoring Program will manage the aging of stainless-steel and aluminum alloy component supports to ensure that these components continue to perform their intended functions during the subsequent period of extended operation. In addition to Structures and Component Supports, stainless steel components in Auxiliary Systems (materials handling) are aligned to this row with management by the Structures Monitoring Program.

In its review of components associated with AMR item 3.5.1-100, the NRC staff noted that the SLRA credits the Structures Monitoring Program to manage the aging effects 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. In addition, the staff finds that stainless steel structural support components will allow for degradation to be detected and for corrective action to be taken prior to a loss of intended function.

Based on the programs identified, the NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.5.2.2.2.4 criteria. For those AMR items associated with SLRA Section 3.5.2.2.2.4, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.5 Cumulative Fatigue Damage

SLRA Section 3.5.2.2.2.5, associated with SLRA Table 3.5.1, AMR Item 3.5.1-053, indicates that there is no CLB fatigue analysis for cumulative fatigue damage due to time-dependent fatigue, cyclic loading, or cyclical displacement of component support members, anchor bolts, and welds for Group B1.1 B1.2 and B3.1 supports at V.C. Summer.

In order to check if a CLB fatigue analysis exists for Group B1.1, B1.2, and B1.3 supports, the staff reviewed the following chapters of the V.C. Summer FSAR: (1) Chapter 3, “Design of Structures, Components, Equipment, and Systems”; (2) Chapter 4, “Reactor”; (3) Chapter 5, “Reactor Coolant System”; (4) Chapter 6, “Engineered Safety Features”; (5) Chapter 9, “Auxiliary Systems”; and (6) Chapter 10, “Steam and Power Conversion System.” In its review, the staff did not identify a CLB fatigue analysis for Group B1.1, B1.2, or B1.3 supports. The staff finds the applicant’s evaluation on the cumulative fatigue damage for component supports is acceptable because there is no CLB fatigue analysis involving a time-dependent assumption for Group B1.1, B1.2, or B1.3 supports.

The NRC staff also noted that the applicant separately addressed the fatigue analysis for the containment liner plate, metal containments and penetrations in SLRA Section 4.6. The staff’s evaluation of the fatigue TLAA is documented in SE Section 4.6.

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 4 dated October 24, 2024 (ML24302A144), associated with SLRA Table 3.5.1, AMR item 3.5.1-097, addresses the V.C. Summer further evaluation (FE) related to reduction of strength and mechanical properties of the concrete used for the primary shield wall (PSW) and secondary shield wall (SSW), and the structural integrity of the reactor vessel (RV) steel support assemblies exposed to neutron and gamma radiation, and radiation-induced heating in air–indoor uncontrolled environment. The SLRA states that the V.C. Summer RV has three loops, with their inlet and outlet nozzles resting on six “support shoes” (one for each nozzle) that are “designed to restrain vertical, lateral, and rotational movement of the RV but to allow for thermal growth by permitting radial sliding on the bearing plates at each support.” The SLRA also states that the support shoes are attached to the top of corresponding fabricated steel box structures forming the RV short columns that are anchored to and transmit load to the PSW via grout and anchor bolts. As noted in the SLRA and graphically demonstrated in Figure 3.5.2.2.2.6-1, the upper portion of the PSW structural concrete cylindrical structure, which is approximately 16 feet in diameter, is a hunched area (corbel) that is lined in part with steel plates.

During the initial NRC staff audit (ML24177A138), the applicant clarified the description provided for the PSW and RV supports in SLRA Section 3.5.2.2.2.6 and for the general arrangement of the RV support shown in SLRA Figure 3.5.2.2.2.6-1. Although not clear in the figure and description in the SLRA, the staff noted the uniqueness, extent, and complexity of the RV supports during the audit. Each RV support is comprised of a weld buildup on the RV nozzle, a Westinghouse-designed support shoe, and a structural steel box composing the short columns for the visible portion of the support. Its below-surface components (i.e., shearing ribs) are mated via grout to Gilbert Associates, Inc. (GAI)-designed reciprocal shearing ribs and ultimately to the wide flange (WF) steel support assembly structure embedded (encased) in reinforced concrete. The overall layout of the RV support system is presented in Revision 23 of the V.C. Summer UFSAR, which incorporated by Reference, DWG E-511-219 (ML23208A075), which also provides the RV hot and cold-leg piping arrangements. Details of the RV short columns and anchorage are shown in Section D.11 of NUREG/CR-7280 (ML21202A265). The included figures in NUREG/CR-7280 detail the integration of the Westinghouse short column RV structural steel support assembly via grouting to the GAI structural steel support assembly.

The extent of the V.C. Summer RV supports is defined in CR-15-05177, which the staff audited and which contains Engineers Technical Work Record (EIR 81987, Revision C), “Reactor Vessel Support ASME Code Boundaries.” The EIR states that each ASME RV support “conservatively consists of three parts: a weld builtup on the RV nozzle, a support shoe, and a structural steel box.” The EIR then states that the remaining RV support assembly components (i.e., the support box base plate and hold down anchor bolts) are considered part of the building structure and, in this case, part of the PSW. The EIR discusses the building structure jurisdiction and states that ASME Code, Section 3, Subsection NF defines the building structure as the load carrying concrete or structural steel whose purpose is to support, house, and protect safety class systems or components.

The SLRA focus of the V.C. Summer evaluation is on the short columns, the anchor bolts, the PSW, and the SSW. Based on its evaluation, the applicant determined, and noted in its SLRA, that the PSW structural concrete “is capable of carrying the loads of the RV at the end of 80 years of plant operation,” and that it “will continue to satisfy its design criteria considering the long-term radiation effects.” In addition, the SLRA states that the “RV supports [will] continue to be structurally stable (i.e., flaw tolerant) considering 80 years of radiation embrittlement effects on the supports.” The SLRA also states that “reduction of strength and loss of mechanical properties due to irradiation will not impact the primary shield wall’s intended function under design basis conditions,” and that a plant-specific AMP or enhancements to an existing AMP are not required to manage the effects of irradiation on the PSW and SSW concretes and RV structural steel support assemblies and components. Furthermore, the applicant states that “no additional inspections or enhancements are required for aging management of the RV supports, and the current ASME Code, Section XI inspection requirements are sufficient.”

The NRC staff noted the applicant’s lack of discussion in the SLRA of the additional RV support components (e.g., the embedded WF steel sections attached to the GAI “anchor assembly” supports (i.e., shearing ribs) interconnecting to those of Westinghouse, and grout) resisting the RV-induced, accident, and other environmental loads. Noted issues observed during the audit, documented in the audit report (ML24177A138), and their lack of resolution, resulted in additional questions that, once suitably answered, provided reasonable assurance that the RV cavity SSCs and materials used to support the RV will continue to fulfill the requirements of 10 CFR 54.21(a)(3) that their “intended function(s) will be maintained consistent with the CLB for the [subsequent] period of extended operation.”

The need for substantive additional review (as outlined in ML24109A177) led to the need for a limited scope audit. By letter dated April 19, 2023 (ML24109A179), the NRC staff informed the applicant of the need for the limited scope audit so that it could gain a better understanding of the applicant’s determination that, during the subsequent period of extended operation: (a) “the PSW will continue to satisfy its design criteria considering the long-term radiation effects and a plant-specific AMP or enhancements to an existing AMP is not required”; (b) “a separate analysis of the SSW is not required”; (c) “reduction of strength and loss of mechanical properties due to irradiation will not impact the PSW’s intended function under design basis conditions”;

(d) “the RV supports continue to be structurally stable (i.e., flaw tolerant) considering 80 years of radiation embrittlement effects on the supports”; (e) “no additional inspections or enhancements are required for aging management of the RV structural steel supports, and the current ASME Code, Section XI inspection requirements are sufficient”; (f) examination of V.C. Summer operating experience precludes the synergy of other aging effects with those associated with radiation; or (g) whether there is a need that the SSCs and associated materials are subject to one or more AMRs with AMPs considered, so that the effects of aging due to radiation are managed and the aforementioned SSCs’ intended functions are maintained consistent with the requirements of 10 CFR Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants,” to the end of the subsequent period of extended operation.

The NRC staff notes that Section 2.1.5.1 of the SLRA identifies the screening procedures and component level scoping for these structures and components that are passive, long-lived, and within the scope of license renewal, and are thus subject to an aging management review. The scoped and screened in “NSSS Supports” include the “Reactor Vessel Support” and “Other Class 1 Supports” discussed in SLRA Section 2.4.1.15, which defines their intended function(s), consistent with the CLB, to “permit unrestrained thermal growth […] but restrain vertical, lateral, and rotational movement resulting from deadweight, seismic, and pipe break loadings.” The staff examined the effects of aging due to radiation, potentially combined with synergistic effects of aging (e.g., loss of material) due to added aging mechanisms (e.g., corrosion), so that the scoped and screened nuclear steam supply system (NSSS) supports associated with this Further Evaluation will continue to perform their intended function(s) during the subsequent period of extended operation in accordance with 10 CFR 54.21(a)(3).

Overview:

The NRC staff’s review began with an evaluation of the applicant’s determination of the irradiation exposure estimates to the PSW and RV supports. Subsequently, the staff evaluated the applicant’s discussion of the state of the PSW structural concrete integrity and the effects of radiation on the grout as structural cementitious material following the SRP-SLR guidance (i.e., reduction of strength, loss of mechanical properties) and collateral effects (e.g., settlement) and associated potential combined effects of aging (e.g., elevated temperatures, loss of material on embedded steel, etc.) at 72 effective full-power years (EFPY). The staff then evaluated the embrittlement, potentially combined with other aging effects, of the RV short column steel supports, embedded in grout shearing ribs, embedded within the PSW WF steel support sections, the weld buildup on the RV nozzle, as well as the applicant’s past and proposed area inspections. Finally, the staff evaluated V.C. Summer, Supplement 4, which was submitted by letter dated October 24, 2024 (ML24302A144).

The review frequently refers to the following two key audited proprietary documents:

1. Structural Engineering Calculation No. 1.53(P), “Reactor Building Interior Concrete Area. Reactor Vessel Support Anchor Assembly/Anchor Assembly under RV Support – Primary Shield Wall” that includes the inverted shearing rib design.
2. CGE-CA120-CN-SA-000001(P), Revision. 1, “V.C. Summer Nuclear Station Unit 1 Subsequent License Renewal: Primary Shield Wall Concrete Assessment.”

Respectively, these frequently are identified as GAI-AOR [Analysis of Record] and W-AOR (i.e., SLRA reported analysis to update the original demands to capacity ratios).

Evaluation of Irradiation Exposure Estimates to the Primary Shield Wall Concrete, Grout, and Reactor Vessel Supports

The NRC staff's evaluation, presented below, addresses the approach used by the applicant to evaluate the exposure of the PSW structural concrete, and of the RV steel support structures, to irradiation using the transport methods described in WCAP-18124-NP-A (ML18204A010), which has been approved for use by the NRC staff in 2018 based on its adherence to RG 1.190. The applicability of RAPTOR-M3G was expanded to the extended RV beltline in 2022 in WCAP-18124-NP-A, Supplement 1-P/NP-A (ML22153A136). While no fluence method is generically approved to calculate the ex-vessel irradiation exposure at the PSW and/or RV support structures, RAPTOR-M3G has been previously applied to calculate such exposure estimates to the PSW and RV support structures at both the Point Beach Nuclear Plant and the St. Lucie Nuclear Plant as a part of their SLRAs, and both were found to be acceptable by the NRC (ML22140A127 and ML23219A003, respectively).

DESC used a three-dimensional plant-specific model of the V.C. Summer, Unit 1 reactor pressure vessel and surrounding structures. During the audit, the NRC staff reviewed images of the three-dimensional model in audited Westinghouse proprietary report CGE-REAC-TM-AA-000005, Revision 1. Irradiation exposures were calculated on a cycle-specific basis for cycles 1–27. Projections beyond cycle 27 to the end of the subsequent period of extended operation (i.e., 80 years or 72 EFPY) were based on average core power distributions and reactor operating conditions of cycles 25–27 but included a +10 percent bias on the peripheral and re-entrant corner assembly relative powers. The peripheral fuel assemblies drive the neutron and gamma leakage, so the +10 percent bias on those assemblies is conservative. The NRC staff finds the projected power distribution to be acceptable because it is based on recent operation and includes a bias on the peripheral assemblies for conservatism.

The SLRA reports the projected maximum radiation exposure for the PSW structural concrete, which is stated in Table 3.5.2.2.2.6-1, as 5.02×10^{19} neutrons per square centimeter (n/cm^2) (Energy [E] greater than 0.1 megaelectron-volts [MeV]) for the fluence and 1.90×10^8 Grays (Gy) for the gamma dose. Both of these numbers have been adjusted upwards to account for an estimated uncertainty of 20 percent. Similarly, the SLRA states that the maximum fast fluence on the PSW structural concrete inside face liner plate and the RV support WF embedded steel sections was estimated to be 4.55×10^{18} n/cm^2 (E greater than 1.0 MeV) and 8.82×10^{17} n/cm^2 (E greater than 1.0 MeV), respectively, which included a +20 percent adjustment for analytical uncertainty. Moreover, the SLRA includes iron displacements per atom (dpa) of the RV steel support structure (i.e., the above-grade support box plate, support box, support shoe, and support box plate bolt) in Table 3.5.2.2.2.6-3 but with a +25 percent adjustment for uncertainty. In its audit of CGE-REAC-CN-AA-000001, Revision 1, the NRC staff observed that fluence to the PSW structural concrete was estimated to have exceeded the SRP-SLR threshold of 1×10^{19} n/cm^2 at approximately 17 EFPY of cumulative operating time.

During the audit the NRC staff asked about the basis for the 20 percent and 25 percent uncertainties for the PSW components and the vessel steel support structure. DESC provided the basis in Enclosure 3 of Supplement 4 to the application (ML24302A144). The uncertainty estimates were established using the WCAP-18124-NP-A, Supplement 1-P/NP-A extended beltline uncertainty method. The 20 percent uncertainty for the PSW was based on the uncertainty calculated for the fast neutron (E greater than 1.0 MeV) fluence at the RV 30 centimeters (about 12 inches) above the top of the active fuel height. The NRC staff notes that the uncertainty of the fluence is expected to increase further away from the core midplane, so using a location further away from the location of interest for the basis of the fluence uncertainty is expected to be conservative.

While the uncertainty analysis is based on fast neutron fluence (E greater than 1.0 MeV) and the energy range of interest for the PSW structural concrete fluence is greater than 0.1 MeV, the estimated uncertainty remains appropriate and bounding of the fast neutron (E greater than 1.0 MeV) maximum fluence because the maximum PSW fluence occurs near the core midplane. At the core midplane, the fast neutron (E greater than 1.0 MeV) fluence uncertainty of the RAPTOR-M3G method of the RV steel at the reactor cavity (i.e., the outer surface of the RPV steel) is approximately 12 percent, as stated in the WCAP supplement and in Table 4-31 of WCAP-18124-NP-A. While the uncertainty of neutron fluences greater than 0.1 MeV is expected to be greater than the 12 percent due to the difference in the energy spectra of interest (E greater than 1.0 MeV versus E greater than 0.1 MeV) at the core midplane, it is not expected to exceed the estimated uncertainty of 20 percent. The NRC staff finds the 20 percent uncertainty in the PSW fluence and gamma dose to be acceptable because it was calculated with the NRC-approved methodology described in Supplement 1-P-A of WCAP-18124-NP-A and is based on a conservative location relative to the location where the maximum PSW irradiation exposure would occur.

The 20 percent estimate for uncertainty also was applied to the PSW steel liner peak fluence. The steel liner is slightly closer to the RV than the concrete, and for steel materials, the neutron energy range of interest is typically greater than 1.0 MeV, so the uncertainty in the fast fluence (E greater than 1.0 MeV) to the steel liner would be expected to be less than that of the concrete. In other words, the uncertainty in the steel liner fluence is expected to be closer to the 12 percent uncertainty that is established for the cavity at the core midplane than the uncertainty in the concrete fluence (the peak exposure to the liner also occurs near the midplane) due to the proximity to the RV. The NRC staff finds the 20 percent uncertainty in the PSW steel liner maximum fluence to be acceptable because the uncertainty is expected to not differ significantly from 12 percent due to the proximity of the liner to the RV.

Furthermore, the 20 percent estimate for uncertainty with a 10 percent positive bias on the peripheral and re-entrant corner assemblies on the projection fuel cycle also was applied to the peak fast fluence (E greater than 1.0 MeV) of the WF steel support assembly embedded in the PSW structural concrete. The embedded steel fast fluence uncertainty would be expected to be higher than that of the PSW steel liner because of its increased distance from the core. However, during the audit, the NRC staff through its review of GAI-AOR, design and/or as-built drawings confirmed that the minimum depth of the embedded steel in the concrete relative to the inside of the PSW (i.e., where the peak fluence to the embedded steel would be) is small, just several inches, so the uncertainty would not be expected to be significantly larger. The 20 percent uncertainty estimate is expected to remain bounding. Therefore, the NRC staff finds the 20 percent uncertainty in the PSW embedded steel to be acceptable because the uncertainty would not be expected to differ significantly from the uncertainty to the steel liner or the PSW structural concrete due to the minimum depth of the embedded steel in the PSW being small.

Overall, the NRC staff finds the fluence and gamma dose estimates in the PSW structural concrete, PSW steel liner, and the PSW embedded steel presented in the application to be acceptable for the following reasons:

1. The estimates were calculated using an NRC-approved methodology for calculating fluence and gamma dose.

2. The geometry of the RV and PSW are well represented in the plant-specific model used in the analyses.
3. The projected power distribution of the core is acceptable, as previously discussed (based on cycles 25–27 with a +10 percent bias on the peripheral and re-entrant corner assembly relative powers.
4. The uncertainty is acceptably accounted for, as described above.

Moreover, as previously stated, the estimated 25 percent uncertainty for the steel support structure dpa also was calculated using the WCAP-18124-NP-A, Supplement 1-P/NP-A extended beltline uncertainty method. Specifically, the 25 percent uncertainty for the RV steel support structure (short columns) was based on the uncertainty calculated for the fast neutron (E greater than 1.0 MeV) fluence at the RV 90 cm (approximately 35.5 in.) above the top of the active fuel height, as stated in Supplement 4 to the application. The supplement also states that the peak fluence and dpa to the support structure is projected to occur at axial elevations less than approximately 60 cm (approximately 23.5 in.) above the top of the active fuel height. The uncertainty in the calculated radiation exposure is expected to increase with increasing distance from the core midplane; therefore, assuming a greater distance from the core midplane for calculations is expected to be conservative. The NRC staff finds the 25 percent estimated uncertainty for the short column support structure (i.e., the above-grade support box plate, support box, support show, and support box plate bolt) exposure to radiation and application of the dpa parameter for assessment of embrittlement to be acceptable because it was calculated with the NRC-approved methodology described in Supplement 1-P-A of WCAP-18124-NP-A and is based on the uncertainty calculated at a conservative location relative to where the peak neutron exposure is projected to occur in the support structure.

As a part of its review of the RV support structure irradiation exposure and associated estimated uncertainty, the NRC staff also reviewed exposure to the support shoe and the grout and support box structure that the shoe rests. The support shoe irradiation was discussed in the previous paragraph. The maximum 72 EFPY fluence to the grout was calculated to be 2.18×10^{19} n/cm^2 and the gamma dose at that location was calculated to be less than the 1×10^8 Gy SRP-SLR threshold value. The NRC staff estimates that the 1×10^{19} n/cm^2 SRP-SLR fluence limit would be exceeded for approximately 5 cm (approximately 2 in.) of grout at the elevation, where the aforementioned peak grout fluence occurs. The NRC staff further finds that the calculational uncertainty included in the grout exposure estimate was 20 percent because the maximum exposure would occur at the bottom of the grout, which is within 30 cm (approximately 2 in.) of the top if the active fuel height, which is consistent with how the 20 percent uncertainty was derived and it is therefore acceptable.

Overall, the NRC staff finds the exposure estimates in the RV steel short column support structure and associated grout to be acceptable for the following reasons:

1. The exposure estimates were calculated using an NRC-approved methodology for calculating fluence and gamma dose.
2. The geometry of the RV, PSW, and supports are well represented in the plant-specific model used in the analyses.
3. The projected power distribution of the core is acceptable, as previously discussed.
4. The uncertainty is acceptably accounted for, as described above.

<u>Evaluation of Primary Shield Wall (PSW) Concrete and Grout (Cementitious Materials) to Irradiation</u>

In compliance with SRP-SLR Section 3.5.2.2.2.6, as modified by SLR-ISG-2021-03-STRUCTURES (ML20181A381), DESC performed a plant-specific SLRA reported analysis to evaluate whether the effects of radiation on the PSW structural materials of concrete and grout (hereinafter also referred as cementitious materials) exceeding the SRP-SLR limits would not compromise the RV support anchorage capacity to resist the AOR design loads and load conditions. As previously stated, the NRC staff verified that the radiation exposure listed in SLRA Table 3.5.2.2.2.6-1 exceeds both the neutron fluence and gamma dose of respective SRP-SLR limits of 1×10^{19} n/cm^2 and 1×10^{10} rad at 72 EFPY, resulting in an expected reduction in strength and in mechanical properties to the PSW structural concrete and grout.

The NRC staff review focused on the completeness of the applicant's input as summarized in the SLRA with supporting documents provided in the audit portal. Specifically, the staff focused on whether, and to what extent, the SLRA identified and adequately addressed the effects of aging on the structural materials of concrete and grout due to neutron fluence, gamma dose, and gamma heating combined with other potentially detrimental environments affecting the capacity of the PSW cementitious materials to perform their intended functions as structural supports consistent with 10 CFR 54.21(a)(3) to the end of the subsequent period of extended operation.

The RV is supported by the PSW structural concrete and grout. The intended function of the grout as seen in NUREG/CR-7280, Figure D.11-6 is to interconnect and stabilize each Westinghouse short column to an underlying embedded Gilbert-designed structural support. The NRC staff's assessments are rooted on whether the entire assembly can transfer the RV imposed/induced loads to the PSW while resting on cementitious materials of concrete and grout that are compromised due to imposing radiation effects. Specifically, as the SLRA notes, where the "concrete strength is 0 percent for the first 4 inches due to neutron fluence, and 90 percent for an additional 6 inches to account for gamma effects." The expectation is that the as-built structures and components can resist CLB inertial, gravity, thermal, and asymmetric (as modified) loads, subject to aging effects due to radiation and other adverse environments noted in relevant operating experience. That way the RV support system and ancillary NSSS components would not misalign, deform, crack, or experience other unacceptable conditions that would affect the stability and hence integrity of the RV and that, consistent with the CLB, the overall design configuration is maintained to the end of the subsequent period of extended operation.

As previously noted, the NRC staff supplemented its review of DESC's plant-specific analysis, summarized in Section 3.5.2.2.2.6 of the SLRA, through audited material in the electronic reading room and audit discussions held with the applicant. However, the staff could not reach reasonable assurance that effects of aging associated with levels of radiation as reported in SRA Table 3.5.2.2.2.6-1, would not negatively affect the structural supports function of the PSW structural concrete and grout during the subsequent period of extended operation. As noted in the literature (Hilsdorf et al.), this level of radiation exceeding the SRP-SLR limits results in reduction or loss of strength, modulus, mechanical properties that manifest themselves as cracking, settlement of cementitious materials potentially leading to deformation, and misalignment of the visible RV short columns supports.

The NRC staff audited the GAI V.C. Summer, Unit 1 design/as-built calculations (e.g., GAI Calculation Master, Calculation 1.5X Series) and compared them to those performed by

Westinghouse (e.g., CGE-CA120-CN-SA-000001-Revisions 1 and 2), for the SLRA to update the original demand to capacity ratios, to Chapter 3 of the FSAR, which discusses the design of SSCs important to safety, and to the design/as-built drawings provided information. All of these resulted in uncertainties on the conservatism of the overall quantification of demand to capacity (D/C) ratios (margins), specifically those associated with the updated SLR D/C ratios documented in SLRA Table 3.5.2.2.2.6-2. For the most part, the uncertainties result from the lack of clarity in the applicant's overall analysis. For example, the staff noted that there was a lack of clarity regarding:

1. The consistency between GAI and Westinghouse analytical models, assumptions, and methods of analyses used, including their level of approximation.
2. The estimated design loads and consistency of load conditions used in the GAI calculations with those entered in the FSAR and noted in the Westinghouse analysis.
3. The extent of aging effects included in the W-AOR.
4. The compressive strength of concrete used in the GAI analytical effort in the entire or sections of the PSW structural concrete design and follow-up construction.
5. The compressive strength of concrete used in the W-AOR versus that used in documentation for the as-built PSW structural concrete.
6. Dissimilar critical PSW sections used in GAI analysis and with those in the W-AOR.
7. Effectiveness of the corbel hoop steel as considered in the W-AOR, because the minimum clear cover is 2.5 in. (reference audited DWG E-411-280), versus the assumed zero strength structural concrete section that extends 4 to 5 in. into the PSW structural concrete.

The NRC staff also noted that there were conservatisms that could have been used in the analyses underlying SLRA Table 3.5.2.2.2.6-2. Although these were discussed in several audited documents, they were not incorporated in the table to provide a more realistic representation of reported D/C results that potentially could have increased the available margins and could have helped to remove some of the uncertainties in the aforementioned analyses. These conservatisms that could have been used in the analyses included:

1. The reduction in asymmetric loads and continued leak-before-break (LBB) implementation during the subsequent period of extended operation (e.g., as presented in proprietary audited WCAP-13206, Revision 4, which the applicant referenced in SLRA Section 4.7.3 "Leak-Before-Break" as the technical basis for a plant-specific TLAA.
2. The reduction in dead and seismic loads due to head replacement (e.g., as presented in audited V.C. Summer/AREVA DC0311E-013(P), Revision 2.
3. An increased average concrete compressive strength due to concrete aging (e.g., as presented in audited V.C. Summer DC00020-209(P), Revision 0.
4. A consideration of about four to five inches of zero-compressive strength of PSW structural concrete reported in the SLRA when, in reality, some strength remained in the irradiated concrete and grout as affirmed by the applicant during the limited scope audit.
5. The uniform application of the maximum neutron fluence along the height of the PSW structural concrete, even though its effects are at a specific azimuth and PSW elevation (fuel core midplane) (e.g., as presented in audited Westinghouse proprietary report CGE-REAC-TM-AA-000005(P), Revision 1).

6. The lack of composite action consideration in the design of embedded in concrete GAI WF steel sections and plate support assemblies, resulting in heavier WF sections discussed in the audited GAI-AOR and W-AOR.

The NRC staff also noted certain anomalies in the W-AOR analysis and in the applicant's responses to the staff's breakout questions. Some of these anomalies were:

1. The assumed uniformity in PSW structural concrete geometry considered for the effects of radiation that led to a conceptual removal of four to five inches of azimuthal sections of PSW concrete (several neutron detectors modified the assumed cross section uniformity) was not an accurate representation of the air cavity geometry.
2. The disregard in the SLRA-reported analysis of four to five inches of concrete due to effects of radiation, but reconsidered later by DESC when responding to staff inquiries.
3. The use of first-of-a-kind specialized analysis rules to reduce the fluence exposure and its effects of radiation on the PSW structural concrete.
4. Unaccounted effects of radiation induced volumetric expansion (RIVE) in the inner part of the PSW.
5. Differences between GAI-AOR and FSAR Section 3.8.1.5.1.1 in strength/capacity reduction factor φ required by the ACI Standard 318-71 (ANSI A89.1972) when using its "Factored Load Combinations."
6. The lack of consideration of the structural significance of the grout in SLRA Section 3.5.2.2.2.6.
7. The lack of consideration of the effects of aging due to irradiation on the grout surrounding the Westinghouse RV short column supports and interconnecting these to the GAI PSW/corbel embedded steel supports.

As a structural material, the grout supports and interconnects the visible/accessible Westinghouse part of the support (short columns) to the GAI embedded WF steel assembly. As a result, it transfers all exerted loads on the short columns to the PSW and GAI embedded/inaccessible WF sections within the PSW structural concrete. The structural significance of the grout and its association with the PSW concrete is discussed in the opening discussion of this SE (see also ML21202A265, Figures D.11-2 and D.11-6).

The maximum neutron fluence at approximate elevation 426.75 ft., as discussed in "*Evaluation of Irradiation Exposure Estimates to the Primary Shield Wall Concrete, Grout, and Reactor Vessel Supports,*" above, with an estimated uncertainty of 20 percent is approximately 2.18×10^{19} n/cm^2 (E greater than 0.1 MeV) at 72 EFPY. This is above the SRP-SLR threshold of 1.0×10^{19} n/cm^2 that would lead to an expected reduction of strength, modulus, and potential RIVE effects. However, even though the SLRA assigned zero compressive strength to the structural concrete and grout as noted in anomalies, the NRC staff acknowledges that they have some compressive strength, albeit less than that considered in the as-built configuration and CLB design.

The minimum specified design compressive strength values for concrete and grout are noted in UFSAR Section 3.8.4.6.1.2. These values are 3,000 psi at 28 days for concrete, or 5,000 psi at 90 days (but applicable to PSW as noted in audited DWG E-411-283, Revision 3) for qualified concrete structures (e.g., Intermediate and Fuel Handling Buildings), and 6,000 psi at 28 days for grout. However, the grout surrounding the RV support and grouting between the

Westinghouse short column support underlying shearing ribs and the GAI shearing ribs support anchors specified as MasterFlow® 713 in audited GAI memorandum Pittsburgh Testing Laboratory, "Report of Test of 713 Grout," tested to a maximum value of 7,870 psi at 14 days. Nonetheless, depending on its placement, the grout strength could vary from 7,000 psi to 8,500 psi at 28 days as reported in MasterFlow® 713, Technical Data Guide. Similarly, the reactor cavity concrete tested to an average 6,759 psi at 90 days but decreased to 6,083 psi based on favorable and unfavorable environmental effects further discussed below in "*Evaluation of the PSW Structural Concrete and grout Temperatures and its Increase due to Potential Gamma Heating.*" Assuming the 28-day grout strength to be its long-term value and applying the same percent reduction to its compressive strength based on similar favorable and unfavorable environmental effects experienced by the adjacent PSW structural concrete, its envisioned maximum compressive strength without the effects of radiation would be reduced to approximately 7,650 psi.

Considering the comprehensive guidance provided by NUREG/CR-7280, which includes conclusions reached by Hilsdorf et al., Field et al., and Maruyama et al. in their studies for the effects of radiation on the reduction of strength and modulus on cementitious materials and the ACI 349/318 Code requirements for "design bearing strength of concrete" to φ x ($0.85 \times$ fc') times the supporting area, the reduction in relative compressive strength due to irradiation for the grout and concrete associated with the RV steel support assemblies varies. While the NUREG/CR-7280 minimum reduction factor for radiation is approximately 0.4, that of Maruyama (Maruyama et al.) is 0.82 and included in EPRI TR-3002018400. This latter factor is derived based on the majority experimental data available, irrespective of temperature environments. As is well known, at least 60 percent of concrete volume is occupied by coarse aggregates with roughly 20 percent attributed to fine aggregates. The NRC staff notes that literature (LePape et al.) points out that the "dominant role of (RIVE) in aggregates for the development of damage in concrete subjected to neutron radiation" and that "higher irradiation temperatures cause the annealing of point-defects resulting in delayed and reduced volumetric expansion rates," which influenced the derivation of 0.82 reduction factor.

The NRC staff also noted that in follow-up studies, Maruyama et al. reconsidered the heating and drying that prolongs the effects of neutron impact on concrete for the definition of lower radiation limits. Follow-up calculations and adjustments by Maruyama et al. of experimental data used in the definition of 0.82 reduction factor in a typical radiation-affected RV air cavity with temperatures upwards of 55°C (131°F) (about 14°C [57°F] lower than that of V.C. Summer air cavity temperature as reported in Supplement 4), that factor for a fluence of 2.18×10^{19} n/cm^2 (E greater than 0.1 MeV) at 72 EFPY is revised downwards to about 0.6. The staff further notes that at the fuel mid-plane elevation where the effects of radiation to the PSW structural concrete are further exacerbated by increased fluence, the above noted references would further adjust the downward trend of the strength reduction factor.

Although this reduction applies primarily to the compressive strength of structural concrete (without considering the Code of Record requirements of ACI 318-71 for bearing strength capacity that further exacerbate the reduction), it may not necessarily apply to the grout. On one hand, test specimens used to derive the reduction factors were small, and the differentiation between large and fine aggregates is indiscernible in the concrete mixes used. On the other hand, studies and tests of grout exposed to irradiated environments are scarce. The MasterFlow® 713 grout main ingredient according to its Safety Data Sheet, is Portland cement. Its composition also includes a sizeable amount of quartz (SiO_2), followed by calcium oxide, amorphous silica, and other minor ingredients. Studies of cement paste coating the surfaces of fine aggregates such as the quartz indicate that at fluence levels of 2.18×10^{19} n/cm^2, while it may maintain some compressive strength (Maruyama et al.), the grout could experience an overall damage (e.g., expansion, microcracking, creep, etc.) (Giorla et al.) that could be as high as 0.6 of its original state. Summarized studies on irradiated cement mortar outlined in NUREG-7280 show that for temperatures from 50 to 80°C (approximately 120°F to 175°F), the cement paste strength reduction factor can vary from slightly less than 1.0 to about 0.6 for neutron radiation of greater than 2.18×10^{19} n/cm^2 (E greater than 0.1 MeV) at 72 EFPY.

Conservatively speaking then, for cementitious materials, an overall compressive strength reduction factor of 0.6 should not be discounted. As previously noted in supplemental breakout question No. 8, the CLB required grout compressive strength for the Westinghouse and GAI integrated RV steel support anchor assembly (shearing ribs included) without consideration of radiation is 6,333 psi. Applying the 0.6 radiation capacity reduction factor (the $\varphi = 0.7$ capacity reduction factor for bearing type construction was considered in the GAI-AOR calculations) to the projected (assumed) long-term grout strength of 7,650 psi results in a compressive strength of roughly 4,600 psi or about 30 percent less capacity (C) than that required by the ACI 318-71 standard for the RV support assembly to safely resist the demands (D) of RV and environment derived loads and load conditions. This D/C = 1.36 ratio occurs at the top of the PSW RV at the support by Westinghouse (at an elevation of 426 ft. and $8^1/_6$ in.) and the interface of the concrete and liner but reverts to SRP-SLR limits at about 2 in. inside the concrete at the liner.

Given the proximity of the RV short column steel supports to the interface of concrete with liner, the reduction of compressive strength due to radiation of cementitious materials and in consideration of noted uncertainties, anomalies, unaccounted and unquantified conservatisms in reported analysis results, and its lack of clarity to convey whether the CLB design margins are adequate for the PSW structural concrete and load bearing grout interconnecting the Westinghouse steel shearing ribs support anchors to those of GAI, ultimately transferring loads to the PSW embedded WF supports, following the onsite limited scope audit (ML25007A234), the applicant supplemented Section 3.5.2.2.2.6 of the SLRA.

Supplement 4 of the application addresses management of the effects of aging due to irradiation for the PSW structural concrete, grout, embedded reinforcement, and WF steel sections as attached to the GAI anchor assembly mated to that of Westinghouse below-grade during the subsequent period of extended operation. The proposed Table 3.5.2 AMR line items, associated AMPs, and their amendments are reviewed below in "*Evaluation of V.C. Summer Supplement 4*."

Evaluation of the PSW Structural Concrete and Grout Temperatures Including Gamma Heating

The NRC staff reviewed SLRA Section 3.5.2.2.2.6, as amended by Supplement 4, and noted that the SLRA states that the "impact of gamma heating on the PSW has been evaluated and it was concluded that the maximum PSW structural concrete temperature, with the reactor cavity seal removed during normal plant operations, would be less than 145°F." The SLRA also states that this temperature is "conservatively based on a reactor cavity air flow velocity of 5 ft/sec instead of the calculated value of 34.8 ft/sec that is based on the design reactor cavity flow rate of 30,000 CFM [cubic feet per minute]." The applicant further states that this temperature is bounded by the long-term PSW structural concrete temperature limit, which is reported in Section 3.8.1.5.1.2 of the FSAR to be 150°F.

The NRC staff further noted that this temperature is discussed in FSAR Section 9.4.8.2.1, which also addresses the main components of the Reactor Building Cooling System (RBCS). The RBCS has four air-handling units that support the air flow. Its operability characteristics are addressed in Technical Specifications 3/4.6.2.3. Technical Specification Limiting Condition for Operation 3.6.1.5 requires that the primary containment average temperature arithmetically averaged over several elevations does not exceed 120°F. This temperature is maintained through air-handling units and the local ventilation and cooling systems and components as noted in SLRA Section 2.3.3.1 for spatial interaction and structural integrity consistent with 10 CFR 54.4(a)(2). In addition to these measures, FSAR Section 5.4 states that the RV has a “canned” 3-in.-thick reflective sheets of stainless steel thermal insulation, which the staff confirmed in its audit of DWG 590063-001CA, to further limit air cavity temperature increases. The FSAR states that RV nozzles also are insulated with “noncrushable nonmetallic material clad with stainless-steel.” Audited calculation DC07020-002, Revision 3, and DWG E-922-004 detail the Reactor Cavity Cooling System, a subset to RBCS, with its additional PSW structural concrete cooling paths composed of six primary shield wall concrete penetrations and eight neutron detectors collectively augmenting the conservative estimate of air cavity air flow of 30,000 CFM by approximately an additional 5,000 CFM.

In its evaluation to determine whether the concrete was exposed to temperatures above the SRP-SLR allowable limits for general and specific areas, the NRC staff examined past relevant operating experience that may have affected the integrity of the PSW structural concrete and grout and anticipated concrete gamma heating effects to the end of subsequent period of extended operation. The staff however notes the conservatism of the SRP-SLR versus the acceptable temperature limits of ACI Code 349. Paragraph E-4.1 of ACI 349-13 limits the concrete temperature to be at 180°F for general and 230°F for local surface areas provided that the measured (tested) concrete compressive strength (e.g., 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 notes that the above referenced temperatures in ACI 349-13 are for sustained, long-term thermal exposures and hot cold cycling of concrete encountered during plant operations. The staff notes, however, that GALL-SLR guidance for current operating plants recommends the quantitative acceptance criteria of ACI 349.3R for the evaluation of existing nuclear safety-related concrete structures for examining concrete structural performance. In association with NUREG/CR 7301, the 349.3R-18 Report warns against “[s]ustained exposure of concrete to temperatures over 300°F (149°C) or to numerous hot cold cycles [which] can cause a loss of mechanical properties and result in cracking.”

In Attachment 14 to audited calculations DC-00020-209 Revision 0, the NRC staff noted that V.C. Summer performed 166 individual strength tests of reactor support area concrete which resulted in an average compressive strength of 6,759 psi at 90 days. This reflects a 1,750 psi increase in compressive strength beyond that of 5,000 psi required at 90 days (recorded in construction drawings as required by design specification SPD-01 and noted in FSAR Section 3.8.1.6.1.1). The staff notes that because the tested concrete compressive strength (f’c) is 35 percent higher than the required at 90 days, or percentage wise about twice that set by the ACI 349-13 Code minimum of 5,750 psi (i.e., 1.15 $\times$ f’c = 1.15 $\times$ 5,000 psi) for temperature limits acceptability, the staff finds these limits to be applicable to V.C. Summer in evaluating the PSW structural concrete for both sustained and short-term elevated temperatures.

Similarly, the NRC staff reviewed NCN 00-163 and noted past operating experience discussing transient air cavity concrete temperatures exceeding the FSAR limit of 150°F. The first operating experience described a loss of air fan flow that led to a 16-hour estimated 244°F temperature at the RV steel support assembly (short column and embedded steel) and a steady-state temperature of 228°F for 90 days. In audited Calculation DC-00020-209, Revision 0, the staff observed that while the SRP-SLR localized temperature limit of 200°F was temporarily exceeded, the 2013 revised ACI 349 Code threshold discussed above was not. The audited calculations indicate that when the RV support assembly steel components temperature was set at 244°F, the nearby local concrete temperature remained within the bounds of ACI 349-13 Code. The next reviewed operating experience was about blockage of the RV annulus by boron deposits and an estimated steady-state increase of the air cavity concrete temperature to 233°F for 18 months. A similar calculation that referenced the available concrete industry research and testing concluded that the local area air cavity concrete, in spite of this condition, maintains an increased compressive strength to 6,083 psi.

Aside from the temporary exposures of general concrete area to temporary elevated temperatures, the staff also examined to what extent the steady state temperature at the RV support assembly steel components would be exacerbated by gamma heating. Calculation DC-00020-209, Revision 0 also shows that the localized steady state temperature in the concrete immediately below the RV support shoes does not exceed 192°F during normal operation with the reactor cavity seal ring permanently removed. Experimental verification of Calculation DC-00020-209, Revision 1 indicated that the margin in the calculated temperature potentially could be as high as 77°F.

Accordingly, noting the variations in temperature assessment between calculated, measured, and imposed, and locations at air cavity, at or below the short columns, for a general bounding assessment, the staff conservatively used an air cavity temperature of 150°F in its evaluation and a flow velocity of 5 ft/sec. From Figure 7 of Bruck et al., the NRC staff noted that, from the temperature profile for the inner gap air temperature of 150°F, the maximum temperature in the concrete section would be approximately 154°F. This is a temperature increase of 4°F (i.e., from 150°F to 154°F) within the concrete, including gamma heating. Conservatively, considering an additional 25 percent increase in temperature due to uncertainties and/or potential variations in concrete conductivity, air flows, and incident gamma dose, a bounding increase in concrete temperature, including gamma heating effects, inside the PSW structural concrete is approximated as not to exceed 5°F (i.e.,1.25 × 4°F). This potential increase in temperature to approximately 160°F is still below the ACI 349-13 temperature limit of 180°F for general area sustained concrete temperature. For the concrete below the short steel columns, taking into consideration the divergent results between analyses, tests, potential RV insulation malfunction, and the additional uncertainties noted above, the staff conservatively assumed the temperature of concrete at these local areas to also be 160°F, which is well below the limit of 230°F allowed by ACI 349-13, with a margin of 70°F.

Therefore, the NRC staff finds that there is reasonable assurance that the maximum temperature, including gamma heating effects inside the PSW structural concrete and below the RV short columns, would be below the increased general area and local area limits permitted by ACI 349-13, such that the aging effects related to elevated general and/or local area concrete temperature including gamma heating effects would not be a concern during the subsequent period of extended operation.

Evaluation of the Secondary Shield Wall (SSW) Structural Concrete to Irradiation

The SLRA states that the "SSW is physically external to the PSW." It also states that because the SSW is located beyond the first 10 in. of the PSW, there are no considerations for neutron fluence and gamma dose effects of aging due to radiation. In its audit review of CM-AA-ETE-101 and V.C. Summer-DBD RB (Revision 9), the NRC staff confirmed that the SSW is physically external to the PSW and further away from the reactor midplane core and connected to it beyond the radius of influence to detrimental radiation. As such, the NRC staff finds that the external to PSW the SSW concrete forming compartments to shield each RV loop-associated

RCS SSCs (SG, RCP, piping) against radiation exposure filtering through the PSW need not be assessed for the effects of aging due to radiation that could potentially affect its integrity because it is beyond the radius of influence to detrimental radiation.

<u>Evaluation of PSW Structural Concrete and Embedded Steel for Loss of Structural Integrity due to Irradiation</u>

The importance of the integrity of the PSW structural concrete cannot be overemphasized. It is a passive structure and as noted in the SLRA with its components, it is designed to provide enclosure, shelter, and/or protection for in-scope equipment, including radiation shielding and pipe whip restraints and steel embedments. Section 3.8.3.1.5.2 of the V.C. Summer FSAR (ML23208A076) clarifies the structural function of its embedded WF steel assembly components. Specifically, FSAR Section 3.8.3.1.5.2 states that the "[e]mbedded steel assemblies provide support for the reactor vessel support system, provide pipe rupture restraint for the reactor coolant piping, and restrict the buildup of pressure and temperature on the primary shield wall and on the reactor vessel, should a loss of coolant accident (LOCA) occur."

Generic Letter 78-02 and NUREG-0609 discuss effects of asymmetric (e.g., LOCA) loads, including thermodynamic consequences associated with a postulated pipe rupture, in compartmentalized regions of the containment and how likely such a disturbance could affect the RV, its supports (further discussed below), the associated NSSS, and its interconnected SSCs. Apart from design basis LOCA loads, and their dynamic effects eliminated by LBB implementation at the RCS primary loop piping, there are other design basis loads (e.g., seismic, thermal, pressure, pipe reactions) and their combinations that still need to be resisted by the PSW structural concrete and embedded steel, so that potential effects on the RV are minimized.

In its review of past relevant operating experience regarding an area disturbance, the NRC staff notes the boric acid leak event at the nozzle-to-piping, nickel-alloy weld of the "A" Loop Hot Leg in 2000 and the elevated temperatures in the air cavity, discussed in part above in "*Evaluation of the PSW Structural Concrete and Grout Temperatures Including Gamma Heating*" and discussed in several audited documents (ML24177A138 and ML25007A234). Its identification, and measures taken to resolve stemming issues include, for example, the staff audit of the Root Cause Report C-00-1392 which investigated the Hot and Cold-Leg Nozzle to RCS piping welds at all three loops and noted that all welds except those for the loop "B" Cold-Leg required repairs. The report also states that the [["

"]].

The NRC staff notes the inherent permeability of concrete coupled with such a sizeable boric acid spillage could lead to undesirable aging mechanisms (corrosion) and effects of aging (loss of material) in the PSW embedded (inaccessible) reinforcement and WF steel sections. Several NRC publications address boric acid corrosion wastage of ferritic steels (e.g., IN 86-108, GL 88-05, NUREG-1823). The same holds for the accessible portions of the RV supports, which for V.C. Summer are identified as short columns including RV nozzle weld buildups. Such aging mechanisms stemming, for example, from boric acid spillage could result in reduced capacity to resist design basis loads due to compromised integrity of the PSW concrete reinforcement (structural concrete) and grout connected Westinghouse to GAI embedded anchorage assembly.

For the accessible portion of the supports, the NRC staff confirmed during the limited scope audit (condition report CR-00-01324) that "[n]o significant corrosion of the steel portions of the

RV support system was noted" as a result of the boric acid leak that occurred in the reactor coolant system Hot Leg Loop "A" in 2000. IN 86-108 affirms the slowness of loss of material due to "[b]oric acid corrosion […being] most active where the metal surface is cool enough so that it is wetted. If the metal is sufficiently hot, then the surface will stay dry, and this loss of electrolyte will slow the corrosion rate." As previously discussed in "*Evaluation of the PSW Structural Concrete and Grout Temperatures Including Gamma Heating*," the RV supports and weld nozzle area temperature at the time of the spillage was 233°F, which is in excess water boiling temperature of 212°F. The staff also confirmed the limited area for exposure of concrete and grout to boric acid spillage in audited DWG E-511 series and lack of available operating experience reporting discoloration of cementitious materials at that elevation. The NRC staff, however, evaluated the potential impact of the reduced capacity of the RV steel support assembly on the piping system welds in proximity of the RV support assemblies, as provided below.

The NRC staff notes the above operating experience on boric acid spillage is also discussed in SLRA AMP B2.1.5, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components." The AMP summarizes the historical cracking of the RV hot leg "A" and boric acid spillage in the RV structural support area and RV cavity as well as the steps taken to ensure integrity of the welds. Because an RV short column assembly supports a corresponding RV coolant loop nozzle and is positioned near the nozzle-to-piping welds, both of which are in the scope of SLRA AMP B2.1.5, the potential for reduced capacity of the RV support system under each nozzle was examined. Lack of integrity to resist design basis loading and effects of aging due to boric acid spillage that could impact the subject welds could result in potential loss of overall support originating at the nozzle-to-piping weld location. The staff evaluated such potential loss of support by confirming that there are measures in the SLRA, CLB, and regulations that provide reasonable assurance of structural integrity of the nozzle-to-piping welds, which are ASME Class 1, high-safety significant welds, through the subsequent period of extended operation. These measures, with the associated SLRA AMP identified, are listed below:

1. ASME Code, Section XI, TABLE IWB-2500-1, Examination Categories B-F and B-J (SLRA AMP B2.1.1 "ASME Section XI Inservice Inspections, Subsections IWB, IWC, and IWD").
2. ASME Code Case N-770-5 "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities Section XI, Division 1" (SLRA AMP B2.1.5 "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components"); additionally, ASME Code Case N-770-5 is mandated in 10 CFR 50.55a(g)(6)(ii)(F).
3. ASME Code Case N-722-1 "Additional Examinations for PWR Pressure Retaining Welds in Class 1 Components Fabricated with Alloy 600/82/182 Materials, Section XI, Division 1" (SLRA AMP B2.1.5 "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components"); additionally, ASME Code Case N-722-1 is mandated in 10 CFR 50.55a(g)(6)(ii)(E).

ASME Code Case N-770-5 is an alternative to the inspections in ASME Code, Section XI, IWB-2500-1, Examination Categories BF and BJ. ASME Code Case N-772-1 specifies additional examinations for nickel-alloy welds. The staff noted that because ASME Code Case N-770-5 is mandated by the regulations, it overrides inspections required by ASME Code, Section XI, IWB-2500-1, Examination Categories BF and BJ. The NRC staff also noted that ASME Code Case N-770-5 specifies a maximum inspection frequency of every five years.

The NRC staff finds that periodic inspections such as these, of the Boric Acid Corrosion Program, and of the RCS piping embedded LOCA Supports discussed above with reference to DWG E-511-219, which are addressed in audited plant procedures ES-0437 and referenced as opportunistic, provide additional assurance that the RV support assembly as defined in EIR 81987 Revision C would continue to maintain its intended function during the subsequent period of extended operation.

Evaluation of ASME Section XI, Subsection IWF RV Steel Support Inspections

Based on the above observations, the NRC staff notes that depending on the RV steel support component and visibility, the necessary inspections are performed under the jurisdiction of 10 CFR 50.55a requirements for ASME Code Section XI and derivative GALL-SLR AMPs XI.M1, XI.S3, and XI.S6, and if applicable under the Maintenance Rule Program.

Documentation of relevant operating experience and of the in-service inspections process associated with the nozzle weld buildup considered to be an integral attachment of the RV nozzle and pressure boundary is in SLRA AMP B2.1.1 "ASME Section XI Inservice Inspections, Subsections IWB, IWC, and IWD B," reviewed and evaluated consistent with ASME Code, Section XI, Subsection IWF Examination category B-K "Welded Attachments for Vessels, Piping, Pumps, and Valves," in Section 3.0.3.2.4 of this SE. Documentation of relevant operating experience and of the in-service inspections process associated with primary water SCC for components or welds constructed from Alloy 600/82/182 and exposed to PWR primary coolant at elevated temperatures is in SLRA B2.1.5 "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components" is reviewed and evaluated in Section 3.0.3.1.4 of this SE.

As noted in the SLRA, ASME Section XI, Subsection IWF, inspections of NF Components are/will be performed under the auspices of SLRA B2.1.32, "ASME Section XI, Subsection IWF," AMP. The SLRA AMP documents the operating experience for the first ASME Code, Section XI, IWF Inservice Inspection performed during 2015 and also discusses the reason for lack of examination until that time. The applicant's failure to perform the required periodic examination until that time resulted in a Non-Cited Violation (NCV) (ML20311A358). The NCV notes the required ASME Section XI: (a) Subsection IWF-2500, Table 2500-1, Examination Category Item Number F1.40, for the RV steel supports VT-3 examination; and (b) Subsection IWB of Section XI, Table IWB-2500-1, Examination Category B-K, Item No. B10.10, for the support integral attachment weld to be periodically subjected to a surface examination. This issue was entered into the licensee's corrective action program, through which the applicant performed an operability determination and conducted remote visual examinations to assess the condition of the RV supports. As noted in audited ETE-SLR-2023-3336, Attachment 1, the examination addressed the visual portion of the RV short columns. The examination was performed through the air vent channels located on the left and right side of each short column support and was limited to the bottom section of the support assembly due to accessibility issues. The report concludes by stating that the remote visual examination of the accessible portion of the steel supports yielded satisfactory results. During the examination, evidence of dry, crystalline boric acid deposits was discovered with no visual evidence of active leakage. However, the applicant identified no indications, no significant surface degradations nor component damage on the RV steel support, and no evidence of rejectable indications per ASME Code, Section XI, IWF-3410.

During the limited scope audit (ML25007A234), however, the applicant clarified that even though the ASME Section XI, Subsection IWF, inspection and examination of the short columns was remote, it exceeded the Table IWF-2500-1 requirements for Examination Category F1.40, mandating that for “multiple components other than pipe supports, within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined.” V.C. Summer examined all six supports as discussed in a DESC letter to the NRC dated August 28, 2014 (ML14245A197). In SLRA Section 3.5.2.2.2.6 and the subsequent onsite limited scope audit, the applicant stated that since the RV steel supports are within the ASME Code, Section XI, ISI program, any further boric acid leaks or rejectable conditions that would affect the supports will be identified, entered into the corrective actions program, and subsequently monitored periodically.

For the steel elements inaccessible to direct visual inspection, the audited TR00010-010, “Maintenance Rule Inspections-2020, Assessment of in Service Conditions of Important to Maintenance Rule ITMR Structures,” Revision 0, states that portions of the RV “base plates and associated anchor bolt assemblies are inaccessible for direct visual inspection and therefore are not inspected under the Maintenance Rule Structures Inspection Program which includes structures that are accessible for visual examinations.” The document states that, however, “the inaccessible building structures including the […RV] support base plates and anchor bolt assemblies are inspected on an opportunistic basis through the ASME Code Section XI program which is consistent with the Maintenance Rule Structures Program inspection of other inaccessible areas.”

In Supplement 4, dated October 24, 2024, amending the SLRA Section 3.5.2.2.2.6 that strictly focused on the visible portion of the supports or the Westinghouse short columns, the applicant augmented its statement that “no additional inspections or enhancements are required for aging management of the RV supports, and the current ASME Code, Section XI inspection requirements are sufficient,” and added “except that procedures [for the ASME Code, Section XI, IWF] will be revised to require that at least one RV support will be inspected every 5 years during the SPEO.” For the inaccessible but embedded portion of the supports, the audited ES-0439 states that “[all] inaccessible permanently encased component supports may be exempt from the examinations required by IWF-2000 per IWF-1230.” The GALL-SLR, XI.S3 AMP “scope of program,” program element, states that the acceptability of supports encased in concrete is evaluated based on conditions existing in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. In Supplement 4, however, the applicant provided a Table 3.5.2 AMR line item to ensure that these embedded steel elements associated with the PSW structural concrete are monitored and inspected.

Based on the above and the limited accessibility for visual inspection of the RV steel support assemblies and opportunistic inspections of the support base plates and anchor bolts, the applicant formalized these inspections in the SLRA as Table 3.5.2 AMR line items which is further addressed in “*Evaluation of V.C. Summer Supplement 4*” of this SE below.

<u>Evaluation of PSW Embedded Anchor Assembly Steel (WF Sections, AB, and studs) to Irradiation</u>

The RV support system discussed in the SLRA consists of six similar support structures identified as short columns. As noted in NUREG 7280, Figures D.11-1, -2, -6, and -7, these short columns interface with GAI-built WF sections embedded within the PSW structural concrete corbel and in the direct line of action of the 5.02×10^{19} n/cm^2 neutron fluence. As previously noted, the NRC staff audited and reviewed GAI-AOR, which details the mating of the

GAI-built WF Sections with ASTM A 302B specialized steel to the Westinghouse short columns. SLRA Section 3.5.2.2.2.6 states that the maximum fluence at 72 EFPY adjusted for 20 percent analytical uncertainty on the WF sections embedded within the PSW is 8.82×10^{17} n/cm^2 (E greater than 1.0 MeV), which is less than the threshold for steel of 1.0×10^{19} n/cm^2 (E greater than or equal to1.0 MeV) per EPRI Report 3002013084. Additionally, the audited and reviewed Westinghouse proprietary report CGE-REAC-TM-AA-000005, Revision 1, includes dpa estimates for these WF sections embedded in the concrete corbel. Based on the review of audited GAI-AOR and FSAR Section 3.8.3.1.5.2, which states that the CLB intended function of the embedded anchor assembly is to [[

]], the NRC staff determined that these WF embedded steel assemblies provide an intended safety function. The staff noted that the dpa values reported in the Westinghouse proprietary report CGE-REAC-TM-AA-000005, Revision 1, are in the range of values in which there is potentially a significant shift in nil-ductility transition temperature (NDTT) of the WF sections embedded steel based on Figure 3-1 of NUREG-1509, which shows the shift in NDTT for RV steel supports as a function of dpa. A significant shift in NDTT means that the WF sections embedded steel are subject to potential reduction in fracture toughness and therefore potential cracking. Therefore, the NRC staff communicated the potential inability of the WF embedded steel to fulfill its CLB-defined intended function that could lead to the aforementioned undesirable consequences, possibly impacting the RV short columns and NSSS supports. Accordingly, the applicant proposed two new Table 3.5.2 AMR line items in Supplement 4 to address this concern. In SLRA Table 3.5.2-1 as amended, the applicant proposed an AMR line item that would monitor loss of intended function of the WF embedded steel as part of the Structures Monitoring AMP (SLRA Section B2.1.35), and in SLRA Table 3.5.2-15 as amended, the applicant proposed an AMR line item that would monitor deformation, cracking, and misalignment of the RV short column assembly as part of the ASME Section XI, Subsection IWF AMP (SLRA Section B2.1.32). The staff further addresses these proposed AMR line items in the "*Evaluation of V.C. Summer Supplement 4*" of this SE below.

<u>Evaluation of the RV Steel Support Structural Integrity to Irradiation</u>

In SLRA Section 3.5.2.2.2.6, the applicant states that the "RV supports [will] continue to be structurally stable (i.e., flaw tolerant) considering 80 years [(72 EFPY)] of radiation embrittlement effects on the supports." For the RV steel support components of the RV supports (i.e., the support box plates and associated weldments, support shoe, anchor bolts, and hold down/guide pins), the applicant performed a fracture mechanics evaluation as basis for these determinations.

In SLRA Section 3.5.2.2.2.6, the applicant states that a review of the aging effect of reduction in fracture toughness of the RV steel support components due to embrittlement was performed for the subsequent period of extended operation in WCAP-18785-NP. In the SLRA, the applicant states that screening criteria in NUREG-1509 for radiation exposure and peak tensile stresses (i.e., below 6 ksi) were not met for the RV steel support components. The applicant also states that the RV steel supports are located near the RV active core and are subjected to high neutron irradiation. The applicant provided the maximum 72 EFPY projected neutron exposures (E greater than or equal to 0.1 MeV) in the RV steel supports in terms of dpa with +25 percent adjustment for uncertainty in SLRA Table 3.5.2.2.2.6-3. Because the NUREG-1509 screening criteria were not met, the applicant performed a fracture mechanics evaluation to demonstrate that brittle fracture is not a concern for the RV steel support components based on 80 years (72 EFPY) of neutron embrittlement. The NRC staff confirmed during the initial audit that the components of the RV steel supports that were evaluated in WCAP-18785-NP; that is, the support box plates and associated weldments, support shoe, anchor bolts, and hold down/guide pins, represent the locations of highest stresses and/or are located near the active core and subjected to high neutron irradiation.

A) Fracture mechanics evaluation

In SLRA Section 3.5.2.2.2.6, in the section titled "Fracture Mechanics Evaluation," the applicant states that linear elastic fracture mechanics (LEFM) was used as a conservative methodology to evaluate the structural integrity of the supports. The applicant applied the LEFM methodology prescribed in NUREG-1509 by:

1. Calculating the critical stress for the plate components of the RV steel supports (i.e., the top plate, vertical plate, and bottom plate) and the support shoe, and

2. Calculating the critical flaw length for the anchor bolts and hold down/guide pins.

The applicant determined the critical stress by equating the applied stress intensity factor (SIF) to the fracture toughness, and back-calculating stress. Similarly, the applicant determined the critical flaw length by equating the applied SIF to the fracture toughness, and back-calculating flaw length. The applicant states that the RV steel support components are flaw tolerant because either the critical stresses are larger than the actual stresses or the critical flaw lengths are larger than the ASME Code, Section XI, allowable flaw lengths. Details of the applicant's fracture mechanics evaluation are in WCAP-18785-NP. During the audit, the NRC staff confirmed that the applicant's LEFM methodology in WCAP-18785-NP is consistent with the guidelines in NUREG-1509 and noted the conservatisms in the methodology used.

The applicant states that the fracture toughness used for the plate components is based on the ASME Code, Section XI, lower bound K_{IC} fracture toughness value of 33.2 ksi√in. The applicant confirmed in Supplement 4 that the ASME Code, Section XI, lower bound K_{IC} fracture toughness value of 33.2 ksi√in is bounding for the plant-specific material of the plate components of the RV supports. The applicant also states that the fracture toughness for the anchor bolts is based on the 95 percent lower tolerance bound Master Curve K_{JC} fracture toughness of 22.9 ksi√in, and material-specific fracture toughness value of 55 ksi√in for 72 EFPY for the support shoes and 42 ksi√in for 72 EFPY for the hold down/guide pins. The NRC staff noted that the fracture toughness value of 33.2 ksi√in for the plate components and 22.9 ksi√in for the anchor bolts are based on the minimum value of the lower bound fracture toughness curves, and that therefore, embrittlement and strain rate effects on fracture toughness are implicitly included. For the anchor bolts and hold-down/guide pins, the staff confirmed during the audit that the applicant's evaluation in WCAP-18785-NP adequately accounted for the effects of embrittlement and strain rate on fracture toughness. Regarding the weldments associated with the support box plates, the staff confirmed during the audit that the proprietary design specification included processes that ensure the fracture toughness of the weldments would be adequately bounded by the fracture toughness of the plate components that is based on the ASME Code, Section XI, lower bound K_{IC} fracture toughness.

The applicant states that the peak tensile stresses due to deadweight, thermal, seismic, and LOCA loads were determined at various locations throughout the RV steel supports, including the support box plates, support shoe, anchor bolts, and hold-down/guide pins. The applicant states that the support box plates included welding residual stress. The applicant determined the applied SIF values resulting from these stresses based on a semi-elliptical postulated flaw for the support box plates and support shoe. For the anchor bolts and hold-down/guide pins, the applied SIF values are based on a postulated 360° circumferential flaw, straight front flaw, and semi-circular front flaw in a bar. During the audit, the NRC staff confirmed in WCAP-18785-NP that applied stresses used in the fracture mechanics evaluation were due to deadweight, thermal, seismic, and LOCA (and load combinations thereof). The staff also confirmed during the audit that the WCAP-18785-NP evaluation included welding residual stress for welded steel plate components (i.e., the support box plates), and that the evaluation computed applied SIFs with the appropriate postulated flaw model. The staff confirmed that the load combinations analyzed in WCAP-18785-NP are consistent with those defined in the V.C. Summer FSAR.

B) Results of fracture mechanics evaluation for the top plate, vertical plate, bottom plate, and support shoes

For the top plate, vertical plate, bottom plate, and support shoes, the applicant calculated critical stress values and provided them in SLRA Table 3.5.2.2.2.6-4. The applicant states that the critical stress values are larger than the actual stress values, which the NRC staff confirmed during the audit.

For the support shoes, the applicant also considered the change in embrittlement from 42 EFPY to 72 EFPY and states that they have sufficient flaw tolerance not to be impacted by neutron embrittlement from the original design life of 40 years to the SLR period of 80 years. The staff confirmed during the audit that even though the critical stress values in the support shoe decreased from 42 EFPY to 72 EFPY as a result of the change in embrittlement from 42 EFPY to 72 EFPY, the actual stress values were below the critical stress values.

In SLRA Section 3.5.2.2.2.6, the applicant states that based on the RV support equipment specification, the structural steel components and welds had required examination per ASME Code, Section III, Appendix IX (radiography, liquid penetrant, magnetic particle, and ultrasonic testing). The applicant also states that during initial fabrication, any unsatisfactory conditions were to be removed, re-welded, and re-examined, and that it is therefore expected that the analyzed components are free from cracks after initial fabrication and after an extended period of time because crack growth mechanisms are not present at the RV supports. The NRC staff confirmed during the audit that the proprietary design specifications for the RV steel support components included the required ASME Code examinations. The staff noted that these examinations provide reasonable assurance that the components of the RV steel supports are free of detectable cracks during installation of the supports because the required examinations have provisions for repair of defects.

Based on the discussion above, the NRC staff determined the applicant adequately demonstrated that the plate components (i.e., the top plate, vertical plate, bottom plate, and associated weldments) and the support shoes are flaw tolerant and will remain flaw tolerant through the subsequent period of extended operation for the following reasons:

1. The critical flaw stress values are larger than the actual stress values.
2. The material specifications for the components ensure that the components are free from rejectable defects and cracks.
3. No crack growth mechanisms are present.

C) *Results of fracture mechanics evaluation for the anchor bolts and hold down/guide pins*

For the anchor bolts and hold down/guide pins, the applicant calculated critical flaw lengths and provided them in SLRA Table 3.5.2.2.2.6-5. The applicant states that the critical flaw lengths are larger than the ASME Code, Section XI, allowable flaw lengths and that there are no significant transients or thermal cycling that would cause any crack growth in these components over time. The NRC staff confirmed during the audit that the critical flaw lengths in WCAP-18785-NP are larger than the ASME Code, Section XI, allowable flaw lengths. The staff also confirmed that the material specifications for the anchor bolts and hold-down/guide pins specify fabrication quality controls for the bolts and pins that assure they are free from rejectable defects and cracks prior to installation. Furthermore, the staff confirmed in audited DWG S-423-046 that the acquired anchor bolts were quenched and tempered alloy steel bolts and subjected to magnetic particle inspection, thus meeting the requirements of ASTM A 490 for the connection of the Westinghouse short columns to the embedded GAI support assembly.

For the hold-down/guide pins, the applicant also considered the change in embrittlement from 42 EFPY to 72 EFPY and states that they have sufficient flaw tolerance not to be impacted by neutron embrittlement from the original design life of 40 years to the SLR period of 80 years. The staff confirmed during the audit that there is little change in the impact of embrittlement between 42 EFPY and 72 EFPY.

Based on the discussion above, the NRC staff determined that the applicant adequately demonstrated that the anchor bolts and hold-down/guide pins are flaw tolerant and will remain flaw tolerant through the subsequent period of extended operation because:

1. The critical flaw lengths in these components are larger than the ASME Code, Section XI, allowable flaw lengths for pressure-retaining bolting.
2. The material specifications for these components ensure that the components are free from rejectable defects and cracks.
3. There are no significant transients or thermal cycling that would cause any crack growth in these components over time.

<u>Evaluation of V.C. Summer Supplement 4</u>

In SLRA Table 3.5.2-1, “Containment Structure - Aging Management Evaluation,” V.C. Summer initially did not assign a PSW AMR line item and an AMP with an associated consistency note to manage the effects of aging due to radiation for the structural concrete. The applicant’s summarized analysis and evaluation in the SLRA concluded that one (or more) AMP(s) was (were) not needed. The NRC staff notes, however, that the applicant did identify in the aforementioned table the appropriate SRP-SLR Table 1 item 3.5.1-097 and GALL-SLR line item III.A4.T-35. These two items state the need for a Further Evaluation consistent with SRP-SLR Section 3.5.2.2.2.6 acceptance criteria (and 3.5.3.2.2.6 review procedures) as modified by “SLR-ISG-2021-03-Structures, Updated Aging Management Criteria for Structures Portions of the Subsequent License Renewal Guidance.” The SLR-ISG, however, makes clear that in the absence of engineering analysis, tests, and evaluation to conclude reasonable assurance, which the staff accepts, the FE determines that the effects of aging need to be managed through an applicant provided, plant-specific AMP or enhancements to designated AMPs.

The NRC staff performed an onsite audit in an effort to clarify the applicant’s SLRA analytical effort, with observations noted in the limited scope audit report (ML25007A234) to facilitate resolution of the issues described above to help conclude reasonable assurance that the structural support assembly will maintain its intended functions through the subsequent period of extended operation. Following the onsite audit, the applicant issued Supplement 4, by letter dated October 24, 2024, amending the SLRA by providing additional aging management information with revised and new Table 3.5.2 AMR line items, to enhance its defense-in-depth approach to manage the effects of aging.

The three proposed Table 3.5.2 AMR line items identify existing AMPs that support managing the effects of aging on components affected by irradiation during the subsequent period of extended operation. As outlined in SLRA Section 3.0, “Aging Management Review [AMR] Results,” each of the provided Table 3.5.2 AMR line items includes a GALL-SLR item number and a link to SLRA Table 3.5.1 identifying the V.C. Summer consistency to SRP-SLR, ensuring that the intended function(s) of the component(s) will be maintained in accordance with 10 CFR 54.21(a)(3). Additionally, the applicant provided plant-specific note(s) that describe the plant’s approach when addressing the potential aging effect. Accordingly, Supplement 4 states that V.C. Summer, through revised/new Table 3.5.2 AMR items and aging management activities, plans to manage any radiation-induced aging effects and other combined aging effects due to associated aging mechanisms.

With regard to PSW structural concrete having enclosure and structural support functions and grout for its support function in an “air–indoor environment,” the revised Table 3.5.2-1, “Containment Structure – Aging Management Evaluation,” AMR line item is assigned to manage the effects of aging for reduction of strength and loss of mechanical properties due to radiation, manifested for example as cracking, through the Structures Monitoring Program. The amended SLRA, in addition to designating the Structures Monitoring Program as an AMP to manage the effects of aging, identified in SRP-SLR AMR item 3.5.1-097, also assigns a consistency Note “A” to the revised AMR Table 3.5.2-1 item and a plant-specific Note 12. Note A states that several aging management activities are conducted to monitor the effects of aging. In addition, Note 12 reiterates that the PSW is adequate to perform its intended functions based on an analysis presented in SLRA Section 3.5.2.2.2.6, to which the NRC staff, as stated in the limited scope audit report (ML25007A234) and noted above, found insufficient in itself to support the requirements of 10 CFR 54.21(a)(3), without the sustained and newly proposed aging management activities scrutinized below.

As previously noted, the Structures Monitoring Program procedures tie the program to systematic opportunistic inspections as discussed in “*Evaluation of PSW Structural Concrete and Embedded Steel for Loss of Structural Integrity due to Irradiation”* and in “*Evaluation of ASME Section XI, Subsection IWF RV Steel Support Inspections*.” V.C. Summer reinforced this point of frequent inspections by revising SLRA Section 3.5.2.2.2.6 to include that the systematic collateral inspections results (i.e., generated data) associated with the integrity of the PSW structural concrete and short-column MasterFlow® 713 grout irrespective of their origin are reviewed by the Structures Monitoring Program at varying frequencies. For example, relevant data generated by Boric Acid Program inspections occurs at every refueling outage, while data generated by the ASME Code Section XI, Subsection IWF is less frequent but more detailed as it helps provide the needed line of sight information for observable conditions of cementitious structural components’, ability to fulfill their intended function consistent with 10 CFR 54.21(a)(3) to the end of the subsequent period of extended operation, albeit not at the Structures Monitoring AMP frequency of five years. These results would be shared with the Structures Monitoring AMP for further evaluation.

To help with the frequency of inspections and address the five-year frequency recommended by Structures Monitoring AMP guidance, the applicant revised its ASME Section XI, Subsection IWF SLRA AMP, to monitor and inspect the general area of at least one short column support, including the support at frequency of five years. The review and evaluation of the ASME Section XI, Subsection IWF SLRA AMP including its enhancement are provided in Section 3.0.3.2.23 of this SE. By virtue of its nature as a cementitious material, the applicant extended management for the effects of aging due to radiation to load bearing grout (through SLRA Table 3.5.2-1, Note 14), as it supports the short columns and links the Westinghouse shearing ribs support anchors to those of GAI discussed below.

Regarding potential embrittlement of accessible short columns steel elements, the applicant added a Table 2 AMR line item to SLRA Table 3.5.2-15, “Structures and Component Supports – NSSS Supports – Aging Management Evaluation,” for reduction in fracture toughness, loss of intended function to be managed by ASME Section XI, Subsection IWF. The staff notes that this line item demonstrates that the applicant will observe for degradations of inaccessible/embedded steel shearing rib components in the PSW (i.e., short column interconnecting plates/shearing ribs support anchors to those of GAI, and associated grout) through a consistency Note H and plant-specific Notes 4 and 5. As a result of this addition, the new Table 3.5.2-15 AMR line item, reviewed and evaluated in Section 3.5.2.3.1 of this SE, manages the effects of aging of RV short column steel components having a support function in an air–indoor uncontrolled environment for reduction of fracture toughness, often manifested as cracking, deformation, and/or misalignment, and against loss of intended function, through the ASME Section XI, Subsection IWF Program and for the integrity of the embedded steel components and associated grout in PSW through the Structures Monitoring Program.

With regard to the inaccessible/embedded GAI designed WF steel sections within the PSW concrete having a support function in a “concrete/grout” environment, ultimately attached to interconnecting shearing rib anchors to those of Westinghouse short columns via grout as noted above, the applicant added a new AMR line item to SLRA Table 3.5.2-1, “Containment Structure - Aging Management Evaluation” for reduction in fracture toughness realized prior to loss of intended function. The new Table 3.5.2-1 AMR line item, with consistency Note H and a plant-specific Note 13, demonstrates that effects of aging are to be managed through the Structures Monitoring Program when industry or plant-specific operating experience is identified. This is reviewed and evaluated in Section 3.5.2.3.1 of this SE.

In addition to the inclusion of the Table 3.5.2 AMR line items discussed above, the amended SLRA Section 3.5.2.2.2.6 informs the assigned Structures Monitoring Program through aging management activities for any emerging information associated with aging effects requiring management and for loss of intended functions due to irradiation. The use of aging management activities in support of the Structures Monitoring Program, in lieu of direct application of the Structures Monitoring Program’s program elements, meets the criteria in the SRP-SLR and is acceptable to meet the requirements of 10 CFR 54.21(c)(1)(iii), which allows an applicant to demonstrate that “the effects of aging on the intended function(s) will be adequately managed for the [subsequent] period of extended operation.” The SRP-SLR implements this regulation through an AMP or through “aging management activities to verify that the effects of aging on the intended function(s) are adequately managed consistent with the CLB for the subsequent period of extended operation.”

The NRC staff reviewed the following V.C. Summer proposed aging management activities:

1. Visual (VT-3) inspections of the six RV supports every 10 years as directed by the ISI program.
2. Review of the RV supports inspection results under the Structures Monitoring Program for conditions that may require evaluation of the primary shield wall concrete and grout acceptable as dispositioned above, when evaluating the AMR Table 3.5.2-1 provided line item with consistency Note “A” for the PSW and grout.
3. Inspection of the incore pit room area under the RV twice per refueling outage. If evidence of the degradation, such as cementitious debris, is noted, a condition report is initiated in the Corrective Action Program for evaluation.
4. Monitoring of the condition of the outside of the PSW concrete every five years under the Structural Monitoring Program.

The staff finds these aging management activities acceptable because they are consistent with SRP-SLR “Generic Safety Issues Related to Aging (Branch Technical Position RLSB-2).” The activities are also consistent with the GALL-SLR Report principles and meet the requirements of 10 CFR Part 54.21.

<u>Conclusion for the PSW Structural Concrete, Steel, and Grout</u>

Based on the review of SLRA Sections 3.5.2.2.2.6, as amended by Supplement 4, and its enclosures, and the applicant’s responses to the staff’s breakout questions/concerns discussed during the first and onsite limited in-scope audits, the NRC staff finds that the applicant:

1. Does not meet the SRP-SLR acceptance limits for estimated fluence and gamma dose values for portions of the PSW structural concrete and grout supporting the RV and associated NSSS supports. Thus, ongoing plant-specific information is needed to demonstrate that the effects of aging are adequately managed during the subsequent period of extended operation.
2. Did not demonstrate that the effects of aging do not need to be managed during the subsequent period of extended operation because the information provided (i.e., analysis results for the PSW structural concrete and grout as summarized in the FE) lacks completeness (e.g., the grout as a structural material and embedded WF Sections were not considered) and clarity as to the validity of the recalculated margins (i.e., D/Cs) that are based on a new analysis with assumptions and approximations made that do not necessarily align with those of the CLB AOR.
3. Enhanced its FE through a defense-in-depth approach to manage the effects of aging due to radiation through three AMR Table 3.5.2 line items for: (1) reduction of strength, loss of mechanical properties on the PSW structural concrete and grout; (2) reduction in fracture toughness, loss of intended function on the RV support steel short columns; and (3) reduction in fracture toughness, loss of intended function of steel embedded in PSW structural concrete and grout components, taking corrective actions as needed through the ASME Section XI, Subsection IWF and Structures Monitoring AMPs.
4. Has in place ongoing activities in accordance and association with the ASME Section XI, Subsection IWF, Structures Monitoring, and Boric Acid AMPs to monitor aging effects affecting the structural integrity of the PSW to the end of the subsequent period of extended operation.

5. Ensured through adequate ventilation that gamma heating is not a concern to the PSW structural concrete and grout.
6. Ensured that the SSW structural concrete integrity remains adequate to the end of the subsequent period of extended operation.
7. Demonstrated through a fracture mechanics evaluation that the components of the RV steel supports are flaw tolerant and will remain flaw tolerant through the subsequent period of extended operation.
8. Showed that results of the ASME Code, Section XI, IWF inspections performed in 2015 for the RV steel supports at all six locations to the extent that were accessible were acceptable.
9. Reiterated that regularly scheduled ISIs will continue to include inspections and examinations of all six support locations (ML14245A197) to the end of the subsequent period of extended operation.
10. Committed to revise the ASME Code, Section XI, IWF procedure(s) to require at least one RV support be inspected every five years during the subsequent period of extended operation.
11. Stated in the SLRA that V.C. Summer performs inspections in support of Code Case N-770-5 that specifies a maximum inspection frequency of every five years for cracking of Nickel-Alloy Components and loss of material due to boric acid-induced corrosion in reactor coolant pressure boundary components, which are nearby the nozzle weld built-up support.
12. Has no operating experience to date indicating that effects of radiation have affected the structural integrity of the PSW, grout, and RV accessible or inaccessible support steel assemblies.
13. Has adequately addressed the NRC staff concerns related to all potential aging effects consistent with SRP-SLR and GALL-SLR Report principles regarding deterioration of PSW structural concrete, grout, and RV steel and NSSS component supports.

Overall Conclusion

Based on the above, the NRC staff finds that the applicant adequately evaluated that although plant-specific programs or enhancement(s) to existing AMPs (except that noted in commitments for ASME Section XI, Subsection IWF) are not needed to manage the effects of aging due to radiation for the V.C. Summer PSW (including the grout and embedded steels) and SSW structural concretes, as well as for the RV steel supports, the applicant will perform aging management activities to manage the effects of aging associated with structural integrity of reviewed SSCs. Therefore, the applicant’s evaluation of the subject components is consistent withs SRP-SLR evaluation criteria and 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

This section documents the NRC staff’s review of AMR results listed in SLRA Tables 3.5.2-1 through 3.5.2-21 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.

3.5.2.3.1 *Containment Structure - Aging Management Evaluation and Structures and Component Supports - NSSS Supports - Aging Management Evaluation*

SLRA Tables 3.5.2-1, "Containment Structure - Aging Management Evaluation," and 3.5.2-15, "Structures and Component Supports – NSSS Supports – Aging Management Evaluation" addresses reduction in fracture toughness, loss of intended function for steel elements (inaccessible/embedded) in PSW concrete and RV steel supports exposed to air–indoor uncontrolled environment will be managed by the SLRA Structures Monitoring (B2.1.35) and ASME Section XI, Subsection IWF (B2.1.32) AMPs, respectively. The AMR items associated with Table 3.5.2-1 and 3.5.2-15 cite generic Note H, for which the applicant has identified the reduction in fracture toughness, and loss of intended function aging effects. These Table 3.5.2 AMR line items include plant-specific notes.

The new Table 3.5.2-1 AMR line item provided through Supplement 4, by letter dated October 24, 2024, includes Note 13, which states that "As discussed in Section 3.5.2.2.2.6, evaluation has determined that reduction in fracture toughness/loss of intended function of embedded steel due to neutron irradiation, and effects associated with reduction of strength of the concrete due to radiation will not impact the ability of the primary shield wall's inaccessible steel elements to perform their intended functions under design basis conditions. Therefore, aging management activities are not required to manage these aging effects. Should future information (e.g., industry and/or plant-specific operating experience) indicate the need for aging management of these aging effects, those activities would be addressed by the Structures Monitoring Program."

The new Table 3.5.2-15 AMR line item provided through Supplement 4, by letter dated October 24, 2024, includes Notes 4 and 5. Note 4 states that the aforementioned aging effects are "limited to the RV supports and that the aging effects also include deformation, cracking, and misalignment." Note 5 states that "[d]egradation identified during the IWF inspections will also be evaluated under the Structures Monitoring Program for potential degradation of the grout, concrete, and embedded steel in the primary shield wall."

The NRC staff notes that V.C. Summer monitors for potential loss of intended function of the WF structural sections and Westinghouse and GAI anchorage (including shearing ribs) embedded steel components in the PSW, manifested as deformation, cracking, and misalignment of the RV short column assembly through aging activities and programs outlined in the staff's evaluation of SLRA Section 3.5.2.2.2.6 in this SE. The staff notes that the proposed Table 3.5.2 AMR line items through the Structures Monitoring (SLRA Section B2.1.35) and ASME Section XI, Subsection IWF (B2.1.32) AMPs, supplemented by the Boric Acid Corrosion (B2.1.4) AMP, provide adequate assurance that the integrity of these embedded steel components would be maintained and corrective action taken as needed prior to loss of their intended function(s) given that these steel components are within the PSW, and are therefore, inaccessible for direct examination.

With regard to the ability of these WF embedded steel assemblies to withstand design basis loads, the NRC staff observed during the audit that the design calculation of record for the WF embedded steel assemblies did not include implementation of LBB nor were its effects included in SLRA Table 3.5.2.2.6-2. Although LBB implementation excludes the dynamic effects of postulated ruptures in primary coolant loop piping, the audited proprietary WCAP-13206, Revision 4 confirms that LBB conditions and margins would prevail during the subsequent period of extended operation for the primary loop piping, including the three RV loops and associated nozzles. Because there is a direct load path from the RV nozzles to the RV short column assemblies and to the WF embedded steel assemblies, the staff noted that LBB conditions and margins would also prevail during the subsequent period of extended operation for the WF embedded steel assemblies. The staff observed during the audit that the plant-specific specification for the ASTM A 302B steel, of which the WF embedded steel assemblies are made, has provisions for ensuring that the WF assemblies are free from rejectable defects and for post-weld heat treatment that would reduce welding residual stress that can lead to cracking.

Therefore, based on the above discussion, the NRC staff finds the applicant's proposal to manage aging effect(s) acceptable, because the proposed two SLRA Table 3.5.2 AMR line items are adequate to monitor: (1) loss of intended function of the WF embedded steel as part of the Structures Monitoring AMP (SLRA Section B2.1.35) supplemented by observations made through ASME Section XI, Subsection IWF (B2.1.32) and Boric Acid Corrosion (B2.1.4) AMPs, and (2) deformation, cracking, and misalignment of the RV short column assembly as part of the ASME Section XI, Subsection IWF AMP (SLRA Section B2.1.32) provide reasonable assurance that the intended safety function of the WF sections and Westinghouse and GAI anchorage (including shearing ribs) embedded steel assemblies will be maintained 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 and Controls," provides AMR results for those components the applicant identified in SLRA Section 2.5, "Scoping and Screening Results: Electrical and Instrumentation and Controls," as being subject to an AMR. SLRA Table 3.6.1, "Summary of Aging Management Programs for the Electrical Components Evaluated in Chapter VI of the GALL-SLR Report," is a summary comparison of the applicant's AMR results with those provided in the GALL-SLR Report for electrical components.

3.6.2 Staff Evaluation

Table 3.6-1 summarizes the NRC staff's evaluation of the component groups listed in SLRA Section 3.6 and addressed in the GALL-SLR Report.

Table 3.6-1 Staff Evaluation for Electrical Components in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.6.1-001	Consistent with the GALL-SLR Report (see SE Section 3.6.2.2.1)
3.6.1-002	Consistent with the GALL-SLR Report
3.6.1-003	Consistent with the GALL-SLR Report
3.6.1-004	Not applicable to V.C. Summer (see SE Sections 3.6.2.2.3 and 3.6.2.3.1)
3.6.1-005	Not applicable to V.C. Summer (see SE Sections 3.6.2.2.3 and 3.6.2.3.1)
3.6.1-006	Not applicable to V.C. Summer (see SE Sections 3.6.2.2.3 and 3.6.2.3.1)
3.6.1-007	Not applicable to V.C. Summer (see SE Sections 3.6.2.2.3 and 3.6.2.3.1)
3.6.1-008	Consistent with the GALL-SLR Report
3.6.1-009	Consistent with the GALL-SLR Report
3.6.1-010	Consistent with the GALL-SLR Report
3.6.1-011	Not applicable to V.C. Summer
3.6.1-012	Not applicable to V.C. Summer
3.6.1-013	Not applicable to V.C. Summer
3.6.1-014	Not applicable to V.C. Summer
3.6.1-015	Not applicable to V.C. Summer
3.6.1-016	Consistent with the GALL-SLR Report
3.6.1-017	Consistent with the GALL-SLR Report
3.6.1-018	Consistent with the GALL-SLR Report
3.6.1-019	Consistent with the GALL-SLR Report
3.6.1-020	Consistent with the GALL-SLR Report
3.6.1-021	Not applicable to V.C. Summer
3.6.1-022	Consistent with the GALL-SLR Report
3.6.1-023	Not applicable to V.C. Summer
3.6.1-024	Not applicable to V.C. Summer
3.6.1-025	This item number is not used in the SRP-SLR nor the GALL-SLR Report
3.6.1-026	This item number is not used in the SRP-SLR nor the GALL-SLR Report
3.6.1-027	Consistent with the GALL-SLR Report
3.6.1-028	This item number is not used in the SRP-SLR nor the GALL-SLR Report
3.6.1-029	Consistent with the GALL-SLR Report (see SE Sections 3.6.2.1.2 and 3.6.2.2.2)
3.6.1-030	Not applicable to V.C. Summer (see SE Section 3.6.2.2.2)
3.6.1-031	Consistent with the GALL-SLR Report (see SE Sections 3.6.2.1.3 and 3.6.2.2.2)
3.6.1-032	Not applicable to V.C. Summer

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 discusses AMR results for components that the applicant states are either not applicable to V.C. Summer 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 NRC staff's review of AMR results listed in SLRA Tables 3.6-1, 3.6.2-1, 3.6.2-2 and 3.6.2-3 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. 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 write-up is required or provided. The staff did not identify any AMR items that required additional review with an associated write-up.

SE Section 3.6.2.1.1 documents the staff's review of AMR items that the applicant determined to be not applicable.

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

For SLRA Table 3.6.1, items 3.6.1-004 through 3.6.1-007, 3.6.1-011 through 3.6.1- 015, 3.6.1-021, 3.6.1-023, 3.6.1-024, 3.6.1-030 and 3.6.1-032, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to V.C. Summer. The staff reviewed the SLRA and FSAR, 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.

3.6.2.1.2 Reduced Electrical Insulation Resistance Due to Degradation Caused Thermal/Thermoxidative Degradation of Organics and Photolysis (Ultraviolet Sensitive Materials Only) of Organics, Moisture/debris Intrusion and Ohmic Heating

SLRA Table 3.6.1, AMR item 3.6.1-029 addresses reduced electrical insulation resistance due to degradation caused thermal/thermoxidative degradation of organics and photolysis (ultraviolet sensitive materials only) of organics, moisture/debris intrusion and ohmic heating for cable bus: electrical insulation; insulators – exposed to air – indoor controlled or uncontrolled, and air – outdoor. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the "Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.38)," to manage the aging effects for reduced electrical insulation resistance of cable bus insulation, insulators. The AMR items cite plant-specific note 1, which states, "The Inspection of Cable Bus Components plant-specific program has been substituted by the Structures Monitoring (B2.1.35) program and the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental

Qualification Requirements (B2.1.38) program to manage the applicable aging effects for cable bus components."

Based on its review of components associated with AMR item 3.6.1-029 for which the applicant cited generic note E, the NRC staff finds that the applicant's proposal to manage the effects of aging using the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.38) acceptable because that program manages reduced electrical insulation resistance of accessible cable and connection insulation material subject to an adverse localized environment and is consistent with the GALL-SLR.

3.6.2.1.3 Loss of Material Due to General, Pitting, Crevice Corrosion

SLRA Table 3.6.1, AMR item 3.6.1-031 addresses loss of material due to general, pitting, crevice corrosion for cable bus external surface of enclosure assemblies composed of galvanized steel; aluminum exposed to air – outdoor. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Structures Monitoring Program (B2.1.35) to manage the aging effects for loss of material of cable bus closure assembly (including tab box enclosure) made of aluminum due to general, pitting, crevice corrosion. The AMR item cites plant-specific note 1, which states, "The Inspection of Cable Bus Components plant-specific program has been substituted by the Structures Monitoring (B2.1.35) program and the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.38) program to manage the applicable aging effects for cable bus components."

Based on its review of components associated with AMR item 3.6.1-031 for which the applicant cited generic note E, the NRC staff finds the applicant's proposal to manage the effects of aging using the Structures Monitoring Program (B2.1.35) acceptable because it is consistent with GALL-SLR. In addition, the applicant's proposal is acceptable because the cable bus is structural by design and is a variation of a metal-enclosed bus, which is similar in construction to a metal-enclosed bus, but instead of segregated or nonsegregated electrical buses, a cable bus has a fully enclosed metal enclosure that uses three-phase insulated power cables installed on insulated support blocks.

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, instrumentation, and controls system components as recommended by the GALL-SLR Report. The applicant also 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, notes that TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1) and that the evaluation of this TLAA, Environmental Qualification of electric equipment, is addressed in SLRA Section 4.4. The NRC staff finds that this is consistent with SRP-SLR Section 3.6.2.2.1 and is, therefore, acceptable.

The staff's evaluation regarding the TLAA for Environmental Qualification of electric equipment is documented in SE Section 4.4.

3.6.2.2.2 Reduced Insulation Resistance Due to Age Degradation of Cable Bus Arrangements Caused by Intrusion of Moisture, Dust, Industrial Pollution, Rain, Ice, Photolysis, Ohmic Heating, and Loss of Strength of Support Structures and Louvers of Cable Bus Arrangements Due to General Corrosion and Exposure to Air-Outdoor

SLRA Section 3.6.2.2.2, associated with SLRA Table 3.6.1, AMR item 3.6.1-029, addresses reduced electrical insulation resistance due to degradation caused thermal/thermoxidative degradation of organics and photolysis (ultraviolet sensitive materials only) of organics moisture/debris intrusion and ohmic heating for cable bus: electrical insulation; insulators – exposed to air – indoor controlled or uncontrolled, air – outdoor, which will be managed by the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.6.2.2.2, AMR item 029.

In its review of components associated with AMR item 3.6.1-029, the NRC staff finds that the applicant has met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is acceptable because reduced electrical insulation resistance for the cable bus insulated electrical cables is the same as other installed insulated electrical cables that are managed by that program.

Based on the programs identified, the NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.6.2.2.2, AMR item 029. For those AMR items associated with SLRA Section 3.6.2.2.2, 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 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 3.6.2.2.2, associated with SLRA Table 3.6.1, AMR item 3.6.1-030, addresses loss of material due to general, pitting, crevice corrosion for cable bus: external surface of enclosure assemblies composed of steel exposed to air – indoor uncontrolled, or air – outdoor. The applicant stated that this item is not applicable. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.6.2.2.2, AMR item 30.

In its review of components associated with AMR item 3.6.1-030, the NRC staff finds that the applicant has met the further evaluation criteria, and the item is not applicable because there are no cable bus enclosures made of steel at V.C. Summer.

For those AMR items associated with SLRA Section 3.6.2.2.2, the NRC staff concludes that the SLRA is consistent with the GALL-SLR Report, and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

SLRA Section 3.6.2.2.2, associated with SLRA Table 3.6.1, AMR item 3.6.1-031, addresses loss of material due to general, pitting, crevice corrosion for cable bus external surface of enclosure assemblies composed of galvanized steel; aluminum exposed to air – outdoor, which will be managed by the Structures Monitoring Program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.6.2.2.2, AMR item 31.

In its review of components associated with AMR item 3.6.1-031, the NRC staff finds that the applicant has met the further evaluation criteria, and that the applicant's proposal to manage the effects of aging using the Structures Monitoring Program is acceptable because this item involves equipment that is structural by design and is similar to metal enclosed bus enclosure AMR item 3.6.1-015, which recommends Structures Monitoring as the appropriate aging management program.

Based on the programs identified, the NRC staff concludes that the applicant's programs meet SRP-SLR Section 3.6.2.2.2, AMR item 031. For those AMR items associated with SLRA Section 3.6.2.2.2, 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 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).

3.6.2.2.3 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, AMR 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 reviewed the applicant's proposal against criteria in SRP-SLR Section 3.6.2.2.3 and SRP-SLR Appendix A.1, "Aging Management Review – Generic (Branch Technical Position RLSB-1)."

In its review of components associated with AMR item 3.6.1-004, the NRC staff finds that the applicant has met the further evaluation criteria, and that the item is not applicable because:

1. The air quality in non-coastal rural areas, such as the area surrounding V.C. Summer, generally contains low concentrations of suspended particles and sulfur dioxide, which minimizes the corrosion rate; and
2. There are no major industries that generate corrosive pollutants in the immediate area where V.C. Summer is located, so this is a considered a typical rural area.

SLRA Section 3.6.2.2.3, associated with SLRA Table 3.6.1, AMR item 3.6.1-005, addresses increased electrical resistance of connection due to oxidation or loss of pre-load for transmission connectors composed of aluminum; steel exposed to air – outdoor. The applicant stated that this item is not applicable. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.6.2.2.3 and SRP-SLR Appendix A.1.

In its review of components associated with AMR item 3.6.1-005, the NRC staff finds that the applicant has met the further evaluation criteria, and that the item is not applicable because:

1. Transmission conductor connections are treated with corrosion inhibitors to avoid connection oxidation;
2. Connections are assembled using stainless steel bolts, lock washers, and nuts; and
3. The connections are torqued when installed to avoid loss of preload.

SLRA Section 3.6.2.2.3, associated with SLRA Table 3.6.1, AMR item 3.6.1-006, addresses loss of material due to wind-induced abrasion, as well as increased electrical resistance of connection due to oxidation or loss of pre-load for switchyard bus and connections composed of aluminum, copper, bronze, stainless-steel, and galvanized steel exposed to air – outdoor. The applicant stated that this item is not applicable. The NRC staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.6.2.2.3 and SRP-SLR Appendix A.1.

In its review of components associated with AMR item 3.6.1-006, the NRC staff finds that the applicant has met the further evaluation criteria, and that the item is not applicable because:

1. The air quality in non-coastal rural areas, such as the area surrounding V.C. Summer, generally contains low concentrations of suspended particles and sulfur dioxide, which minimizes the corrosion rate; and
2. There are no major industries that generate corrosive pollutants in the immediate area where V.C. Summer is located, so this is a considered a typical rural area.

SLRA Section 3.6.2.2.3, associated with SLRA Table 3.6.1 AMR 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 reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.6.2.2.3 and SRP-SLR Appendix A.1.

In its review of components associated with AMR item 3.6.1-007, the NRC staff finds that the applicant has met the further evaluation criteria, and that the item is not applicable because transmission conductors that are in-scope for subsequent license renewal are installed with shorter spans, at lower elevations, and with less sag than typical transmission conductors. Thus, they tend to be less affected by wind loading than typical transmission conductors.

For those AMR items associated with SLRA Section 3.6.2.2.3, the NRC staff concludes that the SLRA is consistent with the GALL-SLR Report, and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.6.2.2.4 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 NRC 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 Electrical and Instrumentation and Controls – Cables and Connections – Aging Management Evaluation

Transmission conductors composed of aluminum; steel exposed to air – outdoor

SLRA Table 3.6.2-2, AMR item 3.6.1-004 states that loss of conductor strength due to corrosion for transmission conductors composed of aluminum, steel exposed to air – outdoor is not applicable and no AMP is proposed. The AMR item cites generic note I. The AMR item also cites plant-specific note 4, which states “Loss of conductor strength is not an applicable aging effect for transmission conductors. The in-scope transmission conductors are aluminum conductor steel reinforced transmission conductors.”

The NRC staff reviewed the associated items in the SLRA to confirm that this aging effect is not applicable for this component, material and environment combination. The staff finds the applicant’s proposal acceptable because:

1. The air quality in non-coastal rural areas, such as the area surrounding V.C. Summer, generally contains low concentrations of suspended particles and sulfur dioxide, which minimizes the corrosion rate; and
2. There are no major industries generate corrosive pollutants in the immediate area where V.C. Summer is located, so this is a considered a typical rural area.

Transmission connectors composed of aluminum; steel exposed to air – outdoor

SLRA Table 3.6.2-2, AMR item 3.6.1-005, states that increased electrical resistance of connection for aluminum and steel exposed to air – outdoor are not applicable and no AMP is proposed. The AMR item cites generic note I. The AMR item also cites plant-specific note 3, which states “Increased electrical resistance of connection is not an applicable aging effect for transmission connections. The in-scope transmission connections are not subject to oxidation or loss of pre-load.”

The NRC staff reviewed the associated items in the SLRA to confirm that this aging effect is not applicable for this component, material, and environment combination. The staff finds the applicant’s proposal acceptable because:

1. Transmission conductor connections are treated with corrosion inhibitors to avoid connection oxidation;
2. Connections are assembled using stainless steel bolts, lock washers, and nuts; and
3. The connections are torqued when installed to avoid loss of preload.

Switchyard bus and connections composed of aluminum; copper; bronze; stainless-steel; galvanized steel exposed to air – outdoor

SLRA Table 3.6.2-2, AMR item 3.6.1-006, states that loss of material; increased electrical resistance of connection for aluminum, galvanized steel, and stainless-steel exposed to air – outdoor is not applicable and no AMP is proposed. The AMR item cites generic note I. The AMR item also cites plant-specific note 1, which states, "Loss of material and increased electrical resistance of connection are not applicable aging effects for switchyard bus and connections. The in-scope switchyard bus and connections are subject to neither wind induced abrasion nor oxidation or loss of pre-load."

The NRC staff reviewed the associated items in the SLRA to confirm that this aging effect is not applicable for this component, material and environment combination. The staff finds the applicant's proposal acceptable because:

1. The air quality in non-coastal rural areas, such as the area surrounding V.C. Summer, generally contains low concentrations of suspended particles and sulfur dioxide, which minimizes the corrosion rate; and
2. There are no major industries generate corrosive pollutants in the immediate area where V.C. Summer is located, so this is a considered a typical rural area.

Transmission conductors composed of aluminum; steel exposed to air – outdoor

SLRA Table 3.6.2-2, AMR item 3.6.1-007, states that loss of material for aluminum, steel for transmission conductors exposed to air – outdoor is not applicable and no AMP is proposed. The AMR item cites generic note I. The AMR item cites plant-specific note 2, which states, "Loss of material is not an applicable aging effect for transmission conductors. The in-scope transmission conductors are not subject to wind induced abrasion."

The NRC staff reviewed the associated items in the SLRA to confirm that this aging effect is not applicable for this component, material and environment combination. The staff finds the applicant's proposal acceptable because transmission conductors that are in-scope for subsequent license renewal are installed with shorter spans, at lower elevations, and with less sag than typical transmission conductors. Thus, they tend to be less affected by wind loading than typical transmission conductors.

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 FSAR supplement program summaries and concludes that, as required by 10 CFR 54.21(d), the FSAR supplement adequately describes the AMPs and activities credited for managing aging at V.C. Summer.

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 license for V.C. Summer, 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 and evaluated in the subsequent license renewal application (SLRA).

The regulation at 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) or 60 years for subsequent license renewal (SLR)];
4. Were determined to be relevant by the licensee in making a safety determination;
5. Involve conclusions or provide the basis for conclusions related to the capability of the [SSC] to perform its intended functions, as delineated in [10 CFR] 54.4(b); and
6. Are contained or incorporated by reference in the current licensing basis (CLB).

The regulation at 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.

Furthermore, in accordance with 10 CFR 54.21(c)(2), an applicant for SLR must provide a list of plant-specific exemptions granted under 10 CFR 50.12 that are based on a TLAA and remain in effect for the CLB. For any such exemptions, the rule requires that the applicant must also provide an evaluation that justifies the continuation of the exemptions for the period of extended operation.

4.1.1 Summary of Technical Information in the Application

SLRA Section 4.1 describes the process used by the applicant to identify the TLAAs within the applicant's CLB and design basis documentation. The applicant identified the CLB and design basis documentation that was reviewed and searched to identify potential TLAAs. The document search was performed consistent with the guidance provided in NUREG-2192, *Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants* (SRP-SLR), NUREG-2191, *Generic Aging Lessons Learned for Subsequent*

License Renewal (GALL-SLR) Report, NEI 17-01, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal,” and 10 CFR Part 54, “Requirements for Renewal of Operating License for Nuclear Power Plants.”

In addition, the applicant stated that it reviewed the V.C. Summer CLB as required by 10 CFR 54.12(c)(2) to identify all plant-specific exemptions granted under 10 CFR 50.12, “Specific exemptions,” and in effect that are based on TLAAs. The applicant stated that there are no exemptions granted pursuant to 10 CFR 50.12 and in effect that are based on TLAAs.

4.1.2 Staff Evaluation

The NRC staff reviewed SLRA Section 4.1 in accordance with the guidance provided in SRP-SLR Section 4.1, “Identification of Time-Limiting Aging Analysis and Exemptions.” Specifically, SRP-SLR Section 4.1.1 summarizes the areas of review. In addition, SRP-SLR Section 4.1.2 summarizes the staff’s acceptance criteria for performing TLAA and SLRA exemption identification reviews, and Section 4.1.3 summarizes the staff’s review procedures for performing the TLAA and SLRA exemption identification reviews.

SRP-SLR Table 4.1-1 provides a sample process for identifying potential TLAAs. SRP-SLR Table 4.1-2 provides a list of generic TLAAs. SRP-SLR Table 4.7-1 provides examples of potential plant-specific TLAAs that have been identified by license renewal applicants. The staff used the guidance and information in these SRP-SLR tables to assist in its review to determine if the applicant identified all applicable calculations and analyses in its CLB as TLAAs in its SLRA.

The SLRA states that the applicant searched the CLB and design basis documentation to identify potential TLAAs. The documentation that was searched included the following: changes to the Final Safety Analysis Report (FSAR), changes to the Technical Specifications (TSs) and bases, NRC Safety Evaluation Report (SER) for the initial renewed operating license, subsequent NRC Safety Evaluations (SEs), and docketed licensing correspondence between Dominion Energy South Carolina, Inc. and the NRC.

During the audit, and as described in the audit report ML24085A699), the staff confirmed that the applicant performed a search of its CLB and design basis documentation to identify potential TLAAs. The staff reviewed the list of key words and found them appropriate because the key words searched were reasonable and tailored to focus on age-related degradation targeted towards time-dependent assessment.

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 potential TLAAs that met all six criteria were identified as TLAAs requiring evaluation for the subsequent period of extended operation.

During its audit, the staff also confirmed that the applicant performed a search of docketed licensing correspondence, the operating license, and the FSAR to identify exemptions granted pursuant to 10 CFR 50.12 that are currently in effect. The staff also confirmed that the applicant reviewed these exemptions to determine whether the exemption was based on a TLAA, and that no 10 CFR 50.12 exemptions involve a TLAA as defined in 10 CFR 54.3.

During its review, the staff performed an independent search of the FSAR, a sample docketed licensing correspondence, as well as NRC SEs to identify potential TLAAs. Based on this independent search, the staff did not identify TLAAs that were not already identified in the

SLRA. Additionally, the staff did not identify any active exemptions granted pursuant to 10 CFR 50.12 and based on a TLAA, as defined in 10 CFR 54.3.

4.1.3 Conclusion

Based on its review and independent search, the staff concludes that the systematic approach the applicant took to search its CLB and design basis documentation to identify the TLAAs as defined in 10 CFR 50.3, in accordance with 10 CFR 54.21(c)(1), is acceptable. In addition, based on its review and independent search, the staff concludes that the systematic approach taken by the applicant to search its CLB for exemptions that were based on a TLAA is acceptable, and no plant-specific exemptions based on TLAAs were required to be identified pursuant to 10 CFR 54.21(c)(2).

4.2 Reactor Vessel Neutron Embrittlement Analysis

4.2.1 Neutron Fluence Projections

4.2.1.1 Summary of Technical Information in the Application

SLRA Section 4.2.1 describes the applicant's TLAA for neutron fluence projections. The applicant dispositioned this TLAA for the reactor pressure vessel (RPV) beltline and extended beltline materials in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of aging due to fluence on the intended functions will be adequately managed by the Reactor Vessel Material Surveillance aging management program (AMP) for the subsequent period of extended operation.

The applicant projected the expected neutron fluence values for the RPV to 80 years. The projected fluence values for V.C. Summer are for 72 effective full-power years (EFPY) as it bounds the EFPY to date and is conservative when projecting the cumulative EFPY to 80 years. The applicant stated in the application that cumulative operating time as of April 2023 is 33.7 EFPY and is estimated to be 56 EFPY at the end of 60 years of operation. The applicant calculated 72 EFPY as 34 (33.7 EFPY rounded up) + 40 (years of extended operation) $\times$ 0.95 (95% capacity factor).

The applicant stated that the fluence projections were performed using the three-dimensional discrete ordinates code RAPTOR-M3G and the BUGLE-96 cross-section library in accordance with the methodology described in WCAP-18124-NP-A, "Fluence Determination with RAPTOR-M3G and FERRET" (ML18204A010) and WCAP-18124-NP-A Supplement 1-NP-A, "Fluence Determination with RAPTOR-M3G and FERRET – Supplement for Extended Beltline Materials" (ML22153A139).

The applicant noted in the SLRA that the vessel beltline neutron fluence values applicable to the 60-year period of operation were taken from WCAP-16298-NP, "Analysis of Capsule Z from the South Carolina Electric & Gas Company V.C. Summer Reactor Vessel Radiation Surveillance Program" (ML043010241), and were previously summarized in WCAP-16305-NP, "V.C. Summer Heatup and Cooldown Limit Curves for Normal Operation" (ML051790035). The applicant stated that the projections for 60-year period of operation were performed using the methods described in Westinghouse Licensing Topical Report WCAP-14040-A, "Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves" (ML050120209).

4.2.1.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the RPV beltline and extended beltline materials and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.2.3.1.1. Specifically, the staff reviewed whether the applicant (1) identified the neutron fluence for each beltline material at the end of the subsequent period of extended operation, (2) used the NRC staff-approved methodology to calculate the neutron fluence, and (3) applied a methodology that is consistent with the guidance in NRC Regulatory Guide (RG) 1.190.

The plant-specific estimated RV beltline and extended beltline fast neutron (E >1.0 MeV) fluences at the end of 80 years of operation are documented in WCAP-18709-NP "V.C. Summer Unit 1 Subsequent License Renewal: Reactor Pressure Vessel Extended Beltline Neutron Exposure Evaluation". In addition to the RPV, the applicant estimated 80-year neutron fluence values for reactor vessel inlet (RVI) nozzle components calculated using a plant-specific model. The fluence projections were performed in accordance with the NRC-approved methodology described in WCAP-18124-NP-A and WCAP-18124-NP-A Supplement 1-NP-A. The NRC staff notes that the applicant based the remaining TLAAs in SLRA Section 4.2.1 on a 72 EFPY projection, which assumes a 95-percent capacity factor for the duration of the subsequent period of extended operation. The staff finds this assumption acceptable because the plant is estimated to be 56 EFPY at the end of 60 years of operation, which means the projected 72 EFPY neutron fluence period will bound the neutron fluence that would be expected at the end of the subsequent period of extended operation.

Based on the audit review of the plant-specific fluence calculation performed for the vessel beltline and extended beltline fast neutron documented in WCAP-18709-NP, the staff found that the neutron fluence methodology used was essentially unbiased with an uncertainty well within the 20 percent criterion established in Regulatory Guide 1.190. The applicant appropriately identified beltline and extended beltline materials in Table 4.2.1-1 of the SLRA, along with the fluence projections for the end of the subsequent period of extended operation. Based on the review performed, the staff concluded that the extended beltline materials will not become limiting during the subsequent period of extended operation.

In the approval for WCAP-18124-NP-A, the NRC identified two limitations and conditions (L&Cs) associated with the application of RAPTOR-M3G and FERRET. L&C #1 states that applicability of WCAP-18124-NP, Revision 0 is limited to the RPV region near the active height of the core based on the uncertainty analysis performed and the measurement data provided.

L&C #1 further states that additional justification should be provided via additional benchmarking, fluence sensitivity analysis to the response parameters of interest, margin assessment, or a combination thereof, for applications of the method to components including, but not limited to, the RPV upper circumferential weld, the reactor coolant system inlet and outlet nozzles, and the reactor vessel internal components. The conditions necessary to meet the L&C #1 are provided in WCAP-18124-NP-A Revision 0, Supplement 1-NP-A, Revision 0, which allows for application of RAPTOR-M3G method to the RPV extended beltline region on a generic basis.

In response to the NRC Staff Request for Confirmatory Information (RCI), the applicant confirmed, in a supplement (ML24155A146, publicly available, and ML24155A145, not publicly available), that except for the lower shell to bottom head circumferential weld, the conditions necessary for meeting the Limitation 1 from WCAP-18124-NP-A Revision 0, Supplement 1-NP-A, Revision 0 are met for the plant-specific neutron exposure measurements. For the lower shell to bottom head circumferential weld, which does not meet the conditions necessary, the applicant confirmed that the fast neutron (E >1.0 MeV) fluence exposures for 72 EFPY, even with any increase in non-calculated analytical uncertainty associated with these exposures, would not result in exposures greater than 1 × 10^{17} n/cm^2. Based on the applicant's response, the NRC staff finds that the lower shell to bottom head circumferential weld will not be susceptible to neutron irradiation embrittlement during the subsequent period of extended operation because the fast neutron fluence exposures would not result in values greater than 1 × 10^{17} n/cm^2 even with any increase in non-calculated analytical uncertainty.

L&C #2 in the approval for WCAP-18124-NP-A states that least squares adjustment is only acceptable if the adjustments to the M/C ratios are to the calculated spectra values are within the assigned uncertainties of the calculated spectra, the dosimetry measured reaction rates, and the dosimetry reaction cross sections. To meet the L&C #2 of WCAP-18124-NP, Revision 0, the applicant confirmed, in response to the NRC Staff RCI, that the least-squares analysis was not used to adjust any calculated RPV or surveillance capsule neutron exposure and was used only as a supplemental check on the results of the dosimetry analyses. Based on the applicant's responses to the RCIs and the independent verification of the responses by the NRC staff, the NRC staff finds the applicant has adequately addressed the L&Cs from WCAP-18124-NP-A.

The applicant stated in the SLRA that the 72 EFPY fluence projections will be managed for the subsequent period of extended operation by the Neutron Fluence Monitoring AMP and the Reactor Vessel Material Surveillance AMP (as described in Sections B.3.2 and B.2.1.19 of the SLRA) during the subsequent period of extended operation. The NRC staff notes that the Reactor Vessel Material Surveillance program, as described in Section B.2.1.19 of the SLRA, includes removal and testing of at least one capsule, with a neutron fluence between one and two times the projected peak vessel neutron fluence at the end of the subsequent period of extended operation. The applicant further stated that the neutron fluence of the RPV beltline and extended beltline components will be monitored in accordance with its Neutron Fluence Monitoring AMP, which the staff finds is consistent with GALL-SLR Report AMP X.M2, "Neutron Fluence Monitoring" (documented in SE Section 3.0.3.2.2). Hence, the staff finds that the applicant's Neutron Fluence Projections TLAA is consistent with the acceptance criteria in SRP-SLR Section 4.2.2.1.1 and that 54.21(c)(1)(iii) has been met.

The NRC staff determined that the applicant has adequately demonstrated the analysis of the neutron fluence for the reactor vessel and the beltline and extended beltline materials has been projected to the end of the subsequent period of extended operation and the intended functions will be adequately managed for the period of extended operation. The NRC staff finds that the analysis meets the acceptance criteria in SRP-SLR Section 4.2.2.1.1 since the methods used to calculate the neutron fluence are NRC-approved methods and adhere to the guidance of NRC RG 1.190, where applicable.

Based on the above, the NRC staff finds the V.C. Summer 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. Additionally, based on the above, the NRC staff finds the intended functions will be adequately managed for the period of extended operation.

4.2.1.3 FSAR Supplement

SLRA Section A.3.2.1 provides the FSAR supplement summarizing the neutron fluence projections. The staff reviewed SLRA Section A.3.2.1 consistent with the review procedures in SRP-SLR Section 4.2.3.1.1.

Based on its review of the FSAR supplements, the staff finds that the applicant's disposition of the TLAA meets the acceptance criteria in SRP-SLR Section 4.2.2.1.1 and are 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 in the FSAR supplement, 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), and that the effects of aging due to neutron fluence on the intended functions of the RPV beltline and extended beltline materials will be adequately managed for the subsequent period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.2 Upper-Shelf Energy

4.2.2.1 Summary of Technical Information in the Application

SLRA Section 4.2.2 describes the applicant's TLAA for upper-shelf energy for RPV. The applicant dispositioned the TLAA for the upper-shelf energy for the RPV in accordance with requirements in 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

During its review, the staff noted that several RPV materials, including their respective material property values (e.g., initial upper-shelf energy, weight % Cu), were identified in Pressurized-Water Reactor Owners Group (PWROG)-21037, Revision 2, "Determination of Unirradiated RT_{NDT} and Upper-Shelf Energy Values of the V.C. Summer Unit 1 Reactor Vessel Materials" (ML23233A176), which was submitted with the SLRA. The staff noted that the following RPV materials are not considered beltline materials because the 80-year projected neutron fluence does not exceed the threshold in Appendix H to 10 CFR Part 50 (i.e., 1×10^{17} n/cm^2):

- Replacement Reactor Vessel Closure Head (Heat# 2B145585 & 2B145586)
- Vessel Flange (Heat# 5P5343, 4P4845, & 3P4570)
- Transition Ring (Heat# A9249-1)
- Bottom Head (Heat# A9231-2)
- Lower Shell to Transition Ring Circ. Weld (Heat# 3P4966, Flux Type 124, Lot# 1214)

The material property values for these non-beltline RPV materials were not (1) contained in SLRA Section 4.2, "Reactor Vessel Neutron Embrittlement Analysis," or (2) part of the applicant's evaluation of RPV l integrity through the subsequent period of extended operation. Thus, the staff does not make any determinations or conclusions regarding this information for these non-beltline RPV materials in its current review for the subsequent period of extended operation, or for any potential future licensing applications or license periods.

The staff reviewed the applicant's TLAA for upper-shelf energy of the RPV and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.2.3.1.2.2.

Material Property Values

During its audit (ML24085A699) and review, the staff also assessed the material property values (e.g., initial USE, weight % Cu) for the RPV materials in SLRA Table 4.2.2-2 to (1) confirm these values were consistent with the CLB, (2) confirm revisions to the CLB values are justified and appropriate, or (3) determine if these values are justified and appropriate if the RPV materials were not previously addressed in the CLB. The staff noted that the additional details regarding the material property values are provided in PWROG 21037, Revision 2 (ML23233A176).

SLRA Table 4.2.2-1 and PWROG-21037, Revision 2, indicate that the weight % Cu of 0.127 is a generic value for SA-508 Class 2 nozzle forgings from PWROG-15109-NP-A, "PWR Pressure Vessel Nozzle Appendix G Evaluation" (ML20024E573) for the following RPV materials:

- Inlet Nozzle 436B-1 (Heat# Q2Q41W)
- Inlet Nozzle 436B-2 (Heat# Q2Q39W)
- Inlet Nozzle 436B-3 (Heat# Q2Q39W)
- Outlet Nozzle 437B-1 (Heat# Q2Q40)
- Outlet Nozzle 437B-2 (Heat# Q2Q40W)
- Outlet Nozzle 437B-3 (Heat# Q2Q44W)

PWROG-15109-NP-A determined that the weight % Cu content of 0.127 was appropriately determined consistent with the guidance in RG 1.99, Rev. 2 and is representative of U.S. pressurized water reactors (PWR) nozzle forgings. During its audit (ML24085A699), the staff confirmed that the weight % Cu content was not available in the certified material test reports or fabrication records for these RPV materials; thus, the use of the weight % Cu content (i.e., 0.127) from PWROG-15109-NP-A is appropriate. Based on its audit and review, the staff finds the use of weight % Cu in SLRA Table 4.2.2-1 to be acceptable for Inlet Nozzles 436B-1, 436B-2, and 436B-3, and Outlet Nozzles 437B-1, 437B-2, and 437B-3.

SLRA Table 4.2.2-1 and Section C.1 of Attachment C of PWROG-21037, Revision 2, indicates that in some situations the heat number used in specific weld seams could not be identified. To address these situations, the applicant indicated that bounding or generic plant-specific weld properties were developed for the following RPV materials based on a review of all weld heats used in the fabrication of the RPV at V.C. Summer:

- Nozzle Shell Longitudinal Weld Seams BE and BF
- Inlet/Outlet Nozzle Forgings to Nozzle Shell Weld Seams 15A/B/C & 16A/B/C

Section C.2 of Attachment C of PWROG-21037, Revision 2 states that two types of welds were used in the fabrication of CB&I Nuclear vessels (i.e., shielded metal arc welds [SMAWs] and submerged arc welds [SAWs]). Tables C.2-1 and C.2-2 summarize all the material properties of the SAW and SMAW, respectively, taken from the plant-specific fabrication files. The staff noted that Sections C.3 through C.10, and Sections C.11 through C.19 provide the additional details from the certified material test reports or fabrication records for each of the V.C. Summer SAW and SMAW, respectively. The staff's review of the applicant's approach to develop the bounding or generic plant-specific weld properties for these RPV materials are documented below.

RG 1.99, Rev. 2 indicates, in part, the following: "If the best-estimate measured values for the material "weight-percent copper" and "weight-percent nickel" of the RPV material are not available, then conservative estimates (mean plus one standard deviation) based on generic data may be used if justification is provided."

Based on its review of information from certified material test reports or fabrication records contained in Sections C.3 through C.19 of Attachment C of PWROG-21037, Revision 2, the staff noted the generic weld Cu% content for V.C. Summer welds seams in which the specific heat number could not be identified was determined based on the approach of "mean plus one standard deviation" of all weld data from the V.C. Summer RPV. Thus, the staff finds the generic weld Cu% content (i.e., 0.06 weight %) for the "Nozzle Shell Longitudinal Weld Seams BE and BF" and "Inlet/Outlet Nozzle Forgings to Nozzle Shell Weld Seams 15A/B/C & 16A/B/C" to be acceptable because this value was determined to be consistent with RG 1.99, Rev. 2.

Based on its review of information from certified material test reports or fabrication records contained in Sections C.3 through C.19 of Attachment C of PWROG-21037, Revision 2, the staff noted that the applicant selected the limiting "mean plus two standard deviations" USE value between the SAWs and the SMAWs used in the fabrication of the V.C. Summer RPV. As described in further detail below, the Charpy upper-shelf onset is the temperature at which the fracture appearance of all Charpy specimens tested is at or above 95 percent shear. The staff noted that, in determining the "mean plus two standard deviations" USE value for the SAWs and the SMAWs, the applicant conservatively included measured USE data tested at less than the Charpy upper-shelf onset temperature, which has less than 95 percent shear. The staff finds the applicant's approach to select the limiting "mean plus two standard deviations" USE value (i.e., 80 ft-lb) as the initial USE value for the "Nozzle Shell Longitudinal Weld Seams BE and BF" and "Inlet/Outlet Nozzle Forgings to Nozzle Shell Weld Seams 15A/B/C & 16A/B/C" to be reasonable and conservative because:

1. The applicant assessed all available weld data and fabrication information for its plant-specific RPV;
2. The applicant considered measured USE data tested at less than the Charpy upper-shelf onset temperature; and
3. Approximately 95% of the data fall within two standard deviations of the mean value.

As documented in PWROG-21037, Revision 2, the applicant determined updated initial (i.e., unirradiated) USE values of RPV materials, that were not discussed above, from certified material test reports and compared them with the original initial USE values in its CLB. The comparison of the original and updated initial USE values is summarized in Table A.3-1 of PWROG-21037-NP, Revision 2, and the details of the determination of updated initial USE values are documented Attachments B and C to PWROG-21037, Revision 2. Additionally, PWROG-21037, Revision 2, stated that in some instances, there may be data deemed "out of family," which are removed from the determination of the USE based on engineering judgment. However, the applicant stated that the use of engineering judgment to remove "out of family" data was not necessary for V.C. Summer.

The applicant determined the updated initial USE values based on the 1982 version of ASTM International E185 (ASTM E185-82) and referred to the 2016 version (ASTM E185-16) for clarification of the definition of USE. The staff noted that the definition of USE in Section 3.1.5 of ASTM E185-16 is similar to the definition of USE in Section 4.18 of ASTM E185-82, with two exceptions. First, the definition in ASTM E185-16 of the Charpy upper-shelf onset is the temperature at which the fracture appearance of all Charpy specimens tested is at or above 95 percent shear. This definition provides a quantitative criterion similar to that in ASTM E185-82, which describes in the definition for Charpy transition curve that the upper-shelf energy part of the curve is above 95 percent shear, and therefore is acceptable for use. The other difference between ASTM E185-82 and E185-16 is that there is a provision in ASTM E185-16 that USE data that are 150°F above the Charpy upper-shelf onset temperature shall not be included; this provision is not consistent with ASTM E185-82, which is the standard endorsed in Appendix H to 10 CFR Part 50, and therefore is not acceptable for use. The staff verified that this provision in ASTM E185-16 was not applied, and that no data was deemed "out of family" for V.C. Summer by confirming that there were no test data from the certified material test reports excluded from determining initial USE values.

During its review, the staff noted that at the time of original licensing for V.C. Summer, the applicant's Reactor Vessel Material Surveillance program was based on ASTM E185-73, "Standard Recommended Practice for Surveillance Tests for Nuclear Reactor Vessels," which did not provide a quantitative definition for determining Charpy upper-shelf onset. Thus, the standard approach at that time was to determine the initial USE values based on curve-fitting the available measured data. As such, the staff noted that the updated initial USE values of RPV materials were a result of the clarification provided for the definition of Charpy upper-shelf onset in ASTM E185-82 and ASTM E185-16, as described above.

Based on its review and audit, the staff verified that the material property values (e.g., initial USE, weight % Cu) for the RPV materials contained in SLRA Table 4.2.2-2 were based on information from certified material test reports or fabrication records for the specific material, or were otherwise justified as described above. Based on its review, the staff finds the material property values for the RPV materials in SLRA Table 4.2.2-2 are acceptable and appropriate for use in determining upper-shelf energy values for the end of the subsequent period of extended operation.

<u>Surveillance Data</u>

The staff noted that the applicant assessed relevant surveillance data to determine its credibility per the criteria in RG 1.99, Rev. 2, and potential consideration as to whether it is appropriate to use when calculating upper-shelf energy values. Specifically, the applicant indicated that USE values for the following RPV materials in SLRA Table 4.2.2-2 were determined based on surveillance data:

- Heat# 4P4784
  - Intermediate Shell Longitudinal Weld Seams BC & BD
  - Intermediate to Lower Shell Circumferential Weld Seam AB
  - Lower Shell Longitudinal Weld Seams BA & BB

    - Nozzle to Intermediate Shell Circumferential Weld Seam AC
- Heat# A9154-1: Intermediate Shell 11-1

The staff noted that WCAP-18728-NP, Revision 5, "V.C. Summer Nuclear Station Unit 1 Subsequent License Renewal: Evaluation of Reactor Vessel Integrity Time Limited Aging Analyses" (ML23233A176), provides the applicant's assessment of surveillance data applicable to the RPVs. The staff reviewed Sections 3, "Material Property Input", and Appendix A, "VCSNS Unit 1 Credibility Evaluation" to determine whether the applicant's use of its surveillance data is appropriate. RG 1.99, Rev. 2 indicates, in part, that if the data does not meet the credibility criterion #3 for the use in adjusted reference temperature shift calculations, it may still be credible for determining decrease in upper-shelf energy if the upper-shelf can be clearly determined. Additionally, Position 2.2 of RG 1.99, Rev. 2 states that the decrease in upper-shelf energy may be obtained by plotting the reduced plant surveillance data on Figure 2 of this guide and fitting the data with a line drawn parallel to the existing lines as the upper bound of all the data, and that this line should be used in preference to the existing graph.

Based on its review, the staff determined that the assessment of the plant-specific surveillance data assessment was acceptable and consistent with RG 1.99, Rev. 2. For the same reason, the staff finds that the credible surveillance data for Heat# 4P4784 and non-credible surveillance data for Heat# A9154-1 is applicable for use in the applicant's evaluation for upper-shelf energy values for the RPV materials identified above.

<u>Projected 72EFPY USE Values</u>

Based on its review, as described above related to the material property information and surveillance data, the staff also verified that the projected USE values, including those that took into consideration surveillance data (credible and non-credible), were calculated in accordance with RG 1.99, Rev. 2. As such, the staff finds that the projected USE values for the RPV materials identified in SLRA Table 4.2.2-2 are appropriate and are greater than the screening criterion of 50 ft-lb per Appendix G of 10 CFR Part 50. The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for USE of the RPV has been projected to the end of the subsequent period of extended operation. Additionally, the analyses 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, Rev. 2 when considering the neutron fluence values for 80 years (72 EFPY). Furthermore, the analyses demonstrated that the screening criterion of 50 ft-lb as required by Appendix G of 10 CFR Part 50 was met.

4.2.2.3 FSAR Supplement

SLRA Section A3.2.2 provides the FSAR supplement summarizing the TLAA for USE for the RPV. The staff reviewed SLRA Section A3.2.2 consistent with the review procedures in SRP-SLR Section 4.2.3.2.

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and therefore is acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the TLAA for upper-shelf energy, as required by 10 CFR 54.21(d).

4.2.2.4 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), and that the USE analyses for the RPV beltline and extended beltline materials have been projected to the end of the subsequent period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.3 Pressurized Thermal Shock

4.2.3.1 Summary of Technical Information in the Application

SLRA Section 4.2.3 describes the applicant's TLAA for pressurized thermal shock. The applicant dispositioned the TLAA for pressurized thermal shock of the RPV in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the subsequent period of extended operation.

4.2.3.2 Staff Evaluation

During its review, the staff noted that several RPV materials, including their respective material property values (e.g., initial USE, weight % Cu), were identified in PWROG-21037, Revision 2, "Determination of Unirradiated RT_{NDT} and Upper-Shelf Energy Values of the V.C. Summer Unit 1 Reactor Vessel Materials" (ML23233A176), which was submitted with the SLRA. The staff noted that the following RPV materials are not considered beltline materials since the 80-year projected neutron fluence does not exceed the threshold in Appendix H to 10 CFR Part 50 (i.e., 1×10^{17} n/cm^2):

- Replacement Reactor Vessel Closure Head (Heat# 2B145585 & 2B145586)
- Vessel Flange (Heat# 5P5343, 4P4845, & 3P4570)
- Transition Ring (Heat# A9249-1)
- Bottom Head (Heat# A9231-2)
- Lower Shell to Transition Ring Circ. Weld (Heat# 3P4966, Flux Type 124, Lot# 1214)

The material property values for these non-beltline RPV materials were not (1) contained in SLRA Section 4.2, "Reactor Vessel Neutron Embrittlement Analysis," or (2) part of the applicant's evaluation of RPV integrity through the subsequent period of extended operation. Thus, the staff does not make any determinations or conclusions regarding this information for these non-beltline RPV materials in its current review for the subsequent period of extended operation, or for any potential future licensing applications or license periods.

The staff reviewed the applicant's TLAA for pressurized thermal shock of the RPV and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.2.3.1.3.2.

<u>Material Property Values</u>

During its audit (ML24085A699) and review, the staff also assessed the material property values (e.g., initial RT_{NDT}, weight % Cu, weight % Ni) for the RPV materials in SLRA Table 4.2.2-2 to (1) confirm these values were consistent with the CLB, (2) confirm revisions to the CLB values are justified and appropriate, or (3) determine if these values are justified and appropriate if the RPV materials were not previously addressed in the CLB. The staff noted that the additional details regarding the material property values are provided in PWROG-21037, Revision 2.

SLRA Table 4.2.2-1 and PWROG-21037, Revision 2, indicates that the weight % Cu of 0.127 is a generic value for SA-508 Class 2 nozzle forgings from PWROG-15109-NP-A, “PWR Pressure Vessel Nozzle Appendix G Evaluation” (ML20024E573) for the following RPV materials:

- Inlet Nozzle 436B-1 (Heat# Q2Q41W)
- Inlet Nozzle 436B-2 (Heat# Q2Q39W)
- Inlet Nozzle 436B-3 (Heat# Q2Q39W)
- Outlet Nozzle 437B-1 (Heat# Q2Q40)
- Outlet Nozzle 437B-2 (Heat# Q2Q40W)
- Outlet Nozzle 437B-3 (Heat# Q2Q44W)

PWROG-15109-NP-A provides the weight % Cu and Ni contents of 0.127 and 0.90, respectively, which the staff found were appropriately determined, consistent with the guidance in RG 1.99, Rev. 2, and is representative of U.S. PWR nozzle forgings. During its audit (ML24085A699), the staff confirmed the following:

- The weight % Cu content was not available in the certified material test reports or fabrication records for these RPV materials; thus, the staff finds that the use of the weight % Cu content (i.e., 0.127) from PWROG-15109-NP-A is appropriate.
- The weight % Ni was available in its certified material test reports or fabrication records for these RPV materials; thus, the staff finds that the use of the respective weight % Ni from these documents is appropriate in lieu of the weight % Ni contained in PWROG-15109-NP-A.

Based on its audit and review, and as described in the bullets above, the staff finds the use of weight % Cu and weight % Ni in SLRA Table 4.2.2-1 to be acceptable for Inlet Nozzles 436B-1, 436B-2, and 436B-3, and Outlet Nozzles 437B-1, 437B-2, and 437B-3.

SLRA Table 4.2.2-1 and Section C.1 of Attachment C of PWROG-21037, Revision 2, indicates that in some situations the heat number used in specific weld seams could not be identified. In order to address these situations, the applicant indicated that bounding or generic plant-specific weld properties were developed for the following RPV materials based on a review of all weld heats used in the fabrication of the RPV at V.C. Summer:

- Nozzle Shell Longitudinal Weld Seams BE and BF
- Inlet/Outlet Nozzle Forgings to Nozzle Shell Weld Seams 15A/B/C & 16A/B/C

Section C.2 of Attachment C of PWROG-21037, Revision 2, states that two types of welds were used in the fabrication of CB&I Nuclear vessels (i.e., SMAWs and SAWs). Tables C.2-1 and C.2-2 summarize all the material properties of the SAW and SMAW, respectively, taken from the plant-specific fabrication files. The staff noted that Sections C.3 through C.10, and Sections C.11 through C.19 provide the additional details from the certified material test reports or fabrication records for each of the V.C. Summer SAW and SMAW, respectively. The staff’s review of the applicant’s approach to develop the bounding or generic plant-specific weld properties for these RPV materials are documented below.

10 CFR 50.61(c) states, in part, the following:

- If measured values of initial RT_{NDT} for the material in question are not available, generic mean values for that class of material may be used if there are sufficient test results to establish a mean and a standard deviation for the class.
- If the best-estimate measured values for the material “weight-percent copper” and “weight-percent nickel” of the RPV material are not available, then conservative estimates (mean plus one standard deviation) based on generic data may be used if justification is provided.

Based on its review of information from certified material test reports or fabrication records contained in Sections C.3 through C.19 of Attachment C of PWROG-21037, Revision 2, the staff noted the generic weld Cu% and Ni% contents for V.C. Summer welds seams in which the specific heat number could not be identified was determined based on the approach of “mean plus one standard deviation” of all weld data from the V.C. Summer RPV. The staff finds the generic weld Cu% and Ni% contents (i.e., 0.06 weight % and 1.01 weight %, respectively) for the “Nozzle Shell Longitudinal Weld Seams BE and BF” and “Inlet/Outlet Nozzle Forgings to Nozzle Shell Weld Seams 15A/B/C & 16A/B/C” to be acceptable because these values were determined consistent with 10 CFR 50.61(c).

Based on its review of information from certified material test reports or fabrication records contained in Sections C.3 through C.19 of Attachment C of PWROG-21037, Revision 2, the staff noted that the applicant selected the maximum RT_{NDT} value (i.e., 10°F) between all the SAW and SMAW used in the fabrication of the V.C. Summer RPV. The staff finds it reasonable and appropriate that the applicant assessed all the available weld data and fabrication information for its plant-specific RPV because it is consistent with 10 CFR 50.61(c) to assess the data from the same class of material when a measured value of initial RT_{NDT} for a specific material is not available. Additionally, the staff finds the applicant’s approach to select the maximum RT_{NDT} value (i.e., 10°F) between all the SAW and SMAW used in the fabrication of its RPV as the initial RT_{NDT} for the “Nozzle Shell Longitudinal Weld Seams BE and BF” and “Inlet/Outlet Nozzle Forgings to Nozzle Shell Weld Seams 15A/B/C & 16A/B/C” to be acceptable because it is more conservative than what is required in 10 CFR 50.61(c).

Based on its review and audit, the staff verified that the material information (e.g., initial RT_{NDT}, weight % Cu, weight % Ni) for the RPV materials contained in SLRA Table 4.2.2-2 were based on information from certified material test reports or fabrication records for the specific material, or were otherwise justified as described above. Thus, the staff finds the material property values for the RPV materials in SLRA Table 4.2.2-2 to be acceptable and appropriate for use in determining RT_{PTS} values for the end of the subsequent period of extended operation. Additionally, based on this review, the staff finds that the appropriate margin value, determined consistent with 10 CFR 50.61, was applied for each RPV material for the purpose of addressing pressurized thermal shock.

Surveillance Data

The staff noted that the applicant assessed relevant surveillance data to determine its credibility per the criteria in 10 CFR 50.61, and considered whether it is appropriate to use when calculating RT_{PTS} values. Specifically, the applicant indicated that RT_{PTS} values for the following RPV materials in SLRA Table 4.2.3-1 were determined based on surveillance data:

- Heat# 4P4784
  - Intermediate Shell Longitudinal Weld Seams BC & BD
  - Intermediate to Lower Shell Circumferential Weld Seam AB
  - Lower Shell Longitudinal Weld Seams BA & BB
  - Nozzle to Intermediate Shell Circumferential Weld Seam AC
- Heat# A9154-1: Intermediate Shell 11-1

The staff noted that WCAP-18728-NP, Revision 5, provides the applicant's assessment of surveillance data applicable to the RPVs. The staff reviewed Sections 3, "Material Property Input", and Appendix A, "VCSNS Unit 1 Credibility Evaluation" to determine whether the applicant's use of its surveillance data is appropriate. Based on its review, the staff determined that the assessment of the plant-specific surveillance data was consistent with the criteria in 10 CFR 50.61. In particular, the staff finds that the credible surveillance data for Heat# 4P4784 is applicable for use in the applicant's evaluation for RT_{PTS} values for the Intermediate Shell Longitudinal Weld Seams BC & BD, Intermediate to Lower Shell Circumferential Weld Seam AB, Lower Shell Longitudinal Weld Seams BA & BB, and Nozzle to Intermediate Shell Circumferential Weld Seam AC.

Additionally, the staff finds that the surveillance data for Intermediate Shell 11-1 (Heat# A9154-1) is non-credible and not applicable for use in the applicant's evaluation for RT_{PTS} values for this RPV material. SLRA Section 4.2.3 identifies non-credible plant-specific surveillance data for Intermediate Shell 11-1 (Heat# A9154-1); however, SLRA Section 4.2.5 states that because the surveillance data were determined to be non-conservative, it is not credited. The staff confirmed that this non-credible surveillance data was not used in determining the limiting RT_{PTS} values discussed below; thus, it was not considered relevant to the staff's evaluation of pressurized thermal shock.

Projected 72 EFPY RT_{PTS} Values

The applicant stated that the limiting RT_{PTS} value at 72 EFPY are listed below:

- Base metal or longitudinal weld materials: 152.5°F for the Intermediate Shell 11-1 (Heat# A9154-1)
- Circumferentially oriented weld materials: 42.5°F for the Intermediate to Lower Shell Circumferential Weld (Heat# 4P4784)

Based on its review, as described above related to material property information and surveillance data, the staff also verified that the projected RT_{PTS} values were calculated in accordance with 10 CFR 50.61. As such, the staff finds that the limiting materials for pressurized thermal shock identified by the applicant for (1) base metal or longitudinal weld materials and (2) circumferentially oriented weld materials are appropriate and the associated RT_{PTS} values are less than the screening criteria specified in 10 CFR 50.61. The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii) and the associated acceptance criteria in SRP-SLR Section 4.2.2.1.3.2, that the analyses for pressurized thermal shock of the RPV has been projected to the end of the subsequent period of extended operation because the pressurized thermal shock analyses were reevaluated consistent with 10 CFR 50.61 when considering the neutron fluence values for 80 years (72 EFPY), and the applicant demonstrated that the pressurized thermal shock screening criteria were not exceeded.

4.2.3.3 FSAR Supplement

SLRA Section A3.2.3, as supplemented by letter dated April 1, 2024 (ML24095A207), provides the FSAR supplement summarizing the TLAA for pressurized thermal shock for the RPV. The staff reviewed SLRA Section A3.2.3 consistent with the review procedures in SRP-SLR Section 4.2.3.2.

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the TLAA for upper-shelf energy, as required by 10 CFR 54.21(d).

4.2.3.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the pressurized thermal shock analyses for the RPV beltline and extended beltline materials have been projected to the end of the subsequent period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.4 Adjusted Reference Temperature

4.2.4.1 Summary of Technical Information in the Application

SLRA Section 4.2.4 describes the applicant’s TLAA for adjusted reference temperature (ART) for the RPV. The applicant dispositioned the TLAA for ART for the RPV in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the subsequent period of extended operation.

4.2.4.2 Staff Evaluation

During its review, the staff noted that several RPV materials, including their respective material property values (e.g., initial USE, weight % Cu), were identified in PWROG-21037, Revision 2, “Determination of Unirradiated RT_{NDT} and Upper-Shelf Energy Values of the V.C. Summer Unit 1 Reactor Vessel Materials” (ML23233A176), which was submitted with the SLRA. The staff noted that the following RPV materials are not considered beltline materials since the 80-year projected neutron fluence does not exceed the threshold in Appendix H to 10 CFR Part 50 (i.e., 1×10^{17} n/cm^2):

- Replacement Reactor Vessel Closure Head (Heat# 2B145585 & 2B145586)
- Vessel Flange (Heat# 5P5343, 4P4845, & 3P4570)
- Transition Ring (Heat# A9249-1)
- Bottom Head (Heat# A9231-2)
- Lower Shell to Transition Ring Circ. Weld (Heat# 3P4966, Flux Type 124, Lot# 1214)

The material property values for these non-beltline RPV materials were not (1) contained in SLRA Section 4.2, “Reactor Vessel Neutron Embrittlement Analysis,” or (2) part of the applicant’s evaluation of RPV integrity through the subsequent period of extended operation. Thus, the staff does not make any determinations or conclusions regarding this information for these non-beltline RPV materials in its current review for the subsequent period of extended operation, or for any potential future licensing applications or license periods.

During its review, the staff noted that SLRA Tables 4.2.4-1 through 4.2.4-2 provided ART values at the ¼T and ¾T locations for RPV materials at the end of 60 years of plant operation (i.e., 56 EFPY), respectively. Additionally, SLRA Table 4.2.4-3 provided the ART values for the reactor vessel nozzle materials at the end of 60-years of plant operation (i.e., 56 EFPY). The staff noted that the contents of SLRA Tables 4.2.4-1 through 4.2.4-3 are associated with the licensee CLB and current licensed operation through 60-years (i.e., 56 EFPY); thus, they are not part of the applicant's evaluation of RPV integrity through the subsequent period of extended operation. As such, the staff does not make any determinations or conclusions regarding this information for ART values through 56 EFPY in its current review for the subsequent period of extended operation or for any potential future licensing applications or license periods. The staff reviewed the applicant's TLAA for the ART for the RPV and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii) consistent with the review procedures in SRP-SLR Section 4.7.3.1.2.

Material Property Values

During its audit (ML24085A699) and review, the staff also assessed the material property values (e.g., initial RT_{NDT}, weight % Cu, weight % Ni) for the RPV materials in SLRA Table 4.2.2-2 to (1) confirm these values were consistent with the CLB, (2) confirm revisions to the CLB values are justified and appropriate, or (3) determine if these values are justified and appropriate if the RPV materials were not previously addressed in the CLB. The staff noted that the additional details regarding the material property values are provided in PWROG-21037, Revision 2 (ML23233A176).

SLRA Table 4.2.2-1 and PWROG-21037, Revision 2, indicates that the weight % Cu of 0.127 is a generic value for SA-508 Class 2 nozzle forgings from PWROG-15109-NP-A, "PWR Pressure Vessel Nozzle Appendix G Evaluation" (ML20024E573) for the following RPV materials:

- Inlet Nozzle 436B-1 (Heat# Q2Q41W)
- Inlet Nozzle 436B-2 (Heat# Q2Q39W)
- Inlet Nozzle 436B-3 (Heat# Q2Q39W)
- Outlet Nozzle 437B-1 (Heat# Q2Q40)
- Outlet Nozzle 437B-2 (Heat# Q2Q40W)
- Outlet Nozzle 437B-3 (Heat# Q2Q44W)

PWROG-15109-NP-A provides the weight % Cu and Ni contents of 0.127 and 0.90, respectively, which the staff found were appropriately determined, consistent with the guidance in RG 1.99, Rev. 2, and is representative of U.S. PWR nozzle forgings. During its audit (ML24085A699), the staff confirmed the following:

- The weight % Cu content was not available in the certified material test reports or fabrication records for these RPV materials; thus, the NRC staff finds that the use of the weight % Cu content (i.e., 0.127) from PWROG-15109-NP-A is appropriate.
- The weight % Ni was available in its certified material test reports or fabrication records for these RPV materials; thus, NRC staff finds the use of the respective weight % Ni from these documents is appropriate in lieu of the weight % Ni contained in PWROG-15109-NP-A.

Based on its audit and review, and as described in the bullets above, the staff finds the use of weight % Cu and weight % Ni in SLRA Table 4.2.2-1 to be acceptable for Inlet Nozzles 436B-1, 436B-2 and 436B-3, and Outlet Nozzles 437B-1, 437B-2, and 437B-3.

SLRA Table 4.2.2-1 and Section C.1 of Attachment C of PWROG-21037, Revision 2 indicate that in some situations the heat number used in specific weld seams could not be identified. In order address these situations, the applicant indicated that bounding or generic plant-specific weld properties were developed for the following RPV materials based on a review of all weld heats used in the fabrication of the RPV at V.C. Summer:

- Nozzle Shell Longitudinal Weld Seams BE and BF
- Inlet/Outlet Nozzle Forgings to Nozzle Shell Weld Seams 15A/B/C & 16A/B/C

Section C.2 of Attachment C of PWROG-21037, Revision 2 states that two types of welds were used in the fabrication of CB&I Nuclear vessels (i.e., SMAWs and SAWs). Tables C.2-1 and C.2-2 summarize all the material properties of the SAW and SMAW, respectively, taken from the plant-specific fabrication files. The staff noted that Sections C.3 through C.10, and Sections C.11 through C.19, provide the additional details from the certified material test reports or fabrication records for each of the V.C. Summer SAW and SMAW, respectively. The staff's review of the applicant's approach to develop the bounding or generic plant-specific weld properties for these RPV materials are documented below.

RG 1.99, Rev.2 indicates, in part, the following:

- If measured values of initial RTNDT for the material in question are not available, generic mean values for that class of material may be used if there are sufficient test results to establish a mean and standard deviation for the class.
- If the best-estimate measured values for the material "weight-percent copper" and "weight-percent nickel" of the RPV material are not available, then conservative estimates (mean plus one standard deviation) based on generic data may be used if justification is provided.

Based on its review of information from certified material test reports or fabrication records contained in the Sections C.3 through C.19 of Attachment C of PWROG-21037, Revision 2, the staff noted the generic weld Cu% and Ni% contents for V.C. Summer welds seams in which the specific heat number could not be identified was determined based on the approach of "mean plus one standard deviation" of all weld data from the V.C. Summer RPV. The staff finds the generic weld Cu% and Ni% contents (i.e., 0.06 weight % and 1.01 weight %, respectively) for the "Nozzle Shell Longitudinal Weld Seams BE and BF" and "Inlet/Outlet Nozzle Forgings to Nozzle Shell Weld Seams 15A/B/C & 16A/B/C" to be acceptable because these values were determined consistent with RG 1.99, Rev. 2.

Based on its review of information from certified material test reports or fabrication records contained in the Sections C.3 through C.19 of Attachment C of PWROG-21037, Revision 2, the staff noted that the applicant selected the maximum RT_{NDT} value (i.e., 10°F) between all the SAW and SMAW used in the fabrication of the V.C. Summer RPV. The staff finds it reasonable and appropriate that the applicant assessed all available weld data and fabrication information for its plant-specific RPV because it is consistent with the intent of with the guidance RG 1.99, Rev. 2 to assess the data from same “class of material” when a measured value of initial RT_{NDT} for a specific material is not available. Additionally, the staff finds the applicant’s approach to select the maximum RT_{NDT} value (i.e., 10° F) between all the SAW and SMAW used in the fabrication of the V.C. Summer RPV as the initial RT_{NDT} for the “Nozzle Shell Longitudinal Weld Seams BE and BF” and “Inlet/Outlet Nozzle Forgings to Nozzle Shell Weld Seams 15A/B/C & 16A/B/C” to be acceptable because it is more conservative than the guidance provided in RG 1.99, Rev. 2.

Based on its review and audit, the staff verified that the material information (e.g., initial RT_{NDT}, weight % Cu, weight % Ni) for the RPV materials contained in SLRA Table 4.2.2-2 were based on information from certified material test reports or fabrication records, for the specific material, or were otherwise justified as described above. Thus, the staff finds the material property values for the RPV materials in SLRA Table 4.2.2-2 are acceptable and appropriate for use in determining ART values for the end of the subsequent period of extended operation Additionally, based on this review, the staff finds that the appropriate margin value, determined consistent with RG 1.99, Rev. 2, was applied for each RPV material for the purposes of addressing ART.

<u>Surveillance Data</u>

The staff noted that the applicant assessed relevant surveillance data to determine its credibility per the criteria in RG 1.99, Rev. 2, and considered whether it is appropriate to use when calculating ART values. Specifically, the applicant indicated that ART values for the following RPV materials in SLRA Tables 4.2.4-4 and 4.2.4-5 were determined based on surveillance data:

- Heat# 4P4784
    - Intermediate Shell Longitudinal Weld Seams BC & BD
    - Intermediate to Lower Shell Circumferential Weld Seam AB
    - Lower Shell Longitudinal Weld Seams BA & BB
    - Nozzle to Intermediate Shell Circumferential Weld Seam AC
    - Heat# A9154-1: Intermediate Shell 11-1

The staff noted that WCAP-18728-NP, Revision 5 (ML23233A176), provides the applicant’s assessment of surveillance data applicable to the RPVs. The staff reviewed Section 3, “Material Property Input”, and Appendix A, “VCSNS Unit 1 Credibility Evaluation” to determine whether the applicant’s use of its surveillance data is appropriate. Based on its review, the staff determined that the assessment of the plant-specific surveillance data was performed consistent with criteria in RG 1.99, Rev. 2. In particular, the staff finds that the credible surveillance data for Heat# 4P4784 is applicable for use in the applicant’s evaluation for ART values for the Intermediate Shell Longitudinal Weld Seams BC & BD, Intermediate to Lower Shell Circumferential Weld Seam AB, Lower Shell Longitudinal Weld Seams BA & BB, and Nozzle to Intermediate Shell Circumferential Weld Seam AC.

Additionally, the staff finds that the surveillance data for Intermediate Shell 11-1 (Heat# A9154-1) is non-credible and not applicable for use in the applicant's evaluation for ART values for this RPV material. SLRA Section 4.2.5 identifies non-credible plant-specific surveillance data for Intermediate Shell 11-1 (Heat# A9154-1); however, it also states that since the surveillance data was determined to be non-conservative, it is not credited. The staff confirmed that this non-credible surveillance data was not used in determining the limiting ART value discussed below; thus, it was not considered relevant to the staff's evaluation of adjusted reference temperature.

<u>Projected 72 EFPY ART Values</u>

The applicant stated that the limiting ART value at 72 EFPY is 147.7°F for the Intermediate Shell 11-1 (Heat# 4P4784).

Based on its review, as described above related to material property information and surveillance data, the staff also verified that the projected ART values were calculated in accordance with RG 1.99, Rev. 2. As such, the staff finds that at the time of the SLRA, the limiting ART values at 72 EFPY identified by the applicant are appropriate. The staff noted that the potential availability of future surveillance data may impact the ART values at 72 EFPY and would be addressed as part of any future licensing actions. The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(ii) and the associated acceptance criteria in SRP-SLR Section 4.7.2.1.2, that the analyses for ART of the RPV have been projected to the end of the subsequent period of extended operation. because the ART analyses were reevaluated consistent with RG 1.99, Rev. 2 when considering the neutron fluence values for 80 years (72 EFPY). The staff noted that ART of the limiting RPV material is used to adjust the beltline pressure-temperature (P-T) limit curves to account for irradiation effects, which are evaluated in SE Section 4.2.5.

4.2.4.3 FSAR Supplement

SLRA Section A3.2.4 provides the FSAR supplement summarizing the TLAA for ART for the RPV. The staff reviewed SLRA Section A3.2.4 consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the staff finds that the FSAR 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 upper-shelf energy, as required by 10 CFR 54.21(d).

4.2.4.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for ART has been projected to the end of the subsequent period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.5 Pressure-Temperature Limits

4.2.5.1 Summary of Technical Information in the Application

SLRA Section 4.2.5 describes the applicant's TLAA for P-T limits. The applicant dispositioned the TLAA for the P-T limits for the RPV in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of irradiation embrittlement of the RPV on the intended functions will be adequately managed through the subsequent period of extended operation.

4.2.5.2 Staff Evaluation

The staff reviewed the applicant's P-T limits TLAA 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 4.2.3.1.4.3.

SRP-SLR Section 4.2.2.1.4.3 specifies updated P-T limits for the subsequent period of extended operation which must be established and completed using the applicable technical specification change process for updating the P-T limit curves prior to the plant's entry into the subsequent period of extended operation. The 10 CFR 50.90 change process for P-T limits located in the Limiting Conditions for Operations can be considered adequate AMPs or aging management activities within the scope of 10 CFR 54.21(c)(1)(iii), such that P-T limits will be maintained through the subsequent period of extended operation.

The staff noted SLRA Table 4.2.5-1 provides, in part, a summary of the limiting ¼T and ¾T ART values for the current 56 EFPY P-T limit curves in TS Figures 3.4-2 and 3.4-3 (i.e., 153°F and 138°F, respectively) and at 72 EFPY (i.e., 147.7°F and 134.2°F, respectively) ART value for the limiting material (i.e., Intermediate Shell 11-1). The staff's review of the applicant's 72 EFPY ART values and adjusted reference TLAA are documented in SE Section 4.2.4.2. The staff noted that at the time of its review of the SLRA, the ¼T and ¾T ART values for the current 56 EFPY P-T limit curves bound the projected 72 EFPY ART values; however, when updated P-T limits are submitted to the staff for review and approval in accordance with 10 CFR 50.90, the application of the limiting ART values for 72 EFPY in the development of the P-T limits will be subject to the staff's review.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii) and the associated acceptance criteria in SRP-SLR Section 4.2.2.1.4.3, that the effects of irradiation embrittlement on the RPV will be adequately managed for the subsequent period of extended operation because P-T limits will be updated and submitted to the staff for review and approval in accordance with established regulatory processes (i.e., 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit").

4.2.5.3 FSAR Supplement

SLRA Section A3.2.5 provides the FSAR supplement summarizing the TLAA for P-T limits. The staff reviewed SLRA Section A3.2.5 consistent with the review procedures in SRP-SLR Section 4.2.3.2.

SLRA Section A3.2.5 states the end of the subsequent period of extended operation ART values at the ¼T and ¾T locations remain bounded by the ART values used in the current P-T limit curves; thus, the P-T limit curves implemented in the TS remain valid for the subsequent period of extended operation (72 EFPY) for the cylindrical shell materials. The staff noted that at the time of its review of the SLRA, the ¼T and ¾T ART values for the current 56 EFPY P-T limit curves bound the projected 72 EFPY ART values; however, when updated P-T limits are submitted to the staff for review and approval in accordance with 10 CFR 50.90, the application of the limiting ART values used in the development of the P-T limits will be subject to the staff's review.

Based on its review, the staff finds that the FSAR 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 TLAA for P-T limits, 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 irradiation embrittlement on the intended functions of the RPV and the associated P-T limits will be updated and submitted to the NRC in accordance with 10 CFR 50.90 prior to exceeding the current terms of applicability in the technical specification. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.2.6 Low Temperature Overpressure Protection

4.2.6.1 Summary of Technical Information in the Application

SLRA Section 4.2.6 describes the applicant's TLAA for the low temperature overpressure protection system, which ensures that the integrity of the reactor coolant pressure boundary is not compromised by precluding violation of P-T limit curves during startup and shutdown conditions. The applicant dispositioned the TLAA for the low temperature overpressure protection system in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analysis for the low temperature overpressure protection setpoints remains valid for the subsequent period of extended operation.

4.2.6.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the low temperature overprotection system and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR Section 4.7.3.1.1.

SRP-SLR Section 4.7.2.1.1 states that the applicant must demonstrate that the analysis remains valid for the subsequent period of extended operation. The analysis remains valid because it is shown to be bounding even during the subsequent period of extended operation. No changes to the existing analysis are necessary.

SLRA Section 4.2.6 states that the Low-Temperature Over-Pressurization System (LTOPS) enabling temperature and relief valve analyses that demonstrate the capability of the relief valves to protect the integrity of the RPV are TLAAs that require reevaluation whenever the P-T curves are revised. Additionally, the applicant stated that it demonstrated that the current P-T limit curves continue to remain valid for the subsequent period of extended operation (72 EFPY) in SLRA Section 4.2.5; therefore, the LTOP enabling temperature and analyses also remain valid for the subsequent period of extended operation.

The staff noted SLRA Table 4.2.5-1 provides, in part, a summary of the limiting ¼T and ¾T ART values for the current 56 EFPY P-T limit curves in TS figures 3.4-2 and 3.4-3 (i.e., 153°F and 138°F, respectively) and at 72 EFPY (i.e., 147.7°F and 134.2°F, respectively) ART value for the limiting material (i.e., Intermediate Shell 11-1). The staff's review of the applicant's 72 EFPY ART values and adjusted reference TLAA are documented in SE Section 4.2.4.2. The staff noted that at the time of its review of the SLRA, the ¼T and ¾T ART values for the current 56 EFPY P-T limit curves bound the projected 72 EFPY ART values; however, when updated P-T limits are submitted to the staff for review and approval in accordance with 10 CFR 50.90 (as evaluated in SE Section 4.2.5), the reevaluation of the LTOPS enabling temperature and relief valve analyses to protect the integrity of the RPV will be subject of staff's review.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i) and the associated acceptance criteria in SRP-SLR Section 4.7.2.1.1, that the TLAA for the low temperature overpressure protection system to protect the P-T limit curves remains valid for the subsequent period of extended operation because the LTOPS enabling temperatures developed based on the ¼T and ¾T ART values for the current 56 EFPY P-T limit curves in TS figures 3.4-2 and 3.4-3 are bounding, compared to the corresponding projected 72 EFPY ART values. However, as described in SE Section 4.2.5 and above, P-T limits will be updated for 72 EFPY and submitted to the staff for review and approval in accordance with established regulatory processes (i.e., 10 CFR 50.90," Application for amendment of license, construction permit, or early site permit"). The reevaluation of the LTOPS enabling temperature and relief valve analyses to protect the integrity of the RPV will be subject to the staff's review.

4.2.6.3 FSAR Supplement

SLRA Section A3.2.6 provides the FSAR supplement summarizing the TLAA for the low temperature overpressure protection system to protect the P-T limit curves. The staff reviewed SLRA Section A3.2.6 consistent with the review procedures in SRP-SLR Section 4.7.3.2.

SLRA Section A3.2.6 indicates that the TS Limiting Condition for Operation 3.4.9.3 specifies an LTOP enabling temperature of 300°F, which remains conservative and can be maintained for the subsequent period of extended operation. The staff noted that at the time of its review of the SLRA, the ¼T and ¾T ART values for the current 56 EFPY P-T limit curves bound the projected 72 EFPY ART values. However, when updated P-T limits are submitted to the staff for review and approval in accordance with 10 CFR 50.90, the application of the limiting ART values for use in the development of the P-T limits and the reevaluation of the LTOPS enabling temperature and relief valve analyses to protect the P-T limit curves will be subject to the staff's review.

Based on its review, the staff finds that the FSAR 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 low temperature overpressure protection system to protect the P-T limit curves, 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)(i), that the analyses for the low temperature overpressure protection system to protect the integrity of the RPV remains valid for the subsequent period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3 Metal Fatigue

4.3.1 Transient Cycle Projections For 80 Years

4.3.1.1 Summary of Technical Information in the Application

SLRA Section 4.3.1, as supplemented by letter dated May 30, 2024 (ML24155A146), describes the applicant's transient cycle projections for 80 years of operation. The applicant performed linear cycle projections based on the actual cycles observed since the start of the operation up to December 31, 2019. These 80-year projected cycles are used as inputs to the fatigue TLAAs described in SLRA Sections 4.3.2 through 4.3.5. 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 4.3.5.

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 (Class 1 fatigue analyses), 4.3.3 (non-Class 1 fatigue analyses), 4.3.4 (environmentally assisted fatigue analysis), and 4.3.5 (high-energy line break analysis). The staff finds that the 80-year cycle projections are not a fatigue TLAA by themselves because the cycle projections are used as inputs to fatigue TLAAs and the specific depositions of fatigue TLAAs are addressed in SLRA Sections 4.3.2 through 4.3.5. Accordingly, this section documents the staff's evaluation of the adequacy of 80-year cycle projections.

The applicant explained that it reviewed the operating data to identify the number of cumulative cycles for each transient that occurred from the start of the operation through December 31, 2019. The applicant also indicated that a linear-rate cycle extrapolation of the total past operating period was performed to project the cycles for 80 years of operation.

SLRA Section 4.3.1, as supplemented by the response to RAI 4.3.1-1 (ML24155A146), states that the absence of recent accelerated cycle accumulation rates such that the use of rates based on the entire past operating period remains conservative. The applicant's discussion cites recent cycle data for the "inadvertent auxiliary spray," "reactor trip from full power with cooldown and safety injection (Case C)," "heatup," and "cooldown" transients to demonstrate the bounding nature of the proposed cycle extrapolation approach.

The staff finds the applicant's cycle extrapolation approach to be acceptable because (1) the full-life cycle accumulation rate is higher than the most recent 10-year cycle accumulation rate for the "inadvertent auxiliary spray" transient and "reactor trip from full power with cooldown and safety injection (Case C)" transient, which have relatively small margins in the 80-year projected cycles against the design cycles, and (2) the full-life-cycle accumulation rate is higher than the most recent 10-year cycle accumulation rate for the "heatup" and "cooldown" transients, respectively, which supports that the overall operating characteristics and the associated design cycles are conservatively characterized by the full-life cycle accumulation rates (i.e., cycle accumulation rates since the start of the plant operation).

SLRA Section 4.3.1, as supplemented by the response to RAI 4.3.1-2 (ML24155A146), discusses the additional transients for the reactor coolant system (RCS) and the auxiliary piping systems connected to the RCS. The staff finds that the applicant's discussion is acceptable because it adequately describes the cumulative cycles for the additional transients. In addition, the applicant's discussion is acceptable because the 80-year projected cycles of these transients do not exceed the design cycles such that these transient cycles do not affect the validity of the Class 1 fatigue waiver evaluation and cumulative usage factor (CUF) analyses in SLRA Section 4.3.2.

As discussed above, the staff finds that the cycle projection approach using the transient cycle data since the start of the operation up to December 31, 2019 is acceptable because (1) the cycle projections are based on the actual cycle data, and (2) the cycle data from the start of operation are sufficient to represent the operating characteristics of the plant and the cycle accumulation projections for the subsequent period of extended operation. The staff's evaluations of the fatigue TLAAs and associated TLAA dispositions are documented in Sections 4.3.2 through 4.3.5 of this SE.

4.3.1.3 FSAR Supplement

SLRA Section A3.3.1 provides the FSAR supplement summarizing the transient cycle projections for 80 years of operation. The staff reviewed SLRA Section A3.3.1, consistent with the review procedures in SRP-SLR Section 4.3.3.2.

Based on its review of the FSAR supplement, the staff finds that the FSAR 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 action 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 its review, the staff concludes that the transient cycle projections for 80 years of operation, which is based on actual cycle data, are reasonable to be used in the fatigue analyses for the subsequent period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the 80-year cycle projections, as required by 10 CFR 54.21(d).

4.3.2 ASME Code, Section III, Class 1 Fatigue Analyses

4.3.2.1 Summary of Technical Information in the Application

SLRA Section 4.3.2, as supplemented by the letter dated May 30, 2024 (ML24155A146), describes the applicant's fatigue TLAAs on ASME Code Section III, Class 1 components and piping. The components evaluated in the fatigue analyses are the control rod drive mechanism, pressurizer, reactor coolant pumps (RCPs), reactor vessel and replacement reactor vessel closure head, steam generators, Class 1 piping, and pressurizer surge line. The Class 1 fatigue analyses also include the Class 1 component fatigue waivers. The fatigue analyses in the CLB demonstrate that the CUFs do not exceed the design limit of 1.0 based on the design transient cycles. The applicant stated that the design transient cycles in the CLB are bounding for the 80-year projected transient cycles.

For the Class 1 piping and pressurizer surge line, the applicant dispositioned the fatigue TLAAs in accordance with 10 CFR 54.21(c)(1)(i) to demonstrate that the CUF values remain less than the design limit (i.e., 1.0). For the Class 1 components, including the components subject to the fatigue waiver evaluation, the applicant dispositioned the TLAAs in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of cumulative fatigue damage on the intended functions 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 components do not exceed the design limit of 1.0, and will be used to ensure that the fatigue waiver evaluations remain valid for the subsequent period of extended operation.

4.3.2.2 Staff Evaluation

The staff reviewed the applicant's fatigue TLAAs for the Class 1 piping and pressurizer surge line, as well as the corresponding disposition of the TLAAs 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. In addition, the staff reviewed the applicant's fatigue TLAAs for the Class 1 components, including the fatigue waiver evaluations, and the corresponding disposition of the TLAAs in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.3.3.1.1.3.

With respect to the Class 1 piping and pressurizer surge line, the applicant explained that the design transient cycles evaluated in the fatigue analyses bound the corresponding 80-year projected transient cycles, as demonstrated in SLRA Table 4.3.1-1. Therefore, the applicant determined that the CUF values for the Class 1 piping and pressurizer surge line will remain less than 1.0 for the subsequent period of extended operation, consistent with the existing fatigue analyses.

The applicant also explained that the Class 1 piping in the fatigue analyses include the following piping:

- reactor coolant loop hot-let, cold-leg and crossover piping
- safety injection accumulator piping
- hot-leg safety injection piping
- cold-leg safety injection piping
- residual heat removal (RHR) piping
- normal and alternate charging piping
- normal letdown with drain piping
- drain piping
- excess letdown with drain piping
- pressurizer spray line piping
- pressurizer safety and relief piping

The staff noted that SLRA Table 4.3.1-1 indicates that the design transient cycles, which are used in the existing CUF analyses for the Class 1 piping and pressurizer surge line, bound the 80-year projected cycles so that the applicant's TLAA disposition based on the bounding nature of the design transient cycles is reasonable.

SLRA Section 4.3.2, as supplemented by the response to RAI 4.3.1-2 (ML24155A146), discusses the cumulative cycles (up to December 31, 2019), 80-year projected cycles and design cycles for additional RCS transients (e.g., “feedwater cycling at hot shutdown” transient, “unit loading between 0 and 15 percent of full power” transient and “unit unloading between 0 and 15 percent of full power” transient). The staff finds that the applicant’s discussion is acceptable because it confirms that the design cycles of the additional RCS transients are bounding for the 80-year projected cycles and, therefore, the bounding nature of the design cycles supports the applicant’s disposition of the Class 1 piping fatigue analysis in accordance with 10 CFR 54.21(c)(1)(i).

As discussed above, the SLRA indicates that the CUF values for the pressurizer surge line will remain less than 1.0 for the subsequent period of extended operation based on the 80-year projected cycles, which are less than the design cycles as listed in SLRA Table 4.3.1-1.

SLRA Section 4.3.2, as supplemented by the response to RAI 4.3.2-1 (ML24155A146), discusses the 80-year projected cycles and design cycles of the pressurizer surge line transients that are not tied to the heatup/cooldown transients. The staff finds that the applicant’s discussion is acceptable because it confirms that the 80-year projected cycles are less than the design cycles of the pressurizer surge line transients that are not tied to the heatup/cooldown transients and, therefore, the bounding nature of the design cycles supports the applicant’s disposition for the surge line fatigue analysis in accordance with 10 CFR 54.21(c)(1)(i).

The Class 1 fatigue analyses also include the following components:

- control rod drive mechanism
- pressurizer
- RCPs
- reactor vessel and replacement reactor vessel closure head
- steam generators

The applicant explained that the design transient cycles analyzed in the fatigue analyses for these components are bounding for the 80-year projected transient cycles applicable for the CUF calculations and, therefore, the staff finds that there is reasonable assurance that the CUF values will continue to meet the fatigue design limit (i.e., 1.0) for the subsequent period of extended operation.

The applicant further addressed the fatigue waiver evaluation for some of the steam generator and RCP components as described in SLRA Table 4.3.2.6-1. The applicant stated that the existing fatigue waiver evaluation for these components complies with the fatigue waiver provisions in ASME Code Section III, NB-3222.4(d). The applicant also explained that the design transient cycles analyzed in the fatigue waiver evaluation are bounding for the 80-year projected transient cycles applicable to the fatigue waiver evaluation and, therefore, the staff finds that the fatigue waiver evaluation remains valid for the subsequent period of extended operation.

In addition, the applicant proposed to use the Fatigue Monitoring AMP (SLRA Section B3.1) to manage the aging effects of fatigue for the Class 1 components other than the Class 1 piping and pressurizer surge line. The staff finds that the applicant’s aging management approach is acceptable because the Fatigue Monitoring AMP monitors the actual transient cycles to ensure that the actual cycles do not exceed the transient cycles that are assumed in the CUF calculations for the Class 1 components.

The staff finds that the fatigue TLAAs for the ASME Code Section III, Class 1 components including the components subject to fatigue waiver evaluation are acceptable because the 80-year projected transient cycles are less than the design cycles, which provides reasonable assurance that the CUF values will not exceed the design limit of 1.0 and that the fatigue waiver evaluation remains valid, consistent with the CLB fatigue analyses. For the Class 1 components and fatigue waiver evaluation, the Fatigue Monitoring AMP will monitor the actual transient cycles to ensure that the CUF values do not exceed the design limit of 1.0 and that the fatigue waiver evaluation remains valid by performing corrective actions as needed (e.g., repair/replacement of components and refinement of fatigue analysis).

As discussed above, for the ASME Code Section III, Class 1 piping and pressurizer surge line, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the CUF values remain less than 1.0 for the subsequent period of extended operation because the 80-year projected cycles are less than the design cycles, which provides reasonable assurance that the CUF values will not exceed the design limit of 1.0. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.1 because the applicant demonstrated that the 80-year cycle projections based on the actual cycle data are bounded by the design cycles that are assumed in the CUF analyses.

For the ASME Code Section III, Class 1 components, including the components subject to fatigue waiver evaluation, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii) and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3, 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 because the Fatigue Monitoring AMP will monitor the actual transient cycles to ensure that (1) the CUF values do not exceed the design limit of 1.0 and (2) the fatigue waiver evaluation remains valid by performing corrective actions as needed. As previously noted, the staff’s evaluation of the Fatigue Monitoring AMP is documented in SE Section 3.0.3.2.1.

4.3.2.3 FSAR Supplement

SLRA Section A3.3.2 provides the FSAR supplement summarizing the fatigue analyses for the Class 1 components and piping. The staff reviewed SLRA Section A3.3.2, consistent with the review procedures in SRP-SLR Section 4.3.3.2.

Based on its review of the FSAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the fatigue TLAAs for the Class 1 components and piping, as required by 10 CFR 54.21(d).

4.3.2.4 Conclusion

Based on its review, the staff concludes the following:

- The applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the existing fatigue analyses for the Class 1 piping and pressurizer surge line will remain valid for the subsequent period of extended operation.

- 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 ASME Code Section III, Class 1 components, including the components subject to the fatigue waiver evaluation, will be adequately managed by the Fatigue Monitoring AMP for the subsequent period of extended operation.

The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.3 Non-Class 1 Allowable Stress Analyses

4.3.3.1 Summary of Technical Information in the Application

SLRA Section 4.3.3, as supplemented by letter dated May 30, 2024 (ML24155A146), describes the applicant's TLAA on allowable stress for ASME Code Section III, (Class 2 and 3), and 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 (CUF), but cyclic loading is considered in a simplified manner in the design process. As shown in SLRA Table 4.3.3-1, the applicant stated that the 80-year projected cycles of the non-Class 1 piping systems will not exceed 7,000 cycles so that no stress reduction factor is required for the allowable stress for thermal expansion in the stress analysis for these piping systems.

The applicant dispositioned the TLAA on allowable stress 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.

4.3.3.2 Staff Evaluation

The staff reviewed the applicant's TLAA on allowable stress 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 stated 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 code. 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), as well as 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 4.3.3-1 describes the conservatively estimated transient cycle for 80 years of operation for the non-Class 1 piping systems. The applicant estimated the bounding cycles based on design transient cycles, piping design information, test requirements, specific system-level knowledge, and FSAR information.

In its review, the staff finds that the overall cycle estimation approach is reasonable because the applicant used the relevant cycle information such as design cycles, test requirements, piping design information, specific system-level knowledge, and FSAR information.

SLRA Section 4.3.3, as supplemented by the response to RAI 4.3.3-1 (ML24155A146), describes the 80-year projected reactor coolant line (RCL) and piping-specific transient cycles for the non-Class 1 piping systems. The cycle projections and related discussion are acceptable because (1) the applicant identified the 80-year projected RCL and piping-specific transient cycles applicable for the non-Class 1 piping systems, and (2) the conservatively estimated 80-year cycles for the non-Class 1 piping systems do not exceed 7,000 cycles.

The staff finds the applicant’s TLAA on allowable stress for non-Class 1 piping systems is acceptable because:

- The applicant used relevant cycle information (e.g., design cycles, test requirements, piping design information, specific system-level knowledge, and FSAR information) to determine the 80-year project transient cycles.
- The cycle estimations for the non-Class 1 piping systems connected to the RCL include both the RCS cycles that contribute to the projected cycles, as well as the piping-specific transient cycles.
- The 80-year projected transient cycles are less than 7,000 cycles so that there is no need to apply a stress range reduction factor less than 1.0 to the allowable stress for thermal expansion.
- Based on the stress range reduction factor of 1.0 for 80 years of operation, the allowable stress analysis remains valid for the subsequent period of extended operation.

As discussed above, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i) and the associated acceptance criteria in SRP-SLR Section 4.3.2.1.1.1, that the analysis on the allowable stress for the non-Class 1 piping systems remains valid for the subsequent period of extended operation because the applicant demonstrated that the existing allowable stress remains valid for the subsequent period of extended operation.

4.3.3.3 FSAR Supplement

SLRA Section A3.3.3 provides the FSAR supplement summarizing the fatigue analysis of the non-Class 1 ping systems. The staff reviewed SLRA Section A3.3.3, consistent with the review procedures in SRP-SLR Section 4.3.3.2.

Based on its review of the FSAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and therefore is acceptable. Additionally, the staff also finds that the applicant provided an adequate summary description of its actions to address the fatigue TLAA for the non-Class 1 piping systems, as required by 10 CFR 54.21(d).

4.3.3.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the analysis on allowable stress for the non-Class 1 piping systems remains valid for the subsequent period of extended operation. In addition, the staff concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.4 Environmentally Assisted Fatigue

4.3.4.1 Summary of Technical Information in the Application

SLRA Section 4.3.4, as supplemented by letters dated April 1, 2024 (ML24095A207), and May 30, 2024 (ML24155A146), describes the applicant's TLAA on environmentally assisted fatigue (EAF) of the ASME Code Section III, Class 1 components, and piping. The EAF analysis considers the EAF locations described in NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components" and additional plant-specific locations that could be more limiting than the NUREG/CR-6260 locations. In the analysis, the environmental cumulative usage factor (CUF_{en}) is calculated by applying the environmental fatigue correction factor (F_{en}) for the component material in accordance with NUREG/CR-6909, Revision 1, "Effect of LWR Water Environments on the Fatigue Life of Reactor Materials."

The applicant dispositioned the EAF TLAA in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of EAF on the intended functions of the Class 1 components and piping will be adequately managed by the Fatigue Monitoring AMP, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP, and Steam Generators AMP (SLRA Sections B3.1, B2.1.1 and B2.1.10, respectively).

4.3.4.2 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.

The applicant performed the EAF analysis on the ASME Code Section III, Class 1 components and piping. The staff noted that the EAF analysis includes the following NUREG/CR-6260 locations applicable to the V.C. Summer Nuclear Station (VCSNS):

- reactor vessel shell and lower head
- reactor vessel inlet and outlet nozzles
- pressurizer surge line including hot-leg and pressurizer nozzles
- reactor coolant piping charging system nozzle
- reactor coolant piping safety injection nozzle
- RHR system Class 1 piping

The staff finds that the inclusion of the NUREG/CR-6260 locations in the EAF analysis is acceptable because it is consistent with the guidance in SRP-SLR 4.3.2.1.2.

The applicant also performed a screening evaluation for EAF to identify additional locations that may be more limiting than the NUREG/CR-6260 locations. The screening process evaluated the Class 1 components and piping, including the NUREG/CR-6260 locations. In the screening evaluation, the applicant grouped the Class 1 components and piping systems into transient sections. The staff finds that the applicant's use of the transient sections is acceptable for the screening evaluation because each transient section experiences the same thermal and pressure transients such that the EAF locations within each transient section can be compared in a consistent and comprehensive manner for the determination of the limiting EAF locations (also called “sentinel locations”).

The applicant also indicated that in the screening evaluation, the F_{en} values were calculated in accordance with the guidance in NUREG/CR-6909, Revision 1. The applicant further explained that the most conservative F_{en} values were used in the screening evaluation.

SLRA Section 4.3.4, as supplemented by the response to RAI 4.3.4-1 (ML24155A146), discusses the meaning of the most conservative F_{en} values used in the screening evaluation. The most conservative F_{en} values were determined by using the strain rate, material temperature, and sulfur content, as applicable, that would maximize the F_{en} for each material type based on the F_{en} equations in NUREG/CR-6909, Revision 1. In addition, the screening F_{en} values were refined to remove the conservatism associated with the F_{en} values by ungrouping the grouped transients and using the fatigue design curves in NUREG/CR-6909 Revision 1.

The applicant’s approach regarding the calculation of the conservative F_{en} values is acceptable because (1) the conservative screening F_{en} values were calculated in accordance with the guidance in NUREG/CR-6909, Revision 1, and (2) the use of the fatigue design curves in NUREG/CR-6909, Revision 1 is also consistent with SRP-SLR Section 4.3.2.1.2 and RG 1.207, Revision 1.

SLRA Section 4.3.4, as supplemented by the response to RAI 4.3.4-5 (ML24155A146), discusses CUF_{en} calculations for (1) safety injection 6-inch RCL cold-leg nozzle, and (2) RHR 6-inch hot-leg nozzle. The applicant’s CUF_{en} calculation is acceptable because of the following:

(1) the CUF_{en} values for the safety injection 6-inch RCL cold-leg nozzle and the RHR 6-inch hot-leg nozzle are based on the design cycles, which are bounding for the 80-year projected cycles;

(2) the bounding nature of the design cycles for 80-year projected cycles provides reasonable assurance that the CUF_{en} values continue to meet the fatigue design limit (i.e., 1.0) for 80 years of operation; and

(3) if a design transient approaches its cycle limit, a corrective action will be taken (e.g., refinement of CUF_{en} calculations and repair/replacement activity) to ensure that the CUF_{en} values do not exceed the fatigue design limit.

SLRA Section 4.3.4, as supplemented by the response to RAI 4.3.4-4 (ML24155A146), discusses the CUF_{en} calculation for the pressurizer lower head at the heater penetration (low alloy steel location). The CUF_{en} calculation is acceptable because of the following:

(1) the CUF_{en} value of the pressurizer lower head at the heater penetration is based on the design cycles that are bounding for the 80-year projected cycles;

(2) the bounding nature of the design cycles for 80-year projected cycles provides reasonable assurance that the CUF_{en} value continues to meet the fatigue design limit (i.e., 1.0) for the subsequent period of extended operation; and

(3) if a design transient approaches its cycle limit, a corrective action will be taken (e.g., refinement of CUF_{en} calculations and repair/replacement activity) to ensure that the CUF_{en} value does not exceed the fatigue design limit.

SLRA Section 4.3.4 states that, among the limiting EAF locations listed in SLRA Table 4.3.4-1, a flaw-tolerance evaluation was performed on the normal and alternate charging cold-leg nozzle-to-pipe welds, as well as the pressurizer surge line hot-leg nozzle-to-pipe weld in accordance with Non-mandatory Appendix L of ASME Code Section XI. The staff noted that the flaw-tolerance evaluation calculated the fatigue crack growth rate in accordance with ASME Code Case N-809. In Code Case N-809, the parameter defining the effect of metal temperature on fatigue crack growth rate (ST) has a minimum value at 300°F for austenitic stainless steels.

SLRA Section 4.3.4, as supplemented by the response to RAI 4.3.4-3 (ML24155A146), discusses how the applicant calculated the ST values in the fatigue crack growth analysis. The applicant’s approach for the calculation of the ST values is acceptable because the applicant used the conservatively bounding ST values for the transients in terms of the temperature effect on crack growth rates and, therefore, the crack growth was calculated based on the conservative ST values in the fatigue crack growth analysis.

As discussed above, SLRA Section 4.3.4 explains that, among the limiting EAF locations listed in SLRA Table 4.3.4-1, flaw-tolerance evaluations were performed on the pressurizer surge line hot-leg nozzle-to-pipe weld (14-inch line), as well as normal and alternate charging cold-leg nozzle-to-pipe welds (3-inch line) in accordance with ASME Code Section XI, Appendix L.

SLRA Section 4.3.4, as supplemented by the response to RAI 4.3.4-2 (ML24155A146), discusses the aging management for the pressurizer surge line hot-leg nozzle-to-pipe weld. The applicant’s aging management approach is acceptable because of the following:

- The previous inspection results for the weld, including preservice volumetric examination results, confirm the absence of recordable indications.
- Ultrasonic examination will be performed on the weld in 2041, prior to entering the subsequent period of extended operation in 2042, to confirm the continued absence of fatigue cracking.
- The flaw-tolerance evaluation in accordance with ASME Code Section XI, Appendix L supports successive inspections every 48 years and provides reasonable assurance for the structural integrity of the weld for the subsequent period of extended.
- The flaw-tolerance evaluation was performed by using conservative ST values in the evaluation of temperature effect on crack growth rates as discussed above.
- The pressurizer surge line including the nozzle-to-pipe weld is also included as a potential inspection location in the risk-informed inservice inspection to address the degradation due to thermal fatigue.

SLRA Section 4.3.4, as supplemented by the response to RAI 4.3.4-2 (ML24155A146), discusses the aging management for the normal and alternate charging cold-leg nozzle-to-pipe welds (i.e., branch line welds). The applicant’s aging management approach is acceptable because of the following:

- The flaw-tolerance evaluation in accordance with ASME Code Section XI, Appendix L supports the time between successive inspections more than 80 years, which provides reasonable assurance that there is no concern related to EAF and structural integrity of the welds throughout 80 years of operation.
- The previous inspection results for the welds, including preservice volumetric examination results, confirm the absence of recordable indications.

- Ultrasonic examination will be performed on the alternative charging nozzle-to-pipe weld, which is representative of the normal charging nozzle-to-pipe weld in terms of susceptibility to EAF during the fifth inservice inspection internal (i.e., January 2024 through December 2033) to confirm the continued absence of fatigue cracking.
- The fifth inservice inspection plan also includes volumetric inspection of the normal charging line at other field welds per ASME Code Case N-716-2. These inspection locations are in the same region as the location of the flaw-tolerance evaluation. Accordingly, the volumetric inspection also manages the degradation due to fatigue for the normal charging line.
- The normal and alternative charging lines are included in the risk-informed inservice inspection as potential inspection locations for the subsequent period of extended operation.

With respect to the aging management, the aging effects of EAF on the intended functions of the pressurizer surge line nozzle-to-pipe weld and normal and alternate charging nozzle-to-pipe welds will be managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP (SE Section 3.0.3.2.4), including the risk-informed inservice inspection, in conjunction with the flaw-tolerance evaluation per ASME Code Section XI, Appendix L. Additionally, the Fatigue Monitoring AMP will monitor the fatigue transients to ensure that the actual transient cycles are bounded by the transient cycles that are used in the flaw-tolerance evaluation.

The staff finds that the applicant’s use of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP in conjunction with the flaw-tolerance evaluation and Fatigue Monitoring AMP is adequate to manage the effects of EAF for the pressurizer surge line nozzle-to-pipe weld as well as the charging line nozzle-to-pipe welds because the inspections based on the flaw-tolerance evaluation are sufficient to ensure the integrity of the components. In addition, the Fatigue Monitoring AMP ensures that the analytical basis for the flaw-tolerance evaluation remains valid by monitoring the actual transient cycles.

The applicant indicated that the aging effects of EAF for the intended functions of the steam generator tubes will be managed by the Steam Generator AMP (i.e., SE Section 3.0.3.2.8). The staff finds that the applicant’s use of the Steam Generators AMP is acceptable because the plan includes periodic inspections and corrective actions, as needed, to ensure the integrity of the steam generator tubes.

The applicant also indicated that the aging effects of EAF on the intended functions of the Class 1 components and piping will be managed by the Fatigue Monitoring AMP (i.e., SE Section 3.0.3.2.1). 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. 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 (i.e., 1.0), consistent with the guidance in GALL-SLR AMP X.M1. “Fatigue Monitoring” and SRP-SLR Section 4.3.2.1.2.3.

For the Class 1 components and piping, the staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(iii) and the associated acceptance criteria in SRP-SLR Section 4.3.2.1.2.3, that the aging effects of EAF on the intended functions of the Class 1 components and piping will be adequately managed for the subsequent period of extended operation because the applicant proposed to use the Fatigue Monitoring AMP, Steam Generators AMP, and ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP in conjunction with the Appendix L flaw-tolerance evaluation to manage the effects of EAF, consistent with the guidance in SRP-SLR Section 4.3.2.1.2.3.

4.3.4.3 FSAR Supplement

SLRA Section A3.3.4 provides the FSAR supplement summarizing the EAF analysis of the Class 1 components and piping. The staff reviewed the SLRA section for FSAR supplement, consistent with the review procedures in SRP-SLR Section 4.3.3.2.

Based on its review of the FSAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR Section 4.3.2.2, and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the EAF TLAA for the Class 1 components and piping, as required by 10 CFR 54.21(d).

4.3.4.4 Conclusion

Based on its review, the staff concludes the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of EAF on the intended functions of the ASME Code Section III, Class 1 components and piping will be adequately managed by the Fatigue Monitoring AMP, Steam Generators AMP, and ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP in conjunction with the ASME Code Section XI Appendix L flaw-tolerance evaluation for the subsequent period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.5 High-Energy Line Break Analyses

4.3.5.1 Summary of Technical Information in the Application

SLRA Section 4.3.5, as supplemented by letters on May 6, 2024 (ML24129A200) and May 30, 2024 (ML24155A146), addresses the applicant’s TLAA on the high-energy line break (HELB) analysis of ASME Code Section III Class 1 piping systems. As described in FSAR Section 3.6.2, the high-energy piping lines were postulated to experience a longitudinal or circumferential break and were analyzed for pipe whip, jet impingement, and environmental effects. A HELB is not required to be postulated at a given piping location of Class 1 piping if the design CUF calculated in accordance with ASME Code, Section III for that location is less than 0.1. However, because the ASME Code, Section III, Class 1 piping fatigue analyses that provided the CUF values less than 0.1 are based on the design transients in SLRA Table 4.3.1-1, the HELB analysis has been identified as a TLAA that requires evaluation for subsequent license renewal.

The applicant dispositioned the HELB TLAA for Class 1 piping systems in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the HELB break locations based on CUFs will remain valid for the subsequent period of extended operation.

4.3.5.2 Staff Evaluation

The staff reviewed the applicant's HELB TLAA for the 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 HELB analysis for the Class 1 piping systems uses the CUF criterion (i.e., CUF greater than 0.1) in the HELB location postulation, as described in FSAR Section 3.6.2. The staff finds that the applicant adequately identified the HELB postulation for the Class 1 piping systems as a TLAA because the postulation and associated analysis are based on the CUF values that depend on the time-limited transient cycles.

The applicant also explained that the CUF analyses for the high-energy piping systems were developed in accordance with the requirements of the ASME Code, Section III based on the design transients listed in SLRA Table 4.3.1-1. The design transient cycles are bounding for the 80-year projected cycles as shown in SLRA Table 4.3.1-1. Therefore, the applicant determined that the HELB location postulation for the Class 1 piping systems based on the CUF values will remain valid due to the bounding nature of the design transient cycles in comparison with the 80-year projected cycles. The staff finds the applicant's evaluation for the Class 1 piping systems to be reasonable because the applicant confirmed that the 80-year projected cycles are bounded by the design transients so that the 80 years of operation does not affect the HELB location postulation for the Class 1 piping systems based on the design transients and the associated CUF values.

In addition to the Class 1 piping HELB analysis, the staff noted that FSAR Section 3.6.2.1.2 indicates that the postulation of HELB locations for the non-Class 1 piping is, in part, based on the allowable stress range for expansion stress (S_A), consistent with Branch Technical Position MEB 3-1 (ML19137A335). The value of S_A may need to be adjusted by a stress range reduction factor that is determined by the number of temperature cycles, as addressed in the implicit fatigue analysis in SLRA Section 4.3.3. However, SLRA Sections 4.3.5 and A3.3.5 (FSAR supplement) do not clearly discuss whether the HELB location postulation for the non-Class 1 piping, which involves SA, is a basis for identifying the HELB analysis as a TLAA.

SLRA Section 4.3.5, as supplemented by letter dated May 6, 2024 (ML24129A200), discusses the non-Class 1 HELB analysis. The applicant's evaluation of non-Class 1 HELB analysis is acceptable because of the following:

(1) the applicant identified the HELB analysis for the non-Class 1 piping systems as a TLAA, consistent with the time-dependent nature of the HELB postulation based on the involvement of 80-year transient cycles;

(2) the 80-year transient cycles for the non-Class 1 systems do not exceed 7,000 cycles so that the existing HELB postulation remains valid for the subsequent period of extended operation; and

(3) the applicant revised SLRA Section 4.3.3 and the related FSAR supplement to include the HELB TLAA for the non-Class 1 piping systems.

In relation to the HELB analysis, the staff also noted that Enhancement 3 of the Fatigue Monitoring AMP (i.e., SLRA Section B3.1) indicates that, when a cycle-counting surveillance limit is reached, corrective action will be taken to ensure that the analytical bases of the HELB locations are maintained. It was not clear to the staff whether this corrective action is applied to the non-Class 1 piping HELB analysis as well as the Class 1 piping HELB analysis.

SLRA Section 4.3.5, as supplemented by the response to RAI 4.3.5-1 (ML24155A146), indicates that the corrective action regarding the HELB analysis is applied to the non-Class 1 piping HELB analysis as well as the Class 1 piping HELB analysis. The staff finds that the applicant's approach regarding the corrective action is acceptable because the corrective action to maintain the analytical bases for the HELB analysis is applied to both Class 1 and non-Class 1 HELB analysis.

For the HELB piping systems, the staff finds that the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i), that the HELB analysis remains valid for the subsequent period of extended operation. Additionally, the applicant's disposition of the TLAA meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.1 because the applicant demonstrated that the 80-year operation does not affect the validity of the existing HELB location postulation.

4.3.5.3 FSAR Supplement

SLRA Section A3.3.5, as amended by letter dated May 6, 2024 (ML24129A200), provides the FSAR supplement summarizing the HELB TLAA. The staff reviewed the SLRA section for FSAR supplement, consistent with the review procedures in SRP-SLR Section 4.3.3.2.

Based on its review of the FSAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR Section 4.3.2.2, and therefore is acceptable. In addition, the staff finds that the applicant provided an adequate summary description of its actions to address the HELB TLAA, as required by 10 CFR 54.21(d).

4.3.5.4 Conclusion

On the basis of its review, the staff concludes the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the HELB analysis remains valid for the subsequent period of extended operation. In addition, the staff concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.4 Environmental Qualification of Electrical Equipment

4.4.1 Summary of Technical Information in the Application

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 electrical and instrumentation components located in harsh environments, developed to meet 10 CFR 50.49 requirements, 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 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 electrical equipment so that such equipment, in its end-of-life condition, will meet its performance specifications during and following design basis accidents. An EQ of electric equipment important to safety, in accordance with the requirements of 10 CFR 50.49, is considered an adequate AMP for the purposes of license renewal. Electrical 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), the qualification program for EQ components must consider aging. In accordance with 10 CFR 50.49(e)(5), EQ components must be replaced or refurbished at the end of the designated life unless ongoing qualification demonstrates that the equipment has additional life (i.e., 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 if the applicant's EQ program meets the requirement of 10 CFR 54.21(c)(1). The applicant's EQ program is implemented per the requirements of 10 CFR 54.21(c)(1)(iii) to show that components evaluated under the applicant's TLAA evaluation are adequately managed during the 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 of the information provided in SLRA Section B3.3 and the program basis documents including reports provided to the staff during the audit. Based on the staff review of SLRA Section B3.3 and the results of the audit, the staff concludes that the applicant's EQ program elements are consistent with the GALL-SLR Report AMP X.E1. The staff's evaluation of the applicant's EQ of Electric Equipment AMP is documented in SE Section 3.0.3.1.1.

The staff also reviewed the applicant's EQ program reanalysis attributes evaluation and concludes that it is acceptable because it is consistent with SRP-SLR Section 4.4.3.1.3 and SRP-SLR Table 4.4-1. Reanalysis of an aging evaluation addresses attributes of analytical methods, data collection and reduction method, underlying assumptions, acceptance criteria, ongoing qualification, and corrective action (if acceptance criteria are not met). The applicant noted that EQ components not qualified for the current license term are to be refurbished, replaced, or have their qualification extended through reanalysis or ongoing qualification prior to reaching the aging limits established in the evaluation.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of thermal, radiation, and cyclical aging on the intended functions of the plant electrical and instrumentation components located in harsh environments, qualified to meet 10 CFR 50.49 requirements, will be adequately managed for the subsequent period of extended operation.

Additionally, the applicant's disposition of the TLAA 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 program for license renewal and that the continued implementation of the EQ program will be in accordance with 10 CFR 50.49. This 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 FSAR Supplement

SLRA Section A3.4 provides the FSAR supplement summarizing the EQ of electric equipment. The staff reviewed SLRA Section A3.4 consistent with the review procedures in SRP-SLR Section 4.4.3.2.

The staff also noted that the applicant committed to ongoing implementation of the existing EQ of Electric Equipment for managing the effects of aging for applicable components during the subsequent period of extended operation (see SLRA Section A4, Commitment No. 48).

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-SLR Section 4.4.3.2 and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address EQ of electric equipment, as required by 10 CFR 54.21(d).

4.4.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of thermal, radiation, and cyclic aging on the intended functions of the plant electrical and instrumentation components located in harsh environments, qualified to meet 10 CFR 50.49 requirements, will be adequately managed by the EQ of Electric Equipment for the subsequent period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.5 Concrete Containment Tendon Prestress Analysis

4.5.1 Summary of Technical Information in the Application

SLRA Section 4.5 describes the applicant's TLAA for containment tendon prestress force losses for the subsequent period of extended operation. The SLRA notes that the ASME Section XI, Subsection IWL program (B2.1.31) performs periodic surveillances of individual tendon prestress values, and the Concrete Containment Unbonded Tendon Prestress program (B3.4) monitors the loss of tendon prestressing force throughout the plant life. The prestressing program periodically updates the regression analysis of the tendon prestress forces to obtain the trendlines that forecast the tendon forces for the subsequent period of extended operation. The predicted-lower-limit (PLL), trend lines of tendon prestress forces, and the current minimum required values of each tendon group are plotted in log-linear time-force plots for the subsequent period of extended operation. SLRA Figures 4.5-1 through 4.5-3 show the trend lines projected past the end of the 80-year subsequent period of extended operation. The SLRA further noted that following the 10-year surveillance conducted in 1990, all vertical tendons were re-tensioned because the tendon group mean-force trend showed that it could fall below the acceptance limit prior to completion of the 15-year surveillance. Consequently, Figure 4.5-2, "Vertical Tendon Force Trend and PLL," only use measured tendon forces from 1996 to 2020 to establish the tendon force trend lines. The applicant dispositioned the TLAA for the containment tendon prestressing system in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of prestress force loss on the intended functions will be adequately managed by the Concrete Containment Unbonded Tendon Prestress program (B3.4) and ASME Section XI, Subsection IWL program (B2.1.31) for the subsequent period of extended operation.

4.5.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the containment tendon prestress force losses and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.5.3.1.3. The review procedures state that the applicant may reference the GALL-SLR Report in its SLRA for a TLAA AMP that is consistent with GALL-SLR Report AMP X.S1 to manage the effects of aging (i.e., loss of tendon prestress) for the subsequent period of extended operation. The SRP-SLR also recommends further evaluation of the applicant's operating experience (OE) related to the containment prestress force.

The staff reviewed SLRA Section 4.5 and noted that the applicant credits the Concrete Containment Unbonded Tendon Prestress program (B3.4) and the ASME Section XI, Subsection IWL program (B2.1.31) to manage the effects of aging related prestress forces on the intended function of the containment prestressing system. The staff confirmed that the applicant identified the appropriate GALL-SLR Report TLAA AMPs in accordance with the review procedures of SRP-SLR Section 4.5.3.1.3. The staff finds the applicant's AMP B3.4 for tendon force monitoring, with justified exceptions and enhancements, is consistent with the GALL-SLR Report X.S1 AMP. The staff's evaluation of the applicant's AMP B3.4 is documented in SE Section 3.0.3.2.3. The staff also noted the AMP B2.1.31 for tendon selection, examination, and tension testing performed in accordance with ASME Section XI, Subsection IWL is consistent with the GALL-SLR Report XI.S4 AMP. The staff's corresponding evaluation is documented in SE Section 3.0.3.1.13

The staff also reviewed the OE in the application including the tendon force trend and PLL plots with time provided in SLRA Figures 4.5-1 through 4.5-3. The staff noted that the trend lines were developed using regression analysis based on actual measured tendon forces from all previous examinations since the year-1 surveillance, except for the vertical tendons group. As explained in SE Section 4.5.1, all the vertical tendons were re-tensioned after the 10th year surveillance. Therefore, the data prior to that time was not used in establishing the vertical tendon force trend line in the regression analysis. Based on the data used, the staff also noted that the predicted tendon forces at 81.6 years (i.e., the end of subsequent period of extended operation) remain above the minimum required values for all tendon groups (i.e., dome, hoop, and vertical). For the reasons stated above, the staff finds that the applicant has properly incorporated data from past surveillances, that the applicant has developed acceptable regression trend lines based on all previous relevant inspections, and that the SLRA "Concrete Containment Unbonded Tendon Prestress" and "ASME Section XI, Subsection IWL" AMPs will also serve to confirm the continued validity of the prestress force projections.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of age-related prestress tendon force loss on the intended functions of the concrete containment prestressing system will be adequately managed for the subsequent period of extended operation because the applicant's disposition of the TLAA meets the acceptance criteria in SRP-SLR Section 4.5.2.1.3. The criteria is met because the applicant credits the

"Concrete Containment Unbonded Tendon Prestress" program, which the NRC staff has determined to be an acceptable AMP, to address concrete containment prestressing in accordance with 10 CFR 54.21(c)(1)(iii). The NRC staff further verified that the tendon force trend lines for the regression analysis incorporated the relevant plant OE.

4.5.3 FSAR Supplement

SLRA Section A3.5 provides the FSAR supplement summarizing the concrete containment tendon prestress. The staff reviewed SLRA Section A3.5 consistent with the review procedures in SRP-SLR Section 4.5.3.2. Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-SLR Section 4.5.2.2, and is therefore acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the containment tendon prestress force losses, as required by 10 CFR 54.21(d).

4.5.4 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 loss in prestressing forces on the intended functions of the concrete containment prestressing system will be adequately managed by the Concrete Containment Unbonded Tendon Prestress program and the ASME Section XI, Subsection IWL program for the subsequent period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6 Containment Liner Plate, Metal Containments, and Penetrations Fatigue

4.6.1 Containment Liner Plate

4.6.1.1 Summary of Technical Information in the Application

SLRA Section 4.6.1 describes the applicant's TLAA for fatigue of the containment steel liner plate. The applicant dispositioned the TLAA for the containment liner plate 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.

4.6.1.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the containment liner plate and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.6.3.1.1.2 and the acceptance criteria in SRP-SLR Section 4.6.2.1.1.2.

The staff reviewed FSAR Section A3.6.1 and confirmed that the containment liner plate and penetration sleeves included a fatigue waiver which demonstrated that all six requirements of the ASME Code were met. Therefore, the staff finds that no fatigue analysis was required for these components. The anticipated startup/shutdown cycles in the fatigue waiver were extrapolated for an 80-year operating period and demonstrated that the six conditions in the ASME Code continue to be met. Therefore, no fatigue analysis is required through the subsequent period of extended operation. The fatigue waiver for the containment liner and penetration sleeves was revised for 80 years and has been projected to the end of the subsequent period of extended operation, in accordance with 10 CFR 54.21(c)(1)(ii).

4.6.1.3 FSAR Supplement

SLRA Section A3.6.1 provides the FSAR supplement summarizing the containment liner plate fatigue analyses. The staff reviewed SLRA Section A3.6.1 consistent with the review procedures in SRP-SLR Section 4.6.3.2.

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-SLR Section 4.6.2.2, and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address containment liner plate fatigue, 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, in accordance with 10 CFR 54.21(c)(1)(ii), that the fatigue waiver analyses for the containment liner plate have been projected to the end of the subsequent period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6.2 Metal Containment

Containment is provided by the Reactor Building, a reinforced concrete structure with a steel liner. Therefore, the topic of metal containment fatigue analysis is not applicable.

4.6.3 Containment Penetrations Fatigue Analysis

4.6.3.1 Summary of Technical Information in the Application

SLRA Section 4.6.3 describes the applicant’s TLAA for fatigue of the containment penetrations fatigue analysis. The applicant dispositioned the TLAA for the containment penetrations fatigue analysis in accordance with 10 CFR 54.21(c)(1)(i) 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 TLAA for the containment penetrations fatigue analysis and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR Section 4.6.3.1.1.1 and the acceptance criteria in SRP-SLR Section 4.6.2.1.1.1.

The staff reviewed FSAR Section A3.6.3 and confirmed that the Reactor Building main steam penetrations were designed in accordance with ASME Section III, 1974 Edition through Winter 1975 Addenda and identified as a TLAA. No other Reactor Building penetrations meet the criteria to be considered as TLAAs. The Reactor Building main steam penetrations consist of three main components. The first is the penetration sleeve, which was evaluated with the containment liner (Section A3.6.1). The remaining two components include the section of process pipe passing through the penetration, and the attachment assemblies both inside and outside of the containment wall that connect the process pipe to the sleeve. Together, the two remaining parts of the main steam penetrations make up the main steam penetrations internals and have a design analysis which demonstrates that the 40-year design transient cycles continue to bound the 80-year projected cycles. Therefore, the staff finds that the TLAA will remain valid for the subsequent period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

4.6.3.3 FSAR Supplement

SLRA Section A3.6.3 provides the FSAR supplement summarizing the containment penetrations fatigue analyses. The staff reviewed SLRA Section A3.6.3 consistent with the review procedures in SRP-SLR Section 4.6.3.2.

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-SLR Section 4.6.2.2, and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address containment liner plate fatigue, as required by 10 CFR 54.21(d).

4.6.3.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(i), that the fatigue waiver analyses for the containment liner plate have been projected to the end of the subsequent period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7 Other Plant-Specific Time-Limited Aging Analyses

4.7.1 Crane Load Cycle Limits

4.7.1.1 Summary of Technical Information in the Application

In SLRA Section 4.7.1, the applicant indicated that the (1) Reactor Cavity Manipulator Crane [refueling machine], (2) Spent Fuel Pit Bridge Crane [fuel handling machine], (3) 125/15-ton Fuel Handling Building Crane [spent fuel cask handling crane], (4) Reactor Building Polar Crane, (5) 3-ton Fuel Handling Building Hoist [transfer canal gate hoist], and (6) ‘B’ Loop Auxiliary Crane were all designed per Crane Manufacturers Association of America (CMAA) Specifications service Class A, that all met the intent of NUREG-0612, *Control of Heavy Loads at Nuclear Power Plants*, and that all were within the scope of SLR.

4.7.1.2 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)(i), consistent with the review procedures in SRP-SLR Section 4.7.3.1.1 and the acceptance criteria in SRP-SLR Section 4.7.2.1.1.

<u>Reactor Cavity Manipulator Crane (refueling machine)</u>

The applicant projected 43,200 lifts of the reactor cavity manipulator crane for the subsequent period of extended operation in Table 4.7.1-2, “*Reactor Cavity Manipulator Crane*,” of Section 4.7.1, “*Crane Load Cycle Limits*,” of the SLRA. The staff reviewed the basis for the estimated number of lifts for each 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 because the estimates confirm that the applicant's conservative projected number of 43,200 lifts remains well below the CLB load cycle limit of 100,000 provided for service Class A in the CMAA Specification 70 (CMAA-70), 1975.

Spent Fuel Pit Bridge Crane (fuel handling machine)

The applicant projected 36,450 lifts of the spent fuel pit bridge crane for the subsequent period of extended operation in Table 4.7.1-3, "*Spent Fuel Pit Bridge Crane*," of Section 4.7.1, "*Crane Load Cycle Limits*," of the SLRA. 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 because the estimates confirm the applicant's conservative projected number of 36,450 lifts remains well below the CLB load cycle limit of 100,000 provided for service Class A in the CMAA Specification 70 (CMAA-70), 1975.

125/15-Ton Fuel Handling Building Crane (spent fuel cask handling crane)

The applicant projected 23,544 lifts of the 125/15-ton fuel handling building crane for the subsequent period of extended operation in Table 4.7.1-4, "*125/15-ton Fuel Handling Building Crane*," of Section 4.7.1, "*Crane Load Cycle Limits*," of the SLRA. 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 because the estimates confirm the applicant's conservative projected number of 23,544 lifts remains well below the CLB load cycle limit of 100,000 provided for service Class A in the CMAA Specification 70 (CMAA-70), 1975.

Reactor Building Polar Crane

The applicant projected 17,162 lifts of the spent fuel pit bridge crane for the subsequent period of extended operation in Table 4.7.1-5, "*Reactor Building Polar Crane*," of Section 4.7.1, "*Crane Load Cycle Limits*," of the SLRA. 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 because the estimates confirm the applicant's conservative projected number of 17,162 lifts remains well below the CLB load cycle limit of 100,000 provided for service Class A in the CMAA Specification 70 (CMAA-70), 1975.

3-Ton Fuel Handling Building Hoist (transfer canal gate hoist)

The applicant projected 1,080 lifts of the spent fuel pit bridge crane for the subsequent period of extended operation in Table 4.7.1-6, "*3-ton Fuel Handling Building Hoist*," of Section 4.7.1, "*Crane Load Cycle Limits*," of the SLRA. 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 because the estimates confirm the applicant's conservative projected number of 1,080 lifts remains well below the CLB load cycle limit of 100,000 provided for service Class A in the CMAA Specification 70 (CMAA-70), 1975.

<u>"B" Loop Auxiliary Crane</u>

The applicant projected 31,000 lifts of the spent fuel pit bridge crane for the subsequent period of extended operation in Table 4.7.1-7, "*'B' Loop Auxiliary Crane*," of Section 4.7.1, "*Crane Load Cycle Limits*," of the SLRA. 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 because the estimates confirm the applicant's conservative projected number of 31,000 lifts remains well below the CLB load cycle limit of 100,000 provided for service Class A in the CMAA Specification 70 (CMAA-70), 1975.

Accordingly, the staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for the following cranes have been projected to the end of the subsequent period of extended operation:

- Reactor Cavity Manipulator crane
- Spent Fuel Pit Bridge crane
- 2/15-ton Fuel Handling Building crane
- Reactor Building Polar crane
- 3-Ton Fuel Handling Building Hoist
- "B" Loop Auxiliary crane

Additionally, the applicant's disposition of the TLAA meets the acceptance criteria in SRP-LR Section 4.7.2.1.1 because the applicant has demonstrated that the crane load cycle analyses remain below the bounds of the CMAA-70 allowable load cycles and is, therefore, acceptable for the subsequent period of extended operation.

4.7.1.3 FSAR Supplement

SLRA Appendix A, Section A3.7.1, "Crane Load Cycle Limits," provides the FSAR supplement summarizing the TLAA for the crane load cycle limits, including the cranes' number of expected lifts for the period of extended operation, as well as the limiting number of lifts. The staff reviewed SLRA Section A3.7.1 consistent with the review procedures in SRP-LR Section 4.7.3.2.

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and therefore is acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address the crane load cycle limits, as required by 10 CFR 54.21(d).

4.7.1.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for the crane load cycle limits have been projected to the end of the subsequent period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.2 Reactor Coolant Pump Flywheel Fatigue Growth Analyses

4.7.2.1 Summary of Technical Information in the Application

SLRA Section 4.7.2 describes the applicant's TLAA related to the RCP flywheel fatigue crack growth (FCG) analyses. The applicant dispositioned the TLAA for the RCP flywheel in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analyses remains valid for the subsequent period of extended operation.

4.7.2.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the RCP flywheel and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR Section 4.7.3.1.1.

The applicant stated that its fatigue analysis and associated 20-year inspection interval for the RCP flywheel is a TLAA because it is based on an existing 60-year evaluation of crack growth that assumes 6,000 cycles of pump starts and stops. The applicant demonstrated that the existing analysis remains valid by citing the updated Westinghouse evaluation PWROG-17011-NP-A, "Update for Subsequent License Renewal: WCAP-14535-A, 'Topical Report on Reactor Coolant Pump Flywheel Inspection Elimination' and WCAP-15666-A, 'Extension of Reactor Coolant Pump Motor Flywheel Examination'," October 2019 (ML19318D194).

The NRC SE for PWROG-17011-NP-A (ML19198A056) states that that there is no additional confirmation on flywheel operating and material data needed for licensees with Westinghouse RCP flywheels, except for Calvert Cliffs Nuclear Power Plant, and the topical report requires SLR applicants to confirm that 6,000 cycles for 80 years of operation is applicable on a plant-specific basis. The applicant states that, for their Westinghouse RCP flywheel, the projected number of RCP flywheel start/stop cycles are within the bounds of 6,000 cycles for 80 years of operation. The staff's review of the applicant's projected RCP flywheel start/stop cycles for the subsequent period of extended operation is documented below.

SLRA Table 4.7.2-1 provides the applicant's basis for the expected 2,000 RCP start/stop cycles for 80 years. The calculation is based on 200 design heatup/cooldown cycles multiplied times 10 estimated RCP start/stop cycles per heatup/cooldown cycle. The staff's assessment of each aspect of the calculation (i.e., heatup/cool cycles and RCP start/stop cycles) is documented separately below.

The staff finds the applicant's use of 200 design heatup/cooldown cycles to be reasonable because it bounds the projected 148 heatup/cooldown cycles for 80-years of operation. As documented in SE Section 4.3.1, the staff finds this projection in heatup/cooldown cycles to be reasonable because it is based on the applicant's plant-specific OE and cumulative transient cycles from the beginning of the initial license. Additionally, the staff noted that heatup/cooldown cycles are tracked as part of the applicant's Fatigue Monitoring program, and that the applicant will ensure that if the number of actual cycles exceeds the CLB cycle limit, it will be addressed by the applicant's corrective actions program. The staff finds that the applicant has demonstrated that the 200 design heatup/cooldown cycles used in its assessment of the TLAA is bounding when compared to the total projected heatup/cooldown cycles for 80 years of operation. In addition, the applicant's use of 10 estimated RCP start/stop cycles per heatup/cooldown cycle is based on plant-specific operator interviews. The staff noted this assumption is reasonable and credible because it considered operator insights from plant-specific information and OE. Thus, the staff finds the 2,000 RCP start/start cycles through 80 years of operation (i.e., 200 heatup/cooldown cycles × 10 estimated RCP start/stop cycles per heatup/cooldown cycle) is an appropriate estimate, and is significantly less than the 6,000 cycles assumed in PWROG-17011-NP-A for 80 years of operation.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i), that the analysis related to the FCG of the RCP remains valid for the subsequent period of extended operation. Additionally, the applicant's disposition of the TLAA meets the acceptance criteria in SRP-SLR Section 4.7.2.1.1 because the applicant has demonstrated that the referenced analysis in PWROG-17011-NP-A, which is applicable to the applicant's site and assessed 6,000 RCP start/stop cycles, remains valid and bounding when compared to the applicant's projected 2,000 projected RCP start/stop cycles for the subsequent period of extended operation.

4.7.2.3 FSAR Supplement

SLRA Section A3.7.2 provides the FSAR supplement summarizing the TLAA related to RCP flywheel FCG. The staff reviewed SLRA Section A3.7.2 consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the staff finds that the FSAR 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 FCG of the RCP flywheel, as required by 10 CFR 54.21(d).

4.7.2.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for the RCP flywheel remain valid for the subsequent period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.3 Leak-Before-Break

4.7.3.1 Summary of Technical Information in the Application

SLRA Section 4.7.3 describes the VCSNS TLAA on the leak-before-break (LBB) evaluation for the RCS piping. The time-limited elements of the analysis are a postulated crack stability analysis that is related to the period of plant operation and loss of fracture toughness due to thermal aging of cast austenitic stainless steel (CASS) material resulting in embrittlement, which causes an increase in hardness and tensile strength of the material. This TLAA considers lower bound fully aged fracture toughness properties.

In the SLRA, the applicant dispositioned the TLAA for the reactor coolant primary loop piping at VCSNS 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.

4.7.3.2 Staff Evaluation

The NRC staff reviewed the VCSNS TLAA for the RCS piping and the corresponding disposition of 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.7.3.1.2 and the acceptance criteria in SRP-SLR Section 4.7.2.1.2. These SRP-SLR sections provide the guidance for plant-specific TLAAs. In addition, the Standard Review Plan (SRP, NUREG-0800), SRP 3.6.3, Rev. 1, "Leak-Before Break Evaluation Procedures," March 2007, provides detailed guidance for LBB analyses and staff's review of the analyses. The SRP guidance addresses acceptable methods to meet 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 4, regarding LBB analyses.

The applicant's updated LBB analysis for 80 years of operation is documented in WCAP-13206, Rev. 4, "Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for the Virgil C. Summer Nuclear Power Plant." The applicant stated that the 40-year FCG analysis originally included in WCAP-13206, Rev. 0, used generic design basis transient cycles for the RCS components for VCSNS and were compared to the projected cycles for 80 years. Evaluations of the reactor coolant piping considering the use of the most limiting fracture toughness properties and all locations were evaluated using CASS properties that present the most limiting condition due to thermal aging. The comparison indicates that the original 40-year transient cycles envelope the projected 80 years of operation. The staff reviewed the updated LBB analysis for 80 years of operation as documented in WCAP-13206, Rev. 4, and concluded the results for the 40-year transient cycles enveloped the projected 80 years of operation. Therefore, the staff finds that the analysis summarized in WCAP-13206, Rev. 4, for fatigue crack growth remains valid for the subsequent period of extended operation.

Additionally, the applicant stated that the evaluations in WCAP-13206, Rev. 4, include a recalculation of the delta ferrite and saturated (fully aged) lower bound fracture toughness properties based on NUREG/CR-4513, "Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems." The applicant stated that the most limiting fracture toughness values calculated using Revision 1 and Revision 2 of NUREG/CR-4513 were conservatively considered in WCAP-13206, Rev. 4. The staff reviewed the calculations described in WCAP-13206, Rev. 4, and concluded that they accurately consider the loss of fracture toughness for the CASS materials and the LBB analyses are acceptable because the analysis will remain valid for the subsequent period of extended operation.

The applicant stated that the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP, is a condition monitoring AMP that imposes inservice inspection requirements for ASME Class 1, 2, and 3 pressure retaining components and integral attachments. The applicant stated that the potential for primary water stress corrosion cracking (PWSCC) is managed through ASME Code Case N-770-5, "Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities Section XI, Division 1." ASME Code Case N-770-5 is currently approved by the NRC, with conditions, and provides the requirements for the volumetric examination of the V.C. Summer Reactor Vessel Inlet Nozzle (RVIN) dissimilar metal welds. The volumetric examination will be conducted once per interval. Code Case N-722-1, "Additional Examinations for PWR Pressure Retaining Welds in Class 1 Components Fabricated with Alloy 600/82/182 Materials, Section XI, Division 1," will provide the visual examinations for the unmitigated Alloy 82/182 welds at the RVIN and will be inspected once per interval. The applicant stated that the RVIN locations, Loop "B" and "C" RV outlet nozzle (RVON) locations, steam generator inlet nozzle locations, and steam generator outlet nozzle (SGON) locations have Alloy 82/182 welds which are susceptible to PWSCC. However, PWSCC effects on Loop “B” and “C” RVON locations have been mitigated by the application of mechanical stress improvement (MSIP) and are considered within the LBB evaluation. The applicant stated that the Alloy 82/182 welds in the Loop “A” RVON location has been replaced with an Inconel 152 weld which is not susceptible to PWSCC. Additionally, the Alloy 82 welds at the steam generator inlet nozzle and steam generator outlet nozzle have been mitigated by installing Alloy 152 inlays on the inside surface of the nozzle weld as a protective barrier for the Alloy 82/182 weld PWSCC effect.

For the unmitigated Alloy 82/182 welds at the RVIN locations, the LBB evaluation considered a conservative factor on the leakage flaw size, which increased the leakage flaw size for the required margin of 10 on the leak rate. The applicant stated that this increased factor accounts for PWSCC morphology characteristics (e.g., surface roughness and number of turns), on the leakage rate of a given leakage flaw size. The applicant stated that the results of the dissimilar metal weld evaluations show that the presence of Alloy 82 or 82/182 is no longer a concern for PWSCC at these locations specific to the LBB conclusions in WCAP-13206, Rev. 4. The staff reviewed the evaluations described in WCAP-13206, Rev. 4, and concluded the results are acceptable because the analysis will remain valid for the subsequent period of extended operation.

Section 5.2.7 of the applicant’s FSAR discusses the leakage detection system is in accordance with Regulatory Guide 1.45, “Guidance on Monitoring and Responding to Reactor Coolant System Leakage.” The leak detection capability provides an increased level of safety that if a flaw were to grow through wall, it would be detected prior to growing to a safety significant size.

Based on the applicant’s actions, including use of PWSCC crack morphology for the LBB calculations, the staff finds the applicant’s consideration of possible PWSCC of the Alloy 82/182 dissimilar metal weld material to be acceptable because the actions will minimize the impacts of PWSCC on the LBB criteria.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(ii) and the associated acceptance criteria in SRP-SLR Section 4.7.2.1.2, that the analyses for the RCS piping have been projected to the end of the subsequent period of extended operation because the original FCG analysis, the recalculated CASS fracture toughness, as well as the applicant’s analyses and activities to monitor welds for PWSCC adequately demonstrate that the effects of RCS pipe breaks need not be considered for the 80-year subsequent period of extended operation.

4.7.3.3 FSAR Supplement

SLRA Section A3.7.3 “Leak-Before-Break,” provides the FSAR supplement summarizing the LBB TLAA for the RCS loop piping. The staff reviewed SLRA Section A3.7.3, consistent with the review procedures in SRP-SLR Section 4.7.3.2. Based on its review of the FSAR supplement, the staff finds that it meets the acceptance criteria in SRP-SLR 4.7.2.2, and therefore is acceptable. The staff also finds that the applicant provided an adequate summary description to address the LBB TLAA for the RCS loop piping as required in 10 CFR 54.21(d).

4.7.3.4 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 LBB analysis has been projected to the end of the subsequent period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.4 Steam Generator Tube Wear Evaluation

4.7.4.1 Summary of Technical Information in the Application

SLRA Section 4.7.4 describes the applicant's TLAA for wear of the steam generator tubes. The applicant dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of wear on the intended functions of the steam generator tubes will be adequately managed by the Steam Generators program for the subsequent period of extended operation.

4.7.4.2 Staff Evaluation

The staff reviewed the applicant's TLAA, for wear of the steam generator tubes 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. The applicant demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the steam generator tube wear analysis remains valid for the subsequent period of extended operation; however, the applicant is choosing to manage steam generator tube wear via the Steam Generators program, pursuant to 10 CFR 54.21(c)(1)(iii).

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii) and the associated acceptance criteria in SRP-SLR Section 4.7.2.1(iii), that the effects of wear on the intended functions of the steam generator tubes will be adequately managed for the subsequent period of extended operation therefore it meets the acceptance criteria.

4.7.4.3 FSAR Supplement

SLRA Section A3.7.4 provides the FSAR supplement that summarizes steam generator tube wear evaluation. The staff reviewed SLRA Section A3.7.4 consistent with the review procedures in SRP-SLR Section 4.7.2.1.3. The staff also noted that the applicant committed to ongoing implementation of the Steam Generators Program (Commitment No. 10).

Based on its review, the staff finds that the FSAR supplement meets the acceptance criteria in SRP-SLR Section 4.7.2.1.3 and therefore is acceptable. Additionally, the staff finds that the applicant provided an adequate summary description of its actions to address wear of steam generator tubes, as required by 10 CFR 54.21(d).

4.7.4.4 Conclusion

Based on its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of wear on the intended functions of the steam generator tubes will be adequately managed by the Steam Generators program for the subsequent period of extended operation. The staff also concludes that the FSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.8 Conclusion for 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 the applicant 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 FSAR 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 to remain in compliance with 10 CFR 54.29(a) are in accordance with the Atomic Energy Act of 1954, as amended, as well as the NRC's regulations.

SECTION 5 REVIEW BY THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

In accordance with 10 CFR 54.25, “Report of the Advisory Committee on Reactor Safeguards,” the SLRA for Virgil C. Summer Nuclear Station, Unit 1 will be referred to the ACRS for a review and report. The ACRS also reviews the NRC staff’s SE for the SLRA. The applicant and the NRC 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 NRC staff reviewed the SLRA for Virgil C. Summer Nuclear Station, Unit 1 in accordance with the NRC's regulations and the guidance in NUREG-2192, *Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants* (ADAMS Accession No. ML17188A158) and NUREG-2191, *Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report* (ADAMS Accession Nos. ML17187A031 and ML17187A204). Section 54.29 of 10 CFR, "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 renewed license if it finds, among other things, that (1) actions have been identified and have been or will be taken, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis, and (2) any applicable requirements of Subpart A, "National Environmental Policy Act—Regulations Implementing Section 102(2)," of 10 CFR Part 51, "Environmental protection regulations for domestic licensing and related regulatory functions" (i.e., 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 NRC staff will publish its environmental review findings in a separate report.

APPENDIX A

LICENSE RENEWAL COMMITMENTS

A.1 License Renewal Commitments

During the U.S. Nuclear Regulatory Commission (NRC) staff's review of the Virgil C. Summer Nuclear Station, Unit No. 1 (V.C. Summer or VCSNS) subsequent license renewal application, Dominion Energy South Carolina, Inc. (DESC or applicant), on behalf of itself and Santee Cooper, 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 VCSNS begins on August 6, 2042.

Table A.1-1 V.C. Summer Unit 1 Subsequent License Renewal Commitments

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
1	*ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program	The *ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedures will be revised to require volumetric inspection of the pressurizer surge line hot leg nozzle every 48 years for management of EAF. Based on satisfactory results from the last inspection performed in Q1 1993, the next inspection will be performed by Q1 2041.	Program enhancement for SLR will be implemented by Q1 2041.	SLRA, Appendix A, Table A4.0-1 (ML23233A172) Supplement 1 (ML24095A207)
2	*Water Chemistry* program	The *Water Chemistry* program is an existing preventive program that is credited.	Ongoing	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
3	*Reactor Head Closure Stud Bolting* program	The *Reactor Head Closure Stud Bolting* program is an existing condition monitoring program that will be enhanced as follows: 1. Procurement documents for reactor head closure studs will be revised to incorporate guidance from RG 1.65, Revision 1 and NUREG-2191, Section XI.M3, to add a limit for the maximum measured yield strength of 150 ksi and a limit for maximum tensile strength of 170 ksi.	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
4	*Boric Acid Corrosion* program	The *Boric Acid Corrosion* program is an existing condition monitoring program that is credited.	Ongoing	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
5	*Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components* program	The *Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components* program is an existing condition monitoring program that is credited.	Ongoing	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
6	*Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)* program	The *Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)* program is an existing condition monitoring program that is credited.	Ongoing	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
7	*PWR Vessel Internals* program	The *PWR Vessel Internals* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to include a list of the components that require inspections for the Primary, Expansion, and Existing Programs categories specified in MRP-227, Revision 1-A, including the components identified in the VCSNS gap analysis. Alternatively, the latest NRC-approved version of MRP- 227 that provides aging management to 80 years will be implemented. 2. Procedure will be revised to require additional spring height measurements prior to the SPEO to establish the core barrel hold down spring height and determine if replacement of the core barrel hold down spring is required.	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172) Supplement 1 (ML24095A207)
8	*Flow-Accelerated Corrosion* program	The *Flow-Accelerated Corrosion* program is an existing condition monitoring program that is credited.	Ongoing	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
9	*Bolting Integrity* program	The *Bolting Integrity* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to specify instructions for performing inspections of pressure boundary bolting for locations that preclude detection of joint leakage including bolting in submerged environments, bolting for air or gas systems, and bolting for piping systems not normally pressurized as follows: a. Submerged closure bolting is visually inspected for loss of material during maintenance activities. In this case, bolt heads are inspected when made accessible, and bolt threads are inspected when joints are disassembled. In each 10-year period during the subsequent period of extended operation, a representative sample of bolt heads and threads is inspected up to a maximum of 25 bolts for each material and environment combination. If opportunistic maintenance activities will not provide access to 20 percent of the population (for	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
		a material/environment combination) up to a maximum of 25 bolt heads and threads over a 10-year period, then periodic pump vibration measurements are taken and trended. b. For air or gas systems, inspections are performed consistent with that of submerged closure bolting. Closure bolting for air or gas systems is visually inspected for loss of material during maintenance activities. In this case, bolt heads are visually inspected when made accessible, and bolt threads are visually inspected when joints are disassembled. In each 10-year period during the subsequent period of extended operation, a representative sample of bolt heads and threads is inspected up to a maximum of 25 bolts for each material and environment combination. If opportunistic maintenance activities will not provide access to 20 percent of the population (for a material/environment combination) up to a maximum of 25 bolt heads and threads over a 10-year period, then soap bubble testing will be performed. c. For piping systems not normally pressurized, the torque of the bolting will be checked to the extent that the closure bolting is not loose. In each 10-year period during the subsequent period of extended operation, a representative sample of bolt heads and threads is inspected up to a maximum of 25 bolts for each material and environment combination. 2. Procedure(s) will be revised to: a. Include inspections of pressure-retaining bolting in inaccessible areas when they become accessible by means such as excavation, dewatering, or shielding/barrier removal. b. Include a requirement during opportunistic maintenance activities to document the condition of bolt heads and threads. 3. Procedure(s) will be revised to specify inspections and tests be performed by personnel qualified in accordance with site procedures and programs to perform the specified task. 4. Procedure(s) will be revised to evaluate sampling-based inspections against plant-specific acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the components' intended functions throughout the subsequent period of extended operation based on the projected rate and extent of degradation. If any		

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		projected inspection results will not meet acceptance criteria prior to the next scheduled inspection, sampling frequencies will be evaluated and adjusted as determined by the Corrective Action Program. Bolting that is unsuitable for continued use will be replaced. 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 will be 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 and environment combination is 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 inspections. Additional samples will be inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. The additional inspections will include inspections of components with the same material and environment combination and will be completed within the 10-year inspection interval in which the original inspection was conducted.		
10	*Steam Generators* program	The *Steam Generators* program is an existing condition monitoring program that is credited.	Ongoing	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
11	*Open-Cycle Cooling Water* program	The *Open-Cycle Cooling Water* program is an existing preventive, mitigative, condition monitoring, and performance monitoring program that will be enhanced as follows: 1. A plant modification will be implemented to the safety-related portion of service water piping in the Service Water Pump House that provides cooling water to the cooling coils to eliminate concerns with recurring internal corrosion. Specifically, the modification will either isolate and drain or physically remove the aforementioned safety-related portion of service water piping. 2. A plant modification will be implemented to replace the carbon steel service water return valves from the diesel generator coolers with	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

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		stainless steel valves and fittings to be more resistant to cavitation damage, and to modify the piping configuration to reduce cavitation. 3. Procedure(s) will be revised to specify that inspections and tests be performed by personnel qualified in accordance with site procedures and programs to perform the specified task. 4. Procedure(s) will be revised to specify that additional inspections will be performed if any inspection results do not meet the acceptance criteria unless the cause of the aging effect for each applicable material and environment is corrected by repair or replacement. There will be no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging effect combination are inspected, whichever is less.		
12	*Closed Treated Water Systems* program	The *Closed Treated Water Systems* program is an existing condition monitoring and mitigative program that will be enhanced as follows: 1. Procedure(s) will be revised to specify that in each 10-year period during the subsequent period of extended operation, the minimum number of inspections be completed for the various sample populations (each material, water treatment program, and aging effect combination). If opportunistic inspections will not fulfill the minimum number of inspections by the end of each 10-year period, the program owner will initiate work orders as necessary to request additional inspections. A representative sample of 20 percent of the population (defined as components having the same material, water treatment program, and aging effect combination) or a maximum of 25 components per population will be inspected. The inspections will focus on the bounding or lead components most susceptible to aging due to time in service, and severity of operating conditions. 2. Procedure(s) will be revised to specify inspections and tests be performed by personnel qualified in accordance with site procedures and programs to perform the specified task. 3. Procedure(s) will be revised to specify that, where practical, the rate of any degradation is evaluated and projected until the end of the subsequent period of extended operation or the next scheduled inspection, whichever is shorter. The sampling bases (e.g., selection, size, frequency) will be adjusted as necessary based on the projection.	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

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		4. Procedure(s) will be revised to specify that additional inspections will be performed if any inspections do not meet the acceptance criteria, unless the cause of the aging effect for each applicable material and environment is corrected by repair or replacement. There will be no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging effect combination inspected, whichever is less. If any subsequent inspections do not meet acceptance criteria, an extent of condition and extent of cause analysis will be conducted to determine the further extent of inspections required. Additional samples will be inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. The additional inspections will include inspections of components with the same material, environment, and aging effect combination. The additional inspections will be completed within the interval (e.g., refueling outage interval, 10-year inspection interval) in which the original inspection was conducted.		
13	*Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* program	The *Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* program is an existing condition monitoring that is credited.	Ongoing	SLRA, Appendix A, Table A4.0-1 (ML23233A172) Supplement 2 (ML24129A200)
14	*Compressed Air Monitoring* program	The *Compressed Air Monitoring* program is an existing preventive and condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to require Turbine Building instrument air dryer outlet dew point readings greater than zero be documented in the Corrective Action Program and evaluations performed for results that do not satisfy established criteria as identified in the applicable procedures. 2. Procedure(s) will be revised to specify inspections and tests be performed by personnel qualified in accordance with site procedures and programs to perform the specified task.	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

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15	*Fire Protection* program	The *Fire Protection* program is an existing condition monitoring and performance monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to provide guidance for detection of loss of material, cracking, holes, and gaps during the visual inspections of fire dampers to ensure that any deficiencies are noted on a condition report, and to determine the acceptability of the findings. 2. Procedure(s) will be revised to require that inspections of fire barrier elastomeric penetration seals and seismic gap filler identify shrinkage, loss of strength, and hardening, or any other signs of degradation. 3. Procedure(s) will be revised to specify that inspection results of materials susceptible to loss of material, cracking, delamination, change in material properties, separation, increased hardness, shrinkage, or loss of strength will be trended. Where practical, identified degradation 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 subsequent period of extended operation based on the projected rate of degradation. 4. Procedure(s) will be revised to specify that inspections will be performed to identify cracking and loss of material for CO_2 fire protection system components, and that those results are trended and appropriate corrective actions identified, if necessary. Where practical, identified degradation 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 subsequent period of extended operation based on the projected rate of degradation. Trending of the results of the CO_2 fire suppression system periodic tests will also be performed. 5. Procedure(s) will be revised to specify that for inspection results that will fail to meet acceptance criteria prior to the next scheduled inspection, inspection frequencies will be adjusted as determined by the Corrective Action Program.	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172) Supplement 2 (ML24129A200) RAI Response Set 2 (ML24171A015)
16	*Fire Water System* program	The *Fire Water System* program is an existing condition monitoring program that will be enhanced as follows:	The program will be implemented, and inspections or tests	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

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		1. Procedure(s) will be revised to require follow-up volumetric wall thickness examinations be performed when surface irregularities that could indicate an unexpected level of degradation due to corrosion and corrosion product deposition are identified during visual inspections. 2. Procedure(s) will be revised to require sprinklers that have been in service for 75 years be replaced or representative samples from one or more sample areas be submitted to a recognized testing laboratory acceptable to the authority having jurisdiction for field service testing and repeated at 5-year intervals. 3. Procedure(s) will be revised for wet pipe sprinkler systems to include a one-time test of sprinklers that have been exposed to water. A sample of 3 percent or a maximum of 10 sprinklers with no more than four sprinklers per structure will be tested. Testing will be based on a minimum time in service of 50 years and severity of operating conditions for each population. 4. Procedure(s) will be revised to perform annual main drain tests on standpipe systems with automatic water supplies in the scope of subsequent license renewal as required by NFPA-25 (2011 Edition), Chapter 13, Valves, Valve Components, and Trim. 5. Procedure(s) will be revised to require flow tests every 5 years at the hydraulically most remote hose connections of each zone of automatic standpipe systems within the scope of subsequent license renewal as required by NFPA-25 (2011 Edition), Section 6.3.1, Flow Tests. 6. Procedure(s) will be revised to require a main drain test be conducted annually at each water-based fire protection system riser to determine whether there has been any change in the condition of the water supply piping and control valves. Acceptance criteria will be based upon monitoring flowing pressures from test to test to determine if there is a 10 percent reduction in full flow pressure when compared to previously performed tests. If required, the Corrective Action Program will determine the cause and any necessary corrective action. 7. Procedure(s) will be revised to specify inspections and tests be performed by personnel qualified in accordance with site procedures and programs to perform the specified task. 8. Procedure(s) will be revised to provide inspection guidance related to lighting, distance and offset for non-ASME Code inspections. The	will begin 5 years before the subsequent period of extended operation. Inspections or tests that are to be completed prior to 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.	

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		procedure will specify adequate lighting be verified at the inspection location to detect degradation. Lighting may be permanently installed, temporary, or portable (e.g., flashlight), as appropriate. For accessible surface inspections, inspecting from a distance of two to four feet (or less) will be appropriate. For distant surface inspections, viewing aids such as binoculars may be used. For viewing angles which may prevent adequate inspection, a viewing aid such as an inspection mirror or boroscope should be used. 9. Procedure(s) will be revised to perform the following augmented testing and inspections of portions of water-based fire protection system components that have been wetted but are normally dry, such as dry-pipe or pre-action sprinkler system piping and valves. The augmented tests and inspections indicated below will be conducted on piping segments that cannot be drained or piping segments that allow water to collect. a. In each 5-year interval, beginning 5 years prior to the subsequent period of extended operation, either conduct a flow test or flush sufficient to detect potential flow blockage, or conduct a visual inspection of 100 percent of the internal surface of piping segments that cannot be drained or piping segments that allow water to collect. 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. b. In each 5-year interval of the subsequent period of extended operation, 20 percent of the length of piping segments that cannot be drained or piping segments that allow water to collect will be subject to volumetric wall thickness inspections. Measurement points will be obtained to the extent that each potential degraded condition can be identified (e.g., general corrosion, MIC). The 20 percent of piping that is inspected in each 5-year interval will be in different locations than previously inspected piping. For portions of the normally dry piping that are configured to drain (e.g., pipe slopes towards a drain point) the tests and inspections of Table XI.M27-1 do not need to be augmented.		

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		10. Procedure(s) will be revised to address recurring internal corrosion with the use of Low Frequency Electromagnetic Technique (LFET) or a similar technique on 100 feet of piping during each refueling cycle to detect changes in the pipe wall thickness. The procedure will specify thinned areas found during the LFET screening be followed up with pipe wall thickness examinations to ensure aging effects are managed and wall thickness is within acceptable limits. 11. Procedure(s) will be revised to perform internal visual inspections of sprinkler and deluge system piping to identify internal corrosion, foreign material, and obstructions to flow every 5 years. Follow-up volumetric examinations will be performed if internal visual inspections detect an unexpected level of degradation due to corrosion product deposition. If organic or foreign material, or internal flow blockage that could result in failure of system function is identified, then an obstruction investigation will be performed within the Corrective Action Program that includes removal of the material, an extent of condition determination, review for increased inspections, extent of follow-up examinations, and a flush in accordance with NFPA 25, 2011 Edition, Annex D.5, Flushing Procedures. The internal visual inspections will consist of the following: a. Wet pipe sprinkler systems - 50 percent of the wet pipe sprinkler systems in scope for subsequent license renewal will have internal visual inspections of piping by opening a flushing connection at the end of one main and removing a sprinkler toward the end of one branch line, performed every 5 years, consistent with NFPA 25, 2011 Edition, Section 14.2. During the next 5-year inspection period, the alternate systems previously not inspected shall be inspected. b. Pre-action sprinkler systems - pre-action sprinkler systems in scope for subsequent license renewal will have internal visual inspections of piping by removing a sprinkler nozzle from the most remote branch line from the source of water that is not equipped with the inspector's test valve, performed every five years, consistent with NFPA 25, 2011 Edition, Section 14.2. c. Deluge systems - deluge systems in scope for subsequent license renewal will have internal visual inspections of piping by removing a		

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		hydraulically remote nozzle, performed every 5 years, consistent with NFPA 25, 2011 Edition, Section 14.2. 12. Procedure(s) will be revised to require results of sampling-based inspections be evaluated against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the components' intended functions throughout the subsequent period of extended operation based on the projected rate and extent of degradation. 13. Procedure(s) will be revised to require that if a flow test (i.e., NFPA 25 Section 6.3.1) or a main drain test (i.e., NFPA Section 13.2.5) does not meet acceptance criteria due to current or projected degradation (i.e., trending) additional tests are conducted. The number of increased tests will be determined in accordance with the Corrective Action Program; however, there will be no fewer than two additional tests for each test that did not meet acceptance criteria. The additional inspections will be completed within the interval (i.e., 5 years, annual/refueling) 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.		
17	*Outdoor and Large Atmospheric Metallic Storage Tanks* program	The *Outdoor and Large Atmospheric Metallic Storage Tanks* program is a new condition monitoring program that will manage the aging effects of cracking and loss of material on the outside and inside surfaces of aboveground metallic tanks constructed on concrete or soil with internal pressures approximating atmospheric pressure. The program manages cracking and loss of material by conducting periodic external visual and surface examinations and periodic thickness measurements of tank bottoms. Industry and plant-specific operating experience will be evaluated in the development of this program.	Program will be implemented, and inspections or tests will begin 10 years before the subsequent period of extended operation. Inspections or tests that are to be completed prior to the subsequent period of extended operation are completed 6 months prior to the subsequent period of extended operation or no later than the last	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

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			refueling outage prior to the subsequent period of extended operation.	
18	*Fuel Oil Chemistry* program	The *Fuel Oil Chemistry* program is an existing mitigative and condition monitoring and preventive monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to drain, clean internally to the extent practical, visually inspect internal surfaces (if physically possible), and perform tank bottom thickness measurements for the following tanks: a. Diesel driven fire pump fuel oil day tank b. Diesel generator fuel oil day tanks c. Diesel generator fuel oil storage tanks The procedure(s) will require that if evidence of degradation is observed during visual inspection, or if visual inspection is not possible, volumetric inspections will be performed. The draining, cleaning and inspection of each tank will be performed at least once during the 10-year period prior to the subsequent period of extended operation and at least once every 10 years during the subsequent period of extended operation. 2. Procedure(s) will be revised to require an Engineering evaluation be performed to evaluate and trend visual and volumetric (if degradation is detected during inspections) tank inspection results. Unacceptable inspection results will be documented in the Corrective Action Program. Thickness measurements will be evaluated against the design thickness and corrosion allowance. The rate of degradation will be evaluated and projected until the end of the subsequent period of extended operation or the next scheduled inspection, whichever is shorter. The inspection frequency will be adjusted, as necessary, based on the projection. 3. Procedure(s) will be revised to periodically drain accumulated water from the diesel driven fire pump fuel oil day tank.	The program will be implemented, and inspections will begin 10 years before the subsequent period of extended operation. Inspections that are to be completed prior to the subsequent period of extended operation are 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.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
19	*Reactor Vessel Material Surveillance* program	The *Reactor Vessel Material Surveillance* program is an existing condition monitoring program that is credited.	Ongoing	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

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20	*One-Time Inspection* program	The *One-Time Inspection* program is a new condition monitoring program consisting of a one-time inspection of selected components to verify: (a) the system-wide effectiveness of an aging management program that is designed to prevent or minimize aging to the extent that it will not cause the loss of intended function during the subsequent period of extended operation; (b) the insignificance of an aging effect; and (c) 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. Industry and plant-specific operating experience will be evaluated in the development of this program.	The program will be implemented inspections will begin 10 years before the subsequent period of extended operation. Inspections that are to be completed prior to the subsequent period of extended operation are 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.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
21	*Selective Leaching* program	The *Selective Leaching* program is a new condition monitoring program that will monitor components constructed of materials which are susceptible to selective leaching. The selective leaching program includes a one-time inspection for susceptible components exposed to closed-cycle cooling water and treated water environment when plant-specific operating experience has not revealed selective leaching in these environments, as well as opportunistic and periodic inspections for susceptible components exposed to raw water, waste water, and soil (which may include groundwater) environments when plant specific operating experience has revealed selective leaching in these environments. Industry and plant-specific operating experience will be evaluated in the development of this program.	The program will be implemented, and inspections will begin 10 years before the subsequent period of extended operation. Inspections that are to be completed prior to the subsequent period of extended operation are completed 6 months prior to the subsequent period of extended operation or no later than the last	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

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			refueling outage prior to the subsequent period of extended operation.	
22	*ASME Code Class 1 Small-Bore Piping* program	he *ASME Code Class 1 Small-Bore Piping* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to specify the following: • Perform one-time inspections of small-bore piping using the program methods and acceptance criteria. • Perform periodic inspections of reactor coolant pump seal injection to thermal barrier nozzle welds using the program methods, frequencies, and acceptance criteria. • Evaluate the results to determine if additional or periodic examinations are required. • Perform any required additional or periodic inspections. 2. Procedure(s) will be revised to require a subsequent re-examination after any component containing flaws or relevant conditions is accepted for continued service by analytical evaluation, in order to meet the intent of ASME Code, Section XI, Subarticle IWB-2420. 3. Procedure(s) will be revised to require examination results be evaluated in accordance with ASME Code, Section XI, Paragraph IWB-3132. 4. Procedure(s) will be revised to require corrective actions include examinations of additional ASME Code Class 1 small-bore piping welds, in order to meet the intent of ASME Code, Section XI, Subarticle IWB-2430.	The program will be enhanced and inspections completed within 6 years before the subsequent period of extended operation. Inspections that are to be completed prior to the subsequent period of extended operation are completed 6 months prior to the subsequent period of extended operation or no later than the last refueling outage prior of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
23	*External Surfaces Monitoring of Mechanical Components* program	The *External Surfaces Monitoring of Mechanical Components* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to specify that walkdowns will be performed at a frequency not to exceed one refueling cycle. Since some surfaces are not readily visible during both plant operations and refueling outages, surfaces will be inspected when they are made accessible and at intervals that would ensure the components' intended functions are maintained. 2. Procedure(s) will be revised to specify that visual inspections of elastomers and flexible polymers will cover 100 percent of accessible component surfaces. The minimum surface area for tactile inspections	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

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		of elastomers and flexible polymers will be at least 10 percent of the accessible surface area. 3. Procedure(s) will be revised to specify the following to manage cracking of copper alloy (>15 percent Zn) components and cracking and loss of material of insulated outdoor/indoor components exposed to condensation populations: a. In each 10-year period during the subsequent period of extended operation, the minimum number of inspections is completed. Examinations for cracking will be performed from the copper alloy (>15 percent Zn) component population every 10 years. Examinations are conducted on 20 percent of the surface area unless the component is measured in linear feet, such as piping. Alternatively, any combination of a minimum of 25 one-foot axial length sections and components is inspected. For insulated outdoor components and indoor components exposed to condensation, following insulation removal, 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 one-foot axial length determination is inspected for loss of material and cracking. Alternatively, any combination of a minimum of 25 one-foot axial length sections and components for each material type is inspected. The new procedure will specify that the inspections focus on the components most susceptible to aging because of time in service, severity of operating conditions, and lowest design margin. b. Additional inspections will be performed if any sampling-based inspections to detect cracking in copper alloy (>15 percent Zn) components do not meet the acceptance criteria, unless the cause of the aging effect for each applicable material and environment is corrected by repair or replacement. There will be no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging effect combination inspected, whichever is less. If any subsequent inspections do not meet acceptance criteria, an extent of condition and extent of cause analysis will be conducted to determine the further extent of inspections required.		

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		Additional samples will be inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. The additional inspections will include inspections of components with the same material, environment, and aging effect combination. The additional inspections will be completed within the interval (e.g., refueling outage interval, 10-year inspection interval) in which the original inspection was conducted. 4. Procedure(s) will be revised to evaluate and project the rate of degradation until the end of the subsequent period of extended operation or the next scheduled inspection, whichever is shorter. The inspection sampling bases (e.g., selection, size, frequency) will be adjusted as necessary based on the projection. 5. Procedure(s) will be revised to specify that, where practical, acceptance criteria are quantitative (e.g., minimum wall thickness). For quantitative analyses, the required minimum wall thickness to meet applicable design standards will be used. For qualitative evaluations, applicable parameters such as ductility, color, and other indicators will be addressed to ensure a decision is based on observed conditions.		
24	*Flux Thimble Tube Inspection* program	The *Flux Thimble Tube Inspection* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to require that, for situations where no wear is measured in a flux thimble tube wall during wall thickness measurements, the minimum detectable wear value will be recorded and used to establish the future inspection frequency. The future inspection frequency will be a maximum of 15 calendar years between inspections.	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172) Supplement 1 (ML24095A207)
25	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* program	The *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to specify inspections and tests be performed by personnel qualified in accordance with site procedures and programs to perform the specified task. 2. Procedure(s) will be revised to provide non-ASME Code inspection guidance related to lighting, distance, offset, surface coverage, presence of protective coatings, and cleaning processes. Adequate lighting will be verified at the inspection location to detect degradation.	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

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		Lighting may be permanently installed, temporary, or portable (e.g., flashlight), as appropriate. For accessible surface inspections, inspecting from a distance of two feet or less will be appropriate. For viewing angles which may prevent adequate inspection, a viewing aid such as an inspection mirror or boroscope should be used. For internal inspections, accessible surfaces will be inspected. If inspecting piping internal surfaces, a minimum of one linear foot will be inspected, if accessible. Cleaning will be performed as necessary to allow for a meaningful examination. If protective coatings are present, the condition of the coating will be documented. 3. Procedure(s) will be revised to specify the following: a. In each 10-year period during the subsequent period of extended operation, the minimum number of inspections is completed for the various sample populations (each material, environment, and aging effect combination). If opportunistic inspections will not fulfill the minimum number of inspections by the end of each 10-year period, the program owner will initiate work orders as necessary to request additional inspections. A representative sample of 20 percent of the population (defined as components having the same material, environment, and aging effect combination) or a maximum of 25 components per population will be inspected. The new procedure will specify that the inspections focus on the bounding or lead components most susceptible to aging due to time in service and severity of operating conditions. b. The rate of degradation will be evaluated and projected until the end of the subsequent period of extended operation or the next scheduled inspection, whichever is shorter. The inspection sampling bases (e.g.: selection, size, frequency) will be adjusted as necessary based on the projection. c. Additional inspections will be performed if any sampling-based inspections do not meet the acceptance criteria, unless the cause of the aging effect for each applicable material and environment is corrected by repair or replacement. There will be no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20 percent of each applicable material, environment, and aging effect combination are inspected,		

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		whichever is less. If any subsequent inspections do not meet acceptance criteria, an extent of condition and extent of cause analysis will be conducted to determine the further extent of inspections required. Additional samples will be inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. The additional inspections will include inspections of components with the same material, environment, and aging effect combination. The additional inspections will be completed within the interval (e.g.: refueling outage interval, 10-year inspection 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. 4. Procedure(s) will be revised to specify that, where practical, acceptance criteria are quantitative (e.g.: minimum wall thickness). For quantitative analyses, the required minimum wall thickness to meet applicable design standards will be used. For qualitative evaluations, applicable parameters such as ductility, color, and other indicators will be addressed to ensure a decision is based on observed conditions.		
26	*Lubricating Oil Analysis* program	The *Lubricating Oil Analysis* program is an existing preventive program that will be enhanced as follows: 1. Procedure(s) will be revised to require periodic sampling and testing of the reactor building chiller oil for water and particulates. Procedure(s) will include water and particulate limits. 2. Procedure(s) will be revised to include: <u>Water Testing:</u> Water in oil will be monitored with the Visual Crackle Test or other first level water content test. The target value for water concentration will be less than or equal to 500 ppm (0.05 percent). If water content is nominally greater than 500 ppm (i.e., it fails the crackle test or other first level water content test), a confirmatory water analysis consistent with ASTM D6304 (Karl-Fischer titration test) or equivalent method will be performed to determine if the water content is within the limits specified	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
		in plant procedures. Phase-separated water in any amount is not acceptable. Particulate limits: Procedure(s) will be revised to specify established particulate limits that are based on equipment manufacturer's recommendations or industry standards. 3. Procedure(s) will be revised to require sampling lubricating oil for particulate and performance of a particle count analysis. 4. Procedure(s) will be revised to require sampling and testing following periodic oil changes or on a schedule consistent with equipment manufacturer's recommendations or industry standards. 5. Procedure(s) will be revised to require that water and particulate test results are monitored to identify adverse trends that require corrective action(s). 6. Procedure(s) will be revised to require initiating a condition report if the data collected exceed an alert limit or indicate an unexpected negative trend. Corrective actions will be determined by the Corrective Action Program, and may include increased monitoring, corrective maintenance, further laboratory analysis, and engineering evaluation of the system.		
27	*Monitoring of Neutron-Absorbing Materials Other Than Boraflex* program	The *Monitoring of Neutron-Absorbing Materials Other Than Boraflex* program is an existing condition monitoring program that is credited.	Ongoing	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
28	*Buried and Underground Piping and Tanks* program	The *Buried and Underground Piping and Tanks* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to specify that the limiting critical potential for the cathodic protection system should not be more negative than -1,200 mV to prevent damage to the coating. 2. The nine cathodic protection systems will be refurbished and upgraded to improve reliability. The refurbishment and upgrades will be implemented 5 years prior to entering the subsequent period of extended operation.	The program will be implemented, and inspections will begin 10 years before the subsequent period of extended operation. Inspections that are to be completed prior to 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.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
29	*Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* program	The *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* program is a new condition monitoring program that will manage loss of coating integrity of the in-scope components, exposed to closed-cycle cooling water, raw water, and treated water environments, that can lead to loss of base material or downstream effects such as reduction in flow, reduction in pressure or reduction of heat transfer when coatings/linings become debris. The program will manage loss of material or cracking for cementitious coatings/linings. Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.	The program will be implemented, and inspections will begin 10 years before the subsequent period of extended operation. Inspections that are to be completed prior to 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	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
			refueling outage prior to the subsequent period of extended operation.	
30	*ASME Section XI, Subsection IWE* program	The *ASME Section XI, Subsection IWE* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to require one-time supplemental surface examinations (or other applicable technique; e.g., EVT-1) to detect cracking due to SCC of the Containment pressure-retaining portions of the stainless steel fuel transfer tube assembly and 20 percent of the stainless steel or dissimilar metal welds associated with high temperature piping penetration sleeves, (i.e., penetration sleeves with temperatures greater than or equal to 140 degrees F). The one-time supplemental surface examinations will be performed prior to the subsequent period of extended operation to confirm the absence of cracking due to SCC. If SCC is detected as a result of the supplemental one-time inspections, additional inspections will be conducted in accordance with the Corrective Action Program. 2. Procedure(s) will be revised to require a one-time volumetric examination of metal liner surfaces that are inaccessible from one side, only if triggered by plant-specific operating experience. The trigger for this supplemental examination will be plant-specific occurrence or recurrence of measurable metal liner corrosion (base metal material loss exceeding 10 percent of nominal plate thickness) on the inaccessible side or areas, identified since the date of issuance of the initial renewed license. This supplemental volumetric examination will consist of a sample of one-foot square locations that include both randomly selected and focused areas most likely to experience degradation based on operating experience and/or other relevant considerations such as environment. This supplemental volumetric examination will occur within two refueling outages after identifying the triggering for the examination. Any identified degradation will be addressed in accordance with the applicable provisions of the *ASME Section XI, Subsection IWE* program. The sample size, locations, and any needed scope expansion (based on findings) for the supplemental volumetric examinations will be determined on a plant-specific basis to	Program enhancements will be implemented 6 months prior to the subsequent period of extended operation and if triggered by plant-specific operating experience, a one-time supplemental volumetric examination by sampling randomly selected as well as focused locations susceptible to loss of thickness due to corrosion of containment shell or liner that is inaccessible from one side is 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.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
		demonstrate statistically with 95 percent confidence that 95 percent of the accessible portion of the containment liner is not experiencing corrosion degradation with greater than 10 percent loss of nominal thickness. There has been no triggering operating experience for liner corrosion since the date of issuance of the initial renewed license. 3. Procedure(s) will be revised to specify that successive inspections be sequenced, evaluated, and re-examined in accordance with ASME Code, Section XI, Subsection IWE, Article IWE-2420. Examination results will be compared with recorded results of prior in-service examinations and evaluated for acceptance in accordance with ASME Code, Section XI, Subsection IWE, Article IWE-3120.		
31	*ASME Section XI, Subsection IWL* program	The *ASME Section XI, Subsection IWL* program is an existing condition monitoring program that is credited.	Ongoing	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
32	*ASME Section XI, Subsection IWF* program	The *ASME Section XI, Subsection IWF* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to include class MC component supports in the scope of the program. 2. Procedure(s) will be revised to evaluate the acceptability of inaccessible areas (e.g., portions of supports encased in concrete, buried underground, or encapsulated by guard pipe) when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. 3. Procedure(s) will be revised to require ASTM A325 and ASTM A490 bolts and associated nuts and washers to be stored in closed containers to protect them from dirt and corrosion. Additionally, the closed containers will be required to be stored in a protected shelter (Storage Level B or C) until use. 4. Procedure(s) will be revised to specify a one-time inspection within 5 years prior to entering the subsequent period of extended operation of an additional 5 percent of the sample populations for Class 1, 2, and 3 piping supports. The additional supports will be selected from the remaining population of IWF piping supports and will include components that are most susceptible to age-related degradation.	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation. The one-time inspections are to begin no earlier than 5 years prior to the subsequent period of extended operation and are to be completed 6 months prior to the subsequent period of extended operation or no later than the last refueling outage prior to the	SLRA, Appendix A, Table A4.0-1 (ML23233A172) Supplement 4 (ML24302A144)

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
		5. Procedures will be revised to require that at least one reactor pressure vessel support will be inspected every 5 years during the subsequent period of extended operation. 6. Procedure(s) will be revised to require that if a component support does not exceed the acceptance standards of IWF-3400 but is repaired to as-new condition, the sample will be increased or modified to include another support that is representative of the remaining population of supports that were not repaired. 7. Procedure(s) will be revised to include the additional unacceptable conditions indicated below that are not specified in IWF-3410(a) and to specify any unacceptable conditions may be accepted with a documented technical basis. a. Loss of material due to corrosion or wear. b. Debris, dirt, or excessive wear that could prevent or restrict sliding of the sliding surfaces as intended in the design basis of the support. c. Cracked or sheared bolts, including high-strength bolts, and anchors. d. Cracks. The above conditions may be accepted provided the technical basis for their acceptance is documented.	subsequent period of extended operation.	
33	*10 CFR 50, Appendix J* program	The *10 CFR 50, Appendix J* program is an existing performance monitoring program that is credited.	Ongoing	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
34	*Masonry Walls* program	The *Masonry Walls* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to include, into the scope of the program, masonry walls in the Auxiliary Service Building and Water Treatment Building. 2. Procedure(s) will be revised to require inspection for potential shrinkage and/or separation, cracking of masonry walls, cracking or loss of material at the mortar joints and gaps between the supports and masonry walls that could impact the intended function or potentially invalidate its evaluation basis. 3. Procedure(s) will be revised to specify that the interval between inspections does not exceed 5 years.	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
35	*Structures Monitoring* program	The *Structures Monitoring* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to include inspection of the following structures within the scope of subsequent license renewal: Auxiliary Service Building; alternate seal injection diesel generator (XEG0101) and control panel (XPN5587) (foundations and anchors); carbon dioxide tank (foundation and anchors); Circulating Water Intake Structure (includes Fire Service Pumphouse); the concrete pad supporting piping and equipment for filling Emergency Diesel Generator fuel oil tanks; 115 kV yard equipment (supports, foundations and anchors) from the plant including transformer XTF-4 and voltage regulator, XTF-6 and electrical switch XES-8, through and including electrical circuit switcher XES-4; electrical manholes EMH(s) 9, 11, 31, 32, 46, 47, 70, 72, 74, 75, and 76; sodium hydroxide tank (foundation and anchors); Unit 1 Relay House; and the Water Treatment Building. Baseline inspections for the added structures will be performed under the enhanced program to establish quantitative inspection data prior to conduct of periodic inspections in the subsequent period of extended operation. 2. Procedure(s) will be revised to include inspection of the following structural components: battery racks, cable bus enclosures and tap box enclosures (external surfaces and supports and support foundations), cable trays and conduits, cable trenches and covers (between Unit 1 Relay House, the Substation Relay House, and the 230 kV breaker XCB-8892), 230 kV substation lightning arrestor poles and foundations, doors, elastomeric materials, electrical duct banks, louvers, masonry wall edge support and bracing members, panels and other enclosures, penetration seals, pipe whip restraints and jet impingement shields (includes guard pipes used as shields against spray or jet impingement), sump and pool liners, switchyard bus supports, transmission towers, racks, trash racks (for Circulating Water Intake Structure), and tube tracks. 3. Procedure(s) will be revised to require storage of ASTM A325 and ASTM A490 bolts and associated nuts and washers be in closed containers to protect them from dirt and corrosion and the closed containers be stored in a protected shelter (Storage Level B or C) until use.	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
		4. Procedure(s) will be revised to require inspection of structural steel bracing and edge supports associated with masonry walls for deflection or distortion, loose bolts, and loss of material due to corrosion. 5. Procedure(s) will be revised to require inspection of elastomeric materials including structural sealants for cracking, loss of material, and hardening include the use of tactile inspection to detect hardening if the intended function is suspect. 6. Procedure(s) will be revised to require, where leakage volumes allow, monitoring and trending of through wall leakage or water infiltration and leaching deposits for volume and chemistry (for pH, mineral, calcium, chloride, sulfate and iron content) to evaluate any potential effect on the concrete or reinforcing steel. 7. Procedure(s) will be revised to require monitoring of aluminum and stainless steel structural components such as louvers, cable trays, conduits, and structural supports for loss of material and cracking due to SCC that could lead to the reduction or loss of their intended function. 8. Procedure(s) will be revised to require accounting for seasonal variations in the sampling of groundwater (e.g., quarterly monitoring every fifth year). 9. Procedure(s) will be revised to indicate excavation and focused examination of a sample of below grade concrete exposed to groundwater, or other measures, may be necessary every 5 years to detect potential concrete degradation if the groundwater in contact with the structures is determined to be aggressive. 10. Procedure(s) will be revised to require indications of groundwater infiltration or through-concrete leakage require assessment for aging effects which may include engineering evaluation, more frequent inspections, or destructive testing of affected concrete to validate existing concrete properties, including concrete pH levels. 11. Procedure(s) will be revised to incorporate the ACI 349.3R Chapter 5 ‘second-tier' evaluation criteria as quantitative acceptance criteria for concrete surfaces. 12. Procedure(s) will be revised to require evaluation criteria for steel structures be based on the judgment of a qualified structural engineer		

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
		using the AISC Specification for Structural Steel Buildings and Code of Standard Practice. 13. Procedure(s) will be revised to specify: a. Loose nuts and bolts are not acceptable (unless accepted by engineering evaluation). b. Structural sealants are acceptable if observed loss of material, cracking, and hardening will not result in loss of sealing. c. Sliding surfaces are acceptable if (a) no indications of excessive loss of material due to corrosion or wear and (b) no debris or dirt that could restrict or prevent sliding of the surfaces as required by design.		
36	*Inspection of Water Control Structures Associated with Nuclear Power Plants* program	The *Inspection of Water Control Structures Associated with Nuclear Power Plants* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to include inspection of steel elements including miscellaneous steel, and structural bolting associated with water control structures. 2. Procedure(s) will be revised to require ASTM A325 and ASTM A490 bolts and associated nuts and washers to be stored in closed containers to protect them from dirt and corrosion. Additionally, the closed containers will be required to be stored in a protected shelter (Storage Level B or C) until use. 3. Procedure(s) will be revised to specify the parameters to be monitored and inspected for concrete structures include those described in ACI-201.1R and ACI-349.3R and include monitoring conditions at junctions with abutments and embankments, loss of material, increase in porosity and permeability, seepage, and leakage. 4. Procedure(s) will be revised to specify steel components and bolting are inspected for loss of material due to corrosion, loose bolts, missing or loose nuts, other conditions indicative of loss of bolt preload, and cracked concrete around anchor bolts. 5. Procedure(s) will be revised to specify earthen structures are inspected for depressions, sinkholes, slope stability, and animal burrows. 6. Procedure(s) will be revised to require periodic determination and assessment of the bottom elevations of the Service Water Pond to ensure required water volume is maintained.	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
		7. Procedure(s) will be revised to require qualifications of inspection and evaluation personnel are consistent with ACI 349.3R for reinforced concrete water-control structures. 8. Procedure(s) will be revised to specify special inspections immediately following the occurrence of significant natural phenomena, such as large floods, hurricanes, tornadoes, or intense local rainfalls. 9. Procedure(s) will be revised to require indications of groundwater infiltration or through-concrete leakage be assessed for aging effects. 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, assessments may include analysis of the leakage pH, along with mineral, chloride, sulfate and iron content in the water. 10. Procedure(s) will be revised to require the underwater portions of the Service Water Pumphouse be included in the underwater structural inspections using a diver or dewatering, performed on a frequency not to exceed 5 years. 11. Procedure(s) will be revised to require the potential for aging affects for inaccessible, below-grade concrete structural elements be evaluated when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to such inaccessible areas. 12. Procedure(s) will be revised to specify examination of representative samples of the exposed portions of the below-grade concrete when excavated for any reason. 13. Procedure(s) will be revised to specify quantitative measurements and qualitative information be recorded and trended for findings exceeding the acceptance criteria for the applicable parameters monitored or inspected. 14. Procedure(s) will be revised to incorporate the ACI 349.3R Chapter 5 ‘second-tier' evaluation criteria as quantitative acceptance criteria for concrete surfaces. 15. Procedure(s) will be revised to specify engineering evaluations are documented and based on codes, specifications and standards such as AISC Specifications and those referenced in the plant's current licensing basis.		

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
37	*Protective Coating Monitoring and Maintenance* program	The *Protective Coating Monitoring and Maintenance* program is an existing condition monitoring program that is credited.	Ongoing	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
38	*Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program	The *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to add the requirement to identify adverse localized environments through plant operational experience reviews, communication with maintenance, operations, and radiation protection personnel, and the use of environmental surveys for determining each of the most limiting cable and connection electrical insulation plant environments (e.g.: caused by temperature, radiation, moisture, or contamination.) 2. Procedure(s) will be revised to include a list of structures/areas to perform/conduct the visual inspections of cables and connections. 3. Procedure(s) will be revised to add the requirement to perform a review of previously identified and mitigated adverse localized environments cumulative aging effects applicable to in-scope cable and connection electrical insulation. 4. Procedure(s) will be revised to add a description of testing methodology: Should testing be deemed necessary based on unacceptable visual indications of surface anomalies, a sample size of 20 percent of each cable and connection insulation material type found within the adverse localized environment with a maximum sample size of 25 will be tested. The following factors will be considered in the development of the cable and connection insulation test sample: environment including identified adverse localized environments (high temperature, high humidity, vibration, etc.), voltage level, circuit loading, connection type, location (high temperature, high humidity, vibration, etc.), and insulation material. 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. The technical basis for the sample selected is provided.	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
		5. Procedure(s) will be revised to specify the visual inspection be performed prior to the period of extended operation and at least once every 10 years thereafter. 6. Procedure(s) will be revised to require the test results for electrical cable and connection insulation material be verified to confirm they are within the acceptance criteria identified in the procedure(s). 7. Procedure(s) will be revised to add the requirement to include the performance of an Engineering evaluation of unacceptable test results and visual indications of cable and connection electrical insulation abnormalities. The evaluation will consider the age and operating environment of the component, as well as the severity of the abnormality and whether such an abnormality has previously been correlated to degradation of cable or connection insulation. Corrective actions include, but are not limited to, testing, shielding, or otherwise mitigating the environment or relocation or replacement of the affected cables or connections. When an unacceptable condition or situation is identified, a determination is made as to whether the same condition or situation is applicable to additional in-scope accessible and inaccessible cables or connections (extent of condition).		
39	*Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits* program	The *Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits* program is an existing performance monitoring program that is credited.	Ongoing	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
40	*Electrical Insulation for Inaccessible Medium-Voltage Power Cables*	The *Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program is an existing condition monitoring program that will be enhanced as follows:	Program enhancements for SLR will be implemented 6 months prior to the	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
	Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program	1. Procedure(s) will be revised to inspect and dewater, if required, the in-scope manholes after event driven occurrences, such as heavy rain, rapid thawing of ice and snow, or flooding. 2. Procedure(s) will be revised to clarify that the frequency of manhole inspections will occur at least once a year. 3. Procedure(s) will be revised to specify that condition monitoring cable test and inspections results that utilize visual inspection and test methods that are trendable and repeatable, will be trended to provide additional information on the rate of cable or connection insulation degradation.	subsequent period of extended operation.	Supplement 1 (ML24095A207)
41	*Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program	The *Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program is a new condition monitoring program that will manage the effects of reduced electrical insulation resistance or degraded dielectric strength of non-EQ, in scope, inaccessible (e.g., installed in buried conduits, cable trenches, cable troughs, duct banks, underground vaults, or direct buried installations), instrument and control cables, potentially exposed to significant moisture. Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.	Program will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172) Supplement 3 (ML24155A146)
42	*Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program	The *Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program is a new condition monitoring program that will manage the effects of reduced insulation resistance of non-EQ, in scope, inaccessible (e.g., installed in buried conduits, cable trenches, cable troughs, duct banks, underground vaults, or direct buried installations), low-voltage power cables (operating voltage less than 2 kV), potentially exposed to significant moisture. Industry and plant-specific operating experience will be evaluated in the development of this program.	Program will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
43	*Fuse Holders* program	The *Fuse Holders* program is a new condition monitoring program that will manage the aging effect of increased electrical resistance of connection of the metallic clamps and reduced electrical insulation resistance of the fuse holder electrical insulation material.	Program will be implemented 6 months prior to the	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
		Industry and plant-specific operating experience will be evaluated in the development of this program.	subsequent period of extended operation.	
44	*Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program	The *Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program is a new condition monitoring program that consists of a representative sample of non-EQ, in scope, electrical cable connections (metallic parts) tested prior to the subsequent period of extended operation to provide an indication of the integrity of the cable connections. The results will be evaluated to determine if there is a need for subsequent periodic testing on a 10-year frequency. Industry and plant-specific operating experience will be evaluated in the development of this program.	Program will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
45	*High-Voltage Insulators* program	The *High-Voltage Insulators* program is a new condition monitoring program that visually inspects high voltage insulator surfaces and metallic parts at least once every 2 years initially with the frequency adjusted based on plant specific operating experience. For high-voltage insulators that are coated, the visual inspection will be performed at least once every 5 years. Industry and plant-specific operating experience will be evaluated in the development of this program.	Program will be implemented 6 months prior to the subsequent period of extended operation. Inspections that are to be completed prior to the subsequent period of extended operation will 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.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
46	*Fatigue Monitoring* program	The *Fatigue Monitoring* program is an existing preventive program that will be enhanced as follows: 1. Procedure(s) will be revised to require: a. Transient cycles associated with the ASME Code, Section XI, Appendix A and L fatigue-sensitive locations be identified and tracked each 10-year interval.	Program enhancements for SLR will be implemented 6 months prior to the	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
		b. A surveillance limit be established for transient cycles associated with the ASME Code, Section XI, Appendix A and L fatigue-sensitive locations and corrective actions be initiated prior to exceeding the ASME Code, Section XI, Appendix A or L analyses transient cycle assumptions. 2. Procedure(s) will be revised to include component repair, component replacement, performance of a more rigorous analysis, performance of an ASME Code, Section XI, Appendix A or L flaw-tolerance analysis, or scope expansion that considers other locations with the highest expected CUF_{en} values, as corrective action considerations when a cycle-counting surveillance limit is exceeded. 3. Procedure(s) will be revised to require that when a cycle-counting surveillance limit is reached, action will be taken to ensure that the analytical bases of the high-energy line break (HELB) locations are maintained.	subsequent period of extended operation.	
47	*Neutron Fluence Monitoring* program	The *Neutron Fluence Monitoring* program is an existing condition monitoring program that is credited.	Ongoing	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
48	*Environmental Qualification of Electric Equipment* program	The *Environmental Qualification of Electric Equipment* program is an existing condition monitoring program that is credited.	Ongoing	SLRA, Appendix A, Table A4.0-1 (ML23233A172)
49	*Concrete Containment Unbonded Tendon Prestress* program	The *Concrete Containment Unbonded Tendon Prestress* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be revised to specify that the trend analyses of tendon prestress loss will include trends projected through the end of the subsequent period of extended operation. 2. Procedure(s) will be revised to specify that for each surveillance interval, the predicted lower limit, minimum required value, and trending lines will be developed for the subsequent period of extended operation as part of the regression analysis for each tendon group.	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	SLRA, Appendix A, Table A4.0-1 (ML23233A172)

Item No.	UFSAR Supplement Section	Commitment	Implementation Schedule	Source
50	N/A	The diesel fire pump engine jacket water heat exchanger core will be replaced at least once every 20 years.	Procedures will be implemented 6 months prior to the subsequent period of extended operation to replace the diesel fire pump engine jacket water heat exchanger core at least once every 20 years.	Supplement 2 (ML24129A200)

APPENDIX B

CHRONOLOGY

B. Chronology

This appendix lists chronologically the routine licensing correspondence between the U.S. Nuclear Regulatory Commission (NRC) staff and Dominion Energy South Carolina, Inc. (DESC, or the applicant). This appendix also lists other correspondence under Virgil C. Summer Nuclear Station, Unit 1 (V.C. Summer or VCSNS) Docket No. 50 395 related to the NRC staff's review of the V.C. Summer 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 reference staff at 1-800-397-4209, 301-415-4737, or by email to pdr.resource@nrc.gov.

Table B-1. Chronology

Date	ADAMS Accession No.	Subject
12/16/2021	ML21350A235	DESC, Virgil C. Summer Nuclear Station, Unit 1 – Intent to Pursue Subsequence License Renewal
08/17/2023	ML23233A179 (package)	DESC, Virgil C. Summer, Unit 1, Application for Subsequent Renewed Operating License
09/05/2023	ML23235A037 (package)	NRC, Virgil C. Summer Nuclear Station, Unit 1 – Receipt and Availability of the Subsequent License Renewal Application
10/11/2023	ML23275A010 (package)	NRC, Virgil C. Summer Nuclear Station, Unit 1 SLRA–Acceptance and Opportunity for Hearing–Letter and FRN
10/16/2023	ML23284A179	NRC, Virgil C. Summer Nuclear Station, Unit No. 1 – Subsequent License Renewal Application Online Reference Portal
10/25/2023	ML23296A109	NRC, Virgil C. Summer Nuclear Station, Unit No. 1 – Aging Management Audit Plan Regarding the Subsequent License Renewal Application Review
12/22/2023	ML23346A041	NRC, Virgil C. Summer Nuclear Station, Unit No. 1 – Request for Withholding Information from Public Disclosure Regarding the Subsequent License Renewal Application
04/01/2024	ML24095A207	DESC, Virgil C. Summer Nuclear Station, Unit 1 – Update to Subsequent License Renewal Application (SLRA) Supplement 1
04/19/2024	ML24109A115	NRC, Virgil C. Summer Nuclear Station, Unit No. 1 – Limited Aging Management Audit Plan Regarding the Subsequent License Renewal Application Review
05/06/2024	ML24129A200	DESC, Virgil C. Summer Nuclear Station, Unit 1, Update to Subsequent License Renewal Application, Supplement 2
05/06/2024	ML24127A110 (package)	NRC, VC Summer SLRA – Requests for Additional Information – Set 1
05/08/2024	ML24129A068 (package)	NRC, VC Summer SLRA – Requests for Confirmation of Information – Set 1
05/30/2024	ML24155A146	DESC, Virgil C. Summer Nuclear Station, Unit 1 – Update to Subsequent License Renewal Application (SLRA) – Response to NRC Request for Additional Information Set 1 Response to NRC Request for Confirmation of Information Set 1 and Supplement 3

Date	ADAMS Accession No.	Subject
06/03/2024	ML24156A001 (package)	NRC, VC Summer SLRA – Requests for Additional Information – Set 2
06/17/2024	ML24171A015	DESC, Virgil C. Summer, Unit 1, Update to Subsequent License Renewal Application (SLRA) Response to NRC Request for Additional Information Set 2 Safety Review
06/25/2024	ML24085A699 (package)	NRC, Aging Management Audit Report – VC Summer Unit 1 – Subsequent License Renewal Application
08/19/2024	ML24190A401	NRC, Virgil C. Summer Nuclear Station, Unit No. 1 – Request for Withholding Information from Public Disclosure Regarding the Subsequent License Renewal Application – Dominion Energy Letter Dated May 30, 2024
09/26/2024	ML24274A194	DESC, Virgil C. Summer Nuclear Station (VCSNS), Unit 1 Subsequent License Renewal Application (SLRA) First 10 CFR 54.21(b) Annual Amendment
10/24/2024	ML24302A144	DESC, Virgil C. Summer Nuclear Station, Unit 1 – Update to Subsequent License Renewal Application (SLRA) Supplement 4 and Requested Information Formation in Response to Limited Aging Management Audit
1/17/2025	ML25007A234	NRC, Virgil C. Summer Nuclear Station, Unit No. 1 – Limited Scope Aging Management Audit Report Regarding the Subsequent License Renewal Application Review

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
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Cintron, Jorge	Review – Electrical
Correll, Brian	Review – Electrical
Dijamco, David	Reviewer – Mechanical and Materials
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Iqbal, Naeem	Reviewer – Scoping and Screening Methodology
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Johnson, Marieliz	Project Manager
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APPENDIX D

REFERENCES

D. References

This appendix lists the references used throughout this safety evaluation for review of the Virgil C. Summer Nuclear Station, Unit 1 subsequent license renewal application.

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