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

Safety Evaluation Report

Related to the Subsequent License Renewal
of North Anna Power Station, Units 1 and 2

Docket Nos. 50-338 and 50-339

Virginia Electric and Power Company

DRAFT REPORT

Issued: October 2021

Office of Nuclear Reactor Regulation

ABSTRACT

This safety evaluation report (SER) documents the technical review of the North Anna Power Station, Units 1 and 2 (NAPS) subsequent license renewal application (SLRA) by the U.S. Nuclear Regulatory Commission (NRC) staff.

By letter dated August 24, 2020 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML20246G703), Virginia Electric and Power Company (Dominion Energy or the applicant) submitted an application for subsequent license renewal. Dominion Energy requested renewal for a period of 20 years beyond the current expiration at midnight on April 1, 2038, for Unit 1 (Facility Operating License No. NPF-4) and at midnight on August 21, 2040, for Unit 2 (Facility Operating License No. NPF-7).

NAPS is located on the southern shore of Lake Anna in Louisa County, VA. Each unit includes a three-coolant-loop, pressurized light water reactor nuclear steam supply system with a license thermal power of 2,940 MWt. The NRC issued the initial operating licenses on April 1, 1978, for Unit 1 and August 21, 1980, for Unit 2. The NRC issued the first renewed operating licenses for these units on March 20, 2003.

This SER presents the status of the NRC staff's review of information submitted by Dominion Energy through October 1, 2021. On the basis of its review of the SLRA, the NRC staff has determined that Dominion Energy has met the requirements of Title 10 of the *Code of Federal Regulations* Section 54.29(a).

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ABBREVIATIONS AND ACRONYMS

AAC	alternate AC
	all aluminum conductor
AC	alternating current
ACAR	aluminum conductor alloy reinforced
ACI	American Concrete Institute
ACRS	Advisory Committee on Reactor Safeguards
ADAMS	Agencywide Documents Access and Management System
AEA	Atomic Energy Act of 1954, as amended
AEC	Atomic Energy Commission
AERM	aging effect requiring management
AISC	American Institute of Steel Construction
AMP	aging management program
AMR	aging management review
ANSI	American National Standards Institute
ART	adjusted reference temperature
ASM	American Society for Metals
ASME	American Society of Mechanical Engineers
ASR	alkali-silica reaction
ASTM	American Society for Testing of Materials
ATWS	anticipated transient without scram
AWWA	American Water Works Association
B&W	Babcock & Wilcox
BAW-XXXX	B&W Report
BMI	bottom mounted instrumentation
BTP	Branch Technical Position
BWR	boiling water reactor
°C	degrees Celsius
CASS	cast austenitic stainless steel
CAT	chemical addition tank
CBS	concrete biological shield

CCT	casing cooling tank
CE	Combustion Engineering
CF	chemistry factor
CFR	*Code of Federal Regulations*
CFRP	carbon fiber reinforced polymer
CLB	current licensing basis
CMAA	Crane Manufacturers Association of America, Inc.
CRD	control rod drive
CRDM	control rod drive mechanism
CRGT	control rod guide tube
CUF	cumulative usage factor
CUF_{en}	environmentally-adjusted cumulative usage factor
CVCS	chemical and volume control system
CW	circulating water
DBE	design basis event
	design basis earthquake
DM	dissimilar metal
DO	dissolved oxygen
DOE	U. S. Department of Energy
EAF	environmentally-assisted fatigue
ECMT	emergency conduit makeup tank
ECSTs	emergency condensate storage tanks
EDG	emergency diesel generator
EFPY	effective full-power year
EMA	equivalent margins analysis
EMDA	Expanded Materials Degradation Assessment
EOCI	Electric Overhead Cranes Institute
EPRI	Electric Power Research Institute
EQ	environmental qualification
ESF	engineered safety features

°F	degrees Fahrenheit
FAC	flow-accelerate corrosion
FCG	fatigue crack growth
F_{en}	environmental fatigue correction factor
FOST	fuel oil storage tank
FSWOL	full structural weld overlay
GALL-SLR	*Generic Aging Lessons-Learned for Subsequent License Renewal* (NUREG–2191)
GDC	general design criterion
GEIS	*Generic Environmental Impact Statement* (NUREG-1437)
GL	generic letter
gpm	gallons-per-minute
HAZ	heat affected zones
HELB	high-energy line break
I&C	instrumentation and controls
I&E	inspection and evaluation
IAEA	International Atomic Energy Agency
IASCC	irradiation-assisted stress corrosion cracking
IN	information notice
INPO	Institute of Nuclear Power Operations
IPA	integrated plant assessment
ISG	interim staff guidance
ISI	inservice inspection
KIC	fracture toughness coefficient
ksi	kilopounds per square inch
LAW	lower axial weld
LBB	leak-before-break
LCO	limited condition for operation
LFW	lower flange weld
LGW	lower girth weld

LOCA	loss-of-coolant accident
LRA	license renewal application
LTOP	low-temperature overpressure protection
LWR	light water reactor
MAW	middle axial weld
MCM	thousand circular mil
MEB	metal-enclosed bus
MIC	microbiologically influenced corrosion
mpy	miles per year
MRP	Materials Reliability Program
MPT	magnetic particle testing
MT	magnetic particle
MUR	measurement uncertainty recapture
n/cm^2	neutrons per square centimeter
NACE	National Association of Corrosion Engineers
NAPS	North Anna Power Station, Units 1 and 2
NDE	nondestructive examination
NDT	nil-ductility temperatures
NEA	Nuclear Energy Agency
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act of 1969, as amended
NFPA	National Fire Protection Association
Ni-Cr-Fe	stainless steel and nickel based
NPP	nuclear power plants
NRC	U.S. Nuclear Regulatory Commission
NSAC	Nuclear Safety Analysis Council
NSAL	nuclear safety advisory letter (Westinghouse)
NSR	nonsafety-related
NSSS	nuclear steam supply system
NST	neutron shield tank
NUREG	denotes a type of Nuclear Regulatory Commission publication

OBE	operating basis earthquake
OE	operating experience
OECD	Organisation for Economic Co-operation and Development
PAMS	plant asset monitoring system
PORV	power-operated relief valve
P-T	pressure-temperature
PTFE	polytetrafluoroethylene
PTR	project topical report
PTS	pressurized thermal shock
PVC	polyvinyl chloride
PVDF	polyvinylidene fluoride
PWR	pressurized water reactor
PWROG	Pressurized Water Reactor Owners' Group
PWRVI	PWR vessel internal
PWSCC	primary water stress corrosion cracking
QA	quality assurance
RAI	request for additional information
RCI	request for confirmation of information
RCP	reactor coolant pump
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RG	regulatory guide
RHR	residual heat removal
RIS	regulatory issue summary
RPV	reactor pressure vessel
RSHX	recirculation spray heat exchanger
RSST	reserve station service transformer
RT	radiographic
RT_{NDT}	reference temperature for nil-ductility transition - irradiated
$RT_{NDT(U)}$	reference temperature for nil-ductility transition - unirradiated
RT_{PTS}	reference temperature for pressurized thermal shock

RV	reactor vessel
RVCH	reactor vessel closure heads
RVI	reactor vessel internal
RWST	refueling water storage tank
SBO	station blackout
SC	structures and components
SCC	stress corrosion cracking
SE	safety evaluation
SEE IN	Significant Event Evaluation and Information Network
SER	safety evaluation report
SFP	spent fuel pool
SG	steam generator
SIA	Structural Integrity Associates
SLR	subsequent license renewal
SLRA	subsequent license renewal application
SPEO	subsequent period of extended operation
SPS	Surry Power Station
SR	safety related
SRM	Staff Requirements Memorandum
SRP	Standard Review Plan
SRP-SLR	*Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants*, (NUREG 2192, Revision 0), issued July 2017
SRSS	square-root of sum of the squares
SS	stainless steel
SSA	steel support assembly
SSC	system, structure, and component
SW	service water
SWVH	service water valve house
SWOL	structural weld overlay
TER	technical evaluation report
TLAA	time-limited aging analysis
TR	topical report

TRM	Technical Requirements Manual
TS	technical specification
UAW	upper axial weld
UPTI	Underground Piping and Tank Integrity
UFSAR	Updated Final Safety Analysis Report
USAS (ANSI)	USA Standards Institute
USE	upper-shelf energy
UT	ultrasonic testing
VT	visual
WCAP	Westinghouse Commercial Atomic Power
ΔRT_{NDT}	adjustment in RT_{NDT}
ΔRT_{PTS}	adjustment in RT_{PTS}

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SECTION 1 INTRODUCTION AND GENERAL DISCUSSION

1.1 Introduction

This safety evaluation report (SER) documents the U.S. Nuclear Regulatory Commission (NRC) staff's safety review of the subsequent license renewal application (SLRA) for North Anna Power Station, Units 1 and 2 (NAPS, North Anna, or applicant), as filed by Virginia Electric and Power Company (Dominion Energy or the applicant), by letters dated August 24, 2020, (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML20246G703), February 4, 2021 (ADAMS Accession No. ML21035A303), March 17, 2021 (ADAMS Accession No. ML21076B025), March 25, 2021 (ADAMS Accession No. ML21084A182), April 1, 2021 (ADAMS Accession No. ML21091A186), April 29, 2021 (ADAMS Accession No. ML21119A287), May 27, 2021 (ADAMS Accession No. ML21147A293), July 29, 2021 (ADAMS Accession No. ML21210A396), August 5, 2021 (ADAMS Accession No. ML21217A187), and August 28, 2021 (ADAMS Accession No. ML21238A297).

Dominion Energy's application seeks to renew NAPS Renewed Facility Operating License Nos. NPF-4 and NPF-7 for an additional 20 years beyond the current expiration of their renewed licenses on April 1, 2038, for Unit 1, and August 21, 2040, for Unit 2. The staff performed a safety review of Dominion Energy'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 Ms. Lois James, who can be contacted by email at Lois.James@nrc.gov.

NAPS is located in Louisa, VA. Each unit consists of a Westinghouse three-loop pressurized-water reactor with licensed thermal power of 2,940 megawatts thermal (MWt). The NRC issued the initial operating licenses on April 1, 1978, for Unit 1, and August 21, 1980, for Unit 2. The NRC issued renewed operating licenses for both NAPS units on March 20, 2003. The NAPS updated final safety analysis report (UFSAR) describes the plant and the site (ADAMS Package Accession No. ML20309A590).

The NRC license renewal process consists of two concurrent reviews: (1) a safety review and (2) an environmental review. NRC regulations in 10 CFR Part 54 and 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," set forth requirements for the safety review and the environmental review, respectively. The safety review for the NAPS subsequent license renewal is based on Dominion Energy's SLRA, the NRC staff's audits, responses to the staff's requests for additional information (RAIs), and response to the staff's requests for confirmation of information (RCIs). Dominion Energy supplemented its application and provided clarifications through its responses to the staff's questions in RAIs, RCIs, audits, meetings, and docketed correspondence. The staff reviewed and considered information submitted through October 1, 2021.

The public may view the SLRA, as well as materials related to the license renewal review, on the NRC website at https://www.nrc.gov/reactors/operating/licensing/renewal/applications/north-anna-1-2-subsequent.html.

This SER summarizes the results of the staff's safety review of the SLRA and describes the technical details the staff considered in evaluating the safety aspects of the units' proposed operation for an additional 20 years beyond the term of the current renewed operating licenses. The staff reviewed the SLRA in accordance with NRC regulations and the guidance in

NUREG-2192, Revision 0, “Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants” (SRP-SLR), dated July 2017 (ADAMS Accession No. ML17188A158).

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

SER Appendix A, “License Renewal Commitments,” contains a table showing Dominion Energy’s commitments for subsequent renewal of the operating licenses. SER Appendix B, “Chronology,” contains a chronology of the principal correspondence between the staff and the applicant, as well as other relevant correspondence, regarding the SLRA review. SER Appendix C contains a list of principal contributors to the SER, and Appendix D contains a bibliography of the references that support the staff’s review.

1.2 License Renewal Background

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

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

1.2.1 Preparations for Subsequent License Renewal

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

During 2011 through 2013, the NRC performed three “Aging Management Program (AMP) Effectiveness Audits” at plants that were already in the period of extended operation. The purpose of these information collection audits was to provide an understanding of how AMPs have been implemented by plants during the period of extended operation and the degradation that has been identified by the AMPs. A summary of the staff’s observations from the first two AMP effectiveness audits can be found in the May 2013 report, “Summary of Aging Management Program Effectiveness Audits to Inform Subsequent License Renewal: R.E. Ginna NPP [Nuclear Power Plant] and Nine Mile Point Nuclear Station, Unit 1” (ADAMS Accession No. ML13122A007). The summary of the staff’s observations from the third audit can be found in the August 5, 2014, report, “H.B. Robinson Steam Electric Plant, Unit 2, Aging Management Program Effectiveness Audit” (ADAMS Accession No. ML14017A289). In addition, on June 15, 2016, the staff issued the technical letter report, “Review of Aging Management Programs: Compendium of Insight from License Renewal Applications and from AMP Effectiveness Audits Conducted to Inform Subsequent License Renewal Guidance Documents” (ADAMS Accession No. ML16167A076), which provides observations from reviewing license renewal applications (LRAs) and the AMP effectiveness audits, as contextualized in ADAMS Accession No. ML16194A124.

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

In May 2012, the NRC and the DOE also cosponsored the Third International Conference on Nuclear Power Plant Life Management for Long-Term Operations, organized by the International Atomic Energy Agency (IAEA). In February 2013 and February 2015, the Nuclear Energy Institute (NEI) held forums on long-term operations and SLR. These conferences focused on the technical issues that would need to be addressed to provide assurance for safe operation beyond 60 years.

The NRC staff also reviewed domestic operating experience as reported in licensee event reports and NRC generic communications related to failures and degradation of passive components. Similarly, the NRC staff reviewed the following international operating experience databases: (i) the International Reporting System, jointly operated by the IAEA and the Nuclear Energy Agency (NEA), (ii) IAEA’s International Generic Aging Lessons Learned Programme, (iii) the Organisation for Economic Co-operation and Development (OECD)/NEA Component Operational Experience and Degradation and Aging Programme database, and (iv) the OECD/NEA Cable Aging Data and Knowledge database.

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

The NRC, in cooperation with the DOE, completed the Expanded Materials Degradation Assessment (EMDA) in October 2014 (ADAMS Accession Nos. ML14279A321, ML14279A331, ML14279A349, ML14279A430, and ML14279A461). The EMDA used an expert elicitation process to identify materials and components that could be susceptible to significant degradation during operation beyond 60 years. The EMDA covers the reactor vessel, primary system piping, reactor vessel internals, concrete, and electrical cables and qualification. The staff used the results of the EMDA to identify gaps in the current technical knowledge or issues that are not being addressed by planned industry or DOE research, and to identify AMPs that will require modification for subsequent license renewal.

Based on the information gathered from these conferences and forums, and other sources from 2008 through 2014, the most significant technical issues identified as challenging operation beyond 60 years are: reactor pressure vessel embrittlement; irradiation-assisted stress corrosion cracking (IASCC) of reactor internals; concrete structures and containment degradation; and electrical cable environmental qualification, condition monitoring, and assessment.

Between 2014 and 2016, over 90 expert panels from the Office of Nuclear Reactor Regulation and Office of Research reviewed and dispositioned the comments and recommendations and published drafts of NUREG-2191, Revision 0, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," and NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" (SRP-SLR) in NEI-2016. The final guidance documents were published in July 2017 (ADAMS Accession Nos. ML17187A031 and ML17187A204) to provide sufficient guidance to support the review of an SLR application.

Concurrent with the development of the technical guidance for SLR, the staff considered whether changes were needed in the regulatory framework and the license renewal rule for SLR. The NRC staff proposed a revision to the 10 CFR Part 54 rule in SECY-14-0016, "Ongoing Staff Activities to Assess Regulatory Considerations for Power Reactor Subsequent License Renewal" (ADAMS Accession No. ML14050A306). In the Commission's staff requirements memorandum (SRM) on SECY-14-0016 (ADAMS Accession No. ML14241A578), the Commission did not approve rulemaking but instead directed the staff to continue to update the license renewal guidance, as needed, to provide additional clarity on implementation of the license renewal regulatory framework for SLR. The SRM also directed the staff to keep the Commission informed of the progress in resolving the following technical issues related to SLR: (i) reactor pressure vessel neutron embrittlement at high fluence, (ii) IASCC of reactor internals and primary system components, (iii) concrete and containment degradation, and (iv) electrical cable qualification and condition assessment. In addition, the SRM directed the staff to keep the Commission informed regarding the staff's readiness for accepting an application and any further need for regulatory process changes, rulemaking, or research.

Consistent with Commission direction, the staff drafted updated guidance documents for subsequent license renewal that addressed the four major technical issues in the Commission's SRM and, in 2017, briefed the Commission on the status of research and the development of SLR guidance, including new or revised aging management programs (AMPs). The final GALL-SLR Report and SRP-SLR guidance documents include new AMPs for neutron fluence and high-voltage insulators; new further evaluations for development of new plant-specific programs, as needed, to manage the effects of irradiation on concrete and steel structural components; and revised programmatic criteria for boiling-water reactor and pressurized-water reactor vessel internals programs to consider higher fluences during the SLR period. Thus, the SLR guidance documents provide a sound basis for development of applicant programs to manage the effects of aging associated with the technical issues and for the NRC staff's review of applicant programs and activities proposed to manage aging during the SLR period. If new aging issues are identified through plant operating experience, industry research activities, or NRC confirmatory research, the NRC staff will revise the guidance documents to address the new information as appropriate.

1.2.2 Safety Review

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

(1) The regulatory process is adequate to ensure that the licensing bases of all currently operating plants maintain an acceptable level of safety with the possible exception of the detrimental aging effects on the functions of certain systems, structures, and components (SSCs), as well as a few other safety-related issues, during the period of extended operation.

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

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

(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(a)].

(3) All systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for fire protection, environmental qualification (EQ), pressurized thermal shock (PTS), anticipated transients without scram (ATWS), and station blackout (SBO).

As required by 10 CFR 54.21(a), a license renewal applicant must review all SSCs within the scope of 10 CFR Part 54 to identify structures and components (SCs) subject to an aging management review (AMR). SCs subject to an AMR are those that perform an intended function without moving parts or without a change in configuration or properties and are not subject to replacement based on a qualified life or specified time period. In accordance with 10 CFR 54.21(a), a license renewal applicant must demonstrate that the effects of aging will be adequately managed so that the intended function(s) of those SCs will be maintained consistent with the current licensing basis (CLB) for the period of extended operation. In contrast, active equipment is adequately monitored and maintained by existing programs and is not subject to an AMR. In other words, detrimental aging effects that may affect active equipment can be readily identified and corrected through existing surveillance, performance monitoring, and maintenance programs. Surveillance and maintenance programs for active equipment, as well as other maintenance aspects of plant design and licensing basis, are required under 10 CFR Part 50 regulations throughout the period of extended operation.

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

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

In the SLRA, Dominion Energy stated that it used the process defined in the GALL-SLR Report, which summarizes staff-approved AMPs for many SCs subject to an AMR. If an applicant commits to implementing these staff-approved AMPs, the time, effort, and resources for SLRA review can be greatly reduced, improving the efficiency and effectiveness of the subsequent license renewal 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 applicants and staff reviewers on AMPs and activities that can manage aging adequately during the subsequent period of extended operation.

1.2.3 Environmental Review

Part 51 of 10 CFR contains the NRC's regulations implementing the requirements of the National Environmental Policy Act of 1969, as amended (NEPA). In December 1996, the staff revised these regulations to facilitate the environmental review for license renewal. The staff prepared the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS) to document its evaluation of possible environmental impacts associated with nuclear power plant license renewals. For certain types of environmental impacts, the GEIS contains generic impact findings that apply to all nuclear power plants (or distinct subsets of plants). These generic findings are codified in Appendix B, "Environmental Effect of Renewing the Operating License of a Nuclear Power Plant," to Subpart A, "National Environmental Policy Act—Regulations Implementing Section 102(2)," of 10 CFR Part 51. Under 10 CFR 51.53(a) and 10 CFR 51.53(c)(3)(i), a license renewal applicant may incorporate these generic findings in its environmental report and an applicant's environmental report need not contain an analysis of the impacts of the generic (i.e., Category 1) issues listed in 10 CFR Part 51. In accordance with 10 CFR 51.53(c)(3)(ii), an environmental report must include analyses of the environmental impacts that must be evaluated on a plant-specific basis (i.e., Category 2 issues).

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

In accordance with the National Environmental Policy Act of 1969 and 10 CFR Part 51, the staff reviewed the NAPS plant-specific environmental impacts of SLR, including any new and significant information that was not considered in the GEIS. As part of its scoping process, the staff held a public scoping meeting on November 4, 2020, via webinar to assist the staff in identifying plant-specific environmental issues (ADAMS Accession No. ML20302A036). The staff issued an environmental scoping summary report on June 30, 2021, which included the comments received during the scoping process and the staff's responses to those comments (ADAMS Accession No. ML21181A127).

The staff issued its draft plant-specific supplement to the GEIS (Supplement 7, Second Renewal) in August 2021 (ADAMS Accession No. ML21228A084). Draft, plant-specific GEIS Supplement 7—SLR, documents the results of the NRC staff's environmental review and makes a preliminary recommendation on the license renewal action based on environmental considerations. A public webinar was held on the draft Supplemental Environmental Impact Statement on September 28, 2021. After considering comments on the draft GEIS Supplement, the staff will publish the final, plant-specific GEIS Supplement 7-SLR, separately from this report.

1.3 Principal Review Matters

Part 54 of 10 CFR describes the requirements for renewal of operating licenses for nuclear power plants. The staff's technical review of the SLRA was performed in accordance with NRC guidance and 10 CFR Part 54 requirements. Section 54.29, "Standards for Issuance of a Renewed License," of 10 CFR Part 54 sets forth the license renewal standards. This SER describes the results of the staff's safety review in accordance with 10 CFR Part 54 requirements.

As required by 10 CFR 54.19(a), the NRC requires a license renewal applicant to submit general information as specified in 10 CFR 50.22(a) through (e), (h), and (i), which Dominion Energy provided in SLRA Section 1. The staff reviewed SLRA Section 1 and finds that Dominion Energy has submitted the required information.

Section 54.19(b) requires that the SLRA include "conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license." On this issue, Dominion Energy 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-80) for North Anna Power 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. 12, lists North Anna Power Station operating license numbers NPF-4 and NPF-7. 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 numbers NPF-4 and NPF-7. Therefore, no changes to the Indemnity Agreement are deemed necessary as part of this application.

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

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

Section 54.21(b) requires that, each year following submittal of the SLRA and at least 3 months before the scheduled completion of the staff's review, the applicant submit an SLRA amendment identifying any CLB changes that materially affect the contents of the SLRA, including the UFSAR supplement. By letter dated August 5, 2021, Dominion Energy submitted an SLRA update that summarizes the CLB changes that have occurred during the staff's review of the SLRA (ADAMS Accession No. ML21217A187. This submission satisfies 10 CFR 54.21(b) requirements.

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

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

As required by 10 CFR 54.25, "Report of the Advisory Committee on Reactor Safeguards," the ACRS issues a report documenting its evaluation of the staff's SLRA review and SER. SER Section 5 describes the role of the ACRS. SER Section 6 documents the findings required by 10 CFR 54.29.

1.4 Interim Staff Guidance

License renewal is a living program. The NRC staff, industry, and other interested stakeholders gain experience and develop lessons learned with each renewed license. The lessons learned contribute to the staff's performance goals of maintaining safety, improving effectiveness and efficiency, reducing regulatory burden, and increasing public confidence. The NRC identifies lessons learned in interim staff guidance (ISG) for the staff, industry, and other interested stakeholders to use until the NRC incorporates the information into license renewal guidance documents such as the SRP-SLR and GALL-SLR Report.

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

Table 1.4-1 Current License Renewal Interim Staff Guidance

License Renewal ISG Topic (Approved LR-ISG Number)	Title	SER Section
SLR-ISG-2021-04-ELECTRICAL (ADAMS Accession No. ML20181A395)	Updated Aging Management Criteria for Electrical Portions of Subsequent License Renewal Guidance	SER Sections 3.0.3.1.18, 3.0.3.1.19, 3.0.3.1.22, 3.0.3.2.22
SLR-ISG-2021-02-MECHANICAL (ADAMS Accession No. ML20181A434)	Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance	SER Sections 3.0.3.1.1, 3.0.3.1.4, 3.0.3.2.15, 3.0.3.2.25
SLR-ISG-2021-03-STRUCTURES (ADAMS Accession No. ML20181A381)	Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance	SER Sections 3.0.3.1.18, 3.5.2.2.1,

License Renewal ISG Topic (Approved LR-ISG Number)	Title	SER Section
SLR-ISG-2021-01-PWRVI (ADAMS Accession No. ML20217L203)	Updated Aging Management Criteria for Reactor Vessel Internal Components of Pressurized Water Reactors of Subsequent License Renewal Guidance	SER Section 3.0.3.2.3

1.5 Summary of Open Items

An item is considered open if, in the staff's judgment, the staff has not determined that it meets all applicable regulatory requirements at the time of the issuance of this SER. After reviewing the SLRA, including additional information Dominion Energy submitted through October 1, 2021, the staff identified no open items.

1.6 Summary of Confirmatory Items

An item is considered confirmatory if, in the staff's judgment, the staff and the applicant have reached an acceptable resolution that meets all applicable regulatory requirements but at the time of the issuance of this SER, the staff had not received the necessary documentation to confirm the resolution. After reviewing the SLRA, including additional information Dominion Energy submitted through October 1, 2021, the staff has determined that no confirmatory items exist that require a formal response from Dominion Energy.

1.7 Summary of Proposed License Conditions

After reviewing the SLRA, including additional information and clarifications from Dominion Energy submitted or provided through October 1, 2021, the NRC staff identified two proposed license conditions.

The first license condition requires Dominion Energy, following the NRC 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 UFSAR update required by 10 CFR 50.71(e). The regulations at 10 CFR 50.71(e) require nuclear power plant licensees to periodically update their plant's final safety analysis report, "to assure that the information included in the report contains the latest information developed." Dominion Energy may make changes to the programs and activities described in the UFSAR update and supplement provided Dominion evaluates such changes under the criteria set forth in 10 CFR 50.59, "Changes, Tests and Experiments," and otherwise complies with the requirements in that section.

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

SECTION 2 STRUCTURES AND COMPONENTS SUBJECT TO AGING MANAGEMENT REVIEW

2.1 Scoping and Screening Methodology

2.1.1 Introduction

Title 10 of the *Code of Federal Regulations* (10 CFR) 54.21, “Contents of Application—Technical Information,” requires, in part, that a [subsequent] license renewal application (SLRA) contain an integrated plant assessment (IPA) that identifies the systems, structures, and components (SSCs) included within the scope of subsequent license renewal in accordance with 10 CFR 54.4(a). The IPA requires a list of those structures and components (SCs), included in the SSCs within the scope of subsequent license renewal, which perform an intended function as described in 10 CFR 54.4, “Scope,” and are subject to an aging management review (AMR). Section 54.21 of 10 CFR further requires that the application describe and justify the methods used to identify the SSCs within the scope of subsequent license renewal and the SCs subject to an AMR.

2.1.2 Summary of Technical Information in the Application

SLRA Section 2.0, “Scoping and Screening Methodology for Identifying Structures and Components Subject to 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 had considered the following in developing the scoping and screening methodology described in SLRA Section 2.0:

- 10 CFR Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants” (the Rule)
- Nuclear Energy Institute (NEI) 17-01, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal” (NEI 17-01), endorsed by NRC letter dated January 31, 2018 (ADAMS Accession No. ML18029A368)

SLRA Section 2.1, “Scoping and Screening Methodology,” describes the methodology used by North Anna Power Station, Units 1 and 2 (NAPS, North Anna, or applicant) to identify the SSCs within the scope of subsequent license renewal (scoping) and the SCs subject to an AMR (screening).

2.1.3 Scoping and Screening Program Review

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

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

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

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

2.1.3.1 Documentation Sources Used for Scoping and Screening

2.1.3.1.1 Summary of Technical Information in the Application

SLRA Section 2.1.1, "Introduction," and Section 2.1.2, "Information Sources Used for Scoping and Screening," discuss the following information sources for the subsequent license renewal scoping and subsequent license renewal screening process:

- updated final safety analysis report (UFSAR)
- engineering drawings
- controlled plant component database
- fire protection report
- Maintenance Rule system basis database
- environmental qualification (EQ) master list
- initial license renewal application
- Safety Evaluation Report Related to NAPS initial license renewal
- NRC safety evaluation reports (SERs)
- engineering evaluations and calculations
- licensing correspondence
- site walkdowns

2.1.3.1.2 Staff Evaluation

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

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

2.1.3.1.3 Conclusion

Based on its review of SLRA Sections 2.0, 2.1, and 2.1.2, the staff finds that the applicant's consideration of document sources, including CLB information, is consistent with the SRP-SLR and NEI 17-01 guidance, is in compliance with the Rule, and, therefore, is acceptable.

2.1.4 Plant Systems, Structures, and Components Scoping Methodology

SLRA Section 2.1.4, "Scoping Methodology," states that the scoping process is the systematic process used to identify the SSCs within the scope of the subsequent license renewal rule. The applicant initially performed the scoping process at the system and structure level, in accordance with the scoping criteria identified in 10 CFR 54.4(a). The applicant identified system and structure functions and intended functions from a review of the source CLB documents and the first license renewal application.

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

2.1.4.1.1 Summary of Technical Information in the Application

The applicant addressed the methods it used to identify SSCs that are included within the scope of subsequent license renewal, in accordance with the requirements of 10 CFR 54.4(a)(1) in SLRA Section 2.1.4.1, "Safety-Related—10 CFR 54.4(a)(1)," which states:

> At NAPS, the safety-related plant components are identified in controlled engineering drawings and in the PAMS [plant asset monitoring system] database. The safety-related classifications in the NAPS PAMS database were populated and maintained using a controlled procedure, with classification criteria consistent with the above 10 CFR 54.4(a)(1) criteria, as described in [SLRA] Section 2.1.3.2.
>
> Safety-related classifications for systems and structures are based on PAMS safety classification, system and structure descriptions and analyses in the UFSAR, or on design basis documents such as engineering drawings, evaluations, or calculations. Systems and structures that are identified as safety-related in the UFSAR 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.
>
> 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) 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 Part 100.11 of this chapter, as applicable.

Regarding identification of DBEs, SRP-SLR Section 2.1.3, “Review Procedures,” states:

> The set of DBEs as defined in the Rule is not limited to Chapter 15 (or equivalent) of the UFSAR. Examples of DBEs that may not be described in this chapter include external events, such as floods, storms, earthquakes, tornadoes, or hurricanes, and internal events, such as a high-energy line break. Information regarding DBEs as defined in 10 CFR 50.49(b)(1) may be found in any chapter of the facility UFSAR, the Commission’s regulations, NRC orders, exemptions, or license conditions within the CLB. These sources should also be reviewed to identify SSCs that are relied upon to remain functional during and following DBEs [as defined in 10 CFR 50.49(b)(1)] to ensure the functions described in 10 CFR 54.4(a)(1).

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

2.1.4.1.3 Conclusion

On the basis of its review of the SLRA, the staff finds that the applicant’s methodology for identifying safety-related SSCs relied upon to remain functional during and following DBEs and for including those SSCs within the scope of subsequent license renewal is in compliance with the requirements 10 CFR 54.4(a)(1) and, therefore, is acceptable.

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

2.1.4.2.1 Summary of Technical Information in the Application

The applicant addressed the methods used to identify SSCs included within the scope of subsequent license renewal, in accordance with the requirements of 10 CFR 54.4(a)(2) in SLRA Section 2.1.4.2, “Nonsafety-Related Affecting Safety-Related – 10 CFR 54.4(a)(2),” and subsections. In addition, SLRA Section 2.0 states that the applicant’s methodology is consistent with the guidance contained in NEI 17-01. NEI 17-01 (which also refers to NEI 95-10, Appendix F, Revision 6) discusses the implementation of the 10 CFR 54.4(a)(2) scoping criteria, to include nonsafety-related SSCs whose failure may have the potential to prevent satisfactory accomplishment of safety functions.

<u>Nonsafety-Related Systems, Structures, and Components Supporting Safety Functions</u>

SLRA Section 2.1.4.2, subsection, “Functional Support for Safety-Related SSC 10 CFR 54.4(a)(1) Functions,” states:

The NAPS UFSAR, CLB and other design basis documents were reviewed to identify nonsafety-related systems or structures required to support satisfactory accomplishment of a safety-related function. Nonsafety-related systems or structures credited in CLB documents to support a safety-related function have been included with the scope of subsequent license renewal.

Nonsafety-Related Systems, Structures, and Components Attached to Safety-Related Systems, Structures, and Components

SLRA Section 2.1.4.2, subsection, "Connected to and Provide Structural Support for Safety-Related SSCs," states:

(a) 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. NEI 95-10, Appendix F (as referenced in NEI 17-01) lists the following configurations that correspond to this requirement:

1. A seismic anchor is defined as a device or structure that ensures that forces and moments are restrained in three orthogonal directions.

2. An equivalent anchor may be defined in the CLB and can be credited for the 10 CFR 54.4(a)(2) evaluation.

3. An equivalent anchor may also consist of a large piece of plant equipment (e.g., a heat exchanger) or a series of supports that have been evaluated as a part of a plant-specific piping design analysis to ensure that forces and moments are restrained in three orthogonal directions.

4. There may be isolated cases where an equivalent anchor, per a particular piping segment, is not clearly described within the existing CLB information or original design basis. In those instances, a combination of restraints or supports such that the [nonsafety-related] NSR piping and associated structures and components attached to the safety-related piping is included in-scope up to a boundary point that encompasses at least two supports in each of three orthogonal directions.

In addition, SLRA Section 2.1.4.2, subsection, "Connected to and Provide Structural Support for Safety-Related SSCs," states:

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 CLB:

(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.

(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 CLB (ten, at NAPS), because significantly smaller piping does not impose loads on larger piping and does not support larger piping.

<u>Nonsafety-Related Systems, Structures, and Components with the Potential for Spatial Interaction with Safety-Related Systems, Structures, and Components</u>

SLRA Section 2.1.4.2, subsection, "Potential for Spatial Interactions with Safety-Related SSCs," states:

> 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.

SLRA Section 2.1.4.2, subsection, "Potential for Spatial Interactions with Safety-Related SSCs," further states:

> The preventive option involves identifying the nonsafety-related SSCs that have a spatial relationship such that failure could adversely impact the performance of a safety-related SSC intended function and including the identified nonsafety-related SSC within the scope of subsequent license renewal without consideration of plant mitigative features.
>
> NAPS applied the preventive option for 10 CFR 54.4(a)(2) scoping [with the exception of the Decontamination building as described below]. The preventive option as implemented at NAPS is based upon a "spaces" approach for determining potential for spatial interactions with safety-related SSCs. The boundaries for the "spaces" are structure boundaries 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, and are located inside structures that contain safety-related SSCs, are included within the scope of subsequent license renewal for potential spatial interaction in accordance with the requirements of Criterion 10 CFR 54.4(a)(2).

SLRA Section 2.1.4.2, subsection, “Potential for Spatial Interactions with Safety-Related SSCs,” further states:

> The Decontamination Building is not treated as a structure containing safety-related components. The Decontamination Building houses safety-related solenoid valves in the heating and ventilation system that are protected from spatial interactions by the electrical panel in which they're housed. If the solenoids or their air supply should fail (or deenergize), the safety-related ventilation alignment is established. The panel completely encloses the solenoids to shield them from spatial interactions that might result in the solenoids establishing an undesired, energized configuration. These solenoid valves credit only the mitigative feature for spatial effects. The electrical panel is addressed as a civil / structural commodity. The Decontamination Building does not house other components that are relied upon to support a safety-related function.

<u>Scoping of Abandoned Equipment</u>

SLRA Section 2.1.4.2, subsection, “Scoping of Abandoned Mechanical Components,” states:

> There are mechanical fluid components at NAPS 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 LR [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 nonsafety-related SSCs in accordance with 10 CFR 54.4(a)(2). During the review, the staff followed the guidance contained in SRP-SLR Section 2.1.3.1.2, “Nonsafety-Related,” which states that the applicant should not consider hypothetical failures but rather should base its evaluation on the plant’s CLB, engineering judgment and analyses, and relevant operating experience.

Nonsafety-Related Systems, Structures, and Components Supporting Safety Functions

The staff reviewed SLRA Section 2.1.4.2 that describes the method used to identify nonsafety-related SSCs, which are required to perform a function relied upon by safety-related SSCs to perform their safety function, to be included within the scope of subsequent license renewal (SLR) in accordance with 10 CFR 54.4(a)(2). The staff confirmed that the applicant had reviewed the UFSAR and other CLB documents to identify nonsafety-related SSCs, which perform a function relied upon by safety-related SSCs, and whose failure could prevent the performance of a safety function. The staff determined that the applicant had identified the nonsafety-related SSCs, which perform a function relied upon by safety-related SSCs and whose failure could prevent the performance of a safety function, and included those SSCs within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

The staff determined that 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).

Nonsafety-Related Systems, Structures, and Components Attached to Safety-Related Systems, Structures, and Components

The staff reviewed SLRA Section 2.1.4.2 that describes the method used to identify nonsafety-related SSCs, directly connected to safety-related SSCs, to be included within the scope of SLR in accordance with 10 CFR 54.4(a)(2). The staff determined that the applicant had used a combination of the following to identify the bounding portion of nonsafety-related piping systems to include within the scope of SLR: seismic anchors, equivalent anchors as defined in the CLB, equivalent anchors as defined in NEI 17-01 (which refers to NEI 95-10), and the bounding conditions identified in NEI 17-01 (which refers to NEI 95-10).

The staff determined that the applicant's methodology for identifying and including 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 Systems, Structures, and Components with the Potential for Spatial Interaction with Safety-Related Systems, Structures, and Components

The staff reviewed SLRA Section 2.1.4.2, which describes the method used to identify nonsafety-related SSCs, with the potential for spatial interaction with safety-related SSCs, to be included within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

The staff determined that the applicant had used a preventive approach and had identified specific structures that contained fluid-filled nonsafety-related systems that also contained safety-related SSCs. The staff determined that the applicant had included all fluid-filled nonsafety-related SSCs located within the structures within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

The staff determined that the applicant had used the mitigative approach in a single application for a structure that contained fluid-filled nonsafety-related systems along with safety-related SSCs (the Decontamination Building) and identified the mitigative feature—a nonsafety-related electric panel housing a safety-related solenoid valve—and included the mitigative feature within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

The staff determined that the applicant’s methodology for identifying and including 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).

Scoping of Abandoned Equipment

The staff reviewed SLRA Section 2.1.4.2, which describes the method used to identify abandoned equipment providing structural or seismic support to safety-related SSCs or that were fluid-filled components with the potential for spatial interaction with safety-related SSCs, to be included within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

The staff determined that the applicant had used a preventive approach by applying three criteria to evaluate abandoned equipment, which, if met, determined that the abandoned equipment would not be required to be included within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

The criteria used were that the abandoned equipment (1) did not provide structural or seismic support to safety-related SSCs, (2) was separated from water sources by blanks, flanges, or pipe caps, and (3) was verified to not contain fluid. These criteria were applied to all abandoned equipment attached to, or in the vicinity of, safety-related SSCs. If the abandoned equipment did not meet each of the three criteria, the equipment was included within the scope of SLR in accordance with 10 CFR 54.4(a)(2).

The staff determined that the applicant’s methodology for identifying and including abandoned equipment that provides structural or seismic support to safety-related SSCs or that were fluid-filled components 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

On the basis of its review of the SLRA, the 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, is within the scope of SLR, is in compliance with the requirements of 10 CFR 54.4(a)(2), and, therefore, is acceptable.

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

2.1.4.3.1 Summary of Technical Information in the Application

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

> 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:

> 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 [SLRA] 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 staff reviewed SLRA Section 2.1.4.3, which describes the method used to identify, and to include within the scope of SLR, those SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission'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"), and station blackout (10 CFR 50.63, "Loss of All Alternating Current Power").

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

2.1.4.3.3 Conclusion

Based on its review of SLRA Section 2.1.4.3, the staff finds that the applicant's methodology for identifying and including SSCs that are relied on to remain functional during regulated events is in compliance with the requirements of 10 CFR 54.4(a)(3) and, therefore, is 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:

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

SLRA Section 2.1.1 states:

> 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, 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).
>
> Systems that contain Electrical and Instrumentation and Control (I&C) components, but do not contain mechanical components, are addressed as electrical and I&C systems. 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. Likewise, electrical and I&C components within in-scope mechanical systems were included within the scope of subsequent license renewal.

SLRA Section 2.1.4, “Scoping Methodology,” states, in part:

> The scoping process is the systematic process used to identify the NAPS 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. In-scope boundaries were established and documented in the scoping evaluations, based on the identified intended functions.

2.1.4.4.2 Staff Evaluation

The staff reviewed SLRA Sections 2.0, 2.1.1, and 2.1.4 and the associated subsections, which described the applicant’s methodology for identifying SSCs within the scope of SLR to verify that it met the requirements of 10 CFR 54.4(a). SLRA Section 2.1.1 stated that the applicant had defined the plant in terms of systems and structures and completed the scoping process for all systems and structures on site to ensure that the entire plant was assessed.

The staff reviewed SLRA Section 2.1.4 and its subsections, which describe the applicant’s methodology for identifying SSCs within the scope of SLR to verify that the applicant had met the requirements of 10 CFR 54.4(a) for identifying SSCs within the scope of SLR. The staff determined that the applicant had developed implementing procedures to (1) identify the systems and structures that are subject to 10 CFR 54.4 SLR review, (2) determine whether the system or structure performed an intended function consistent with the criteria of 10 CFR 54.4(a), and (3) document the activities in scoping results documentation.

The staff reviewed the applicant’s implementing procedures and results documentation to confirm that the applicant had identified the SSCs within the scope of SLR and documented the results of the scoping process in accordance with the implementing procedures, as discussed in SLRA Section 2.3, “Scoping and Screening Results: Mechanical Systems”; SLRA Section 2.4, “Scoping and Screening Results: Structures”; and SLRA Section 2.5, “Scoping and Screening Results: Electrical and Instrumentation and Control Systems.” SLRA Sections 2.3 through 2.5 included a description of the structure or system, a list of functions performed by the system or structure, an identification of intended functions, the 10 CFR 54.4(a) scoping criteria met by the system or structure, scoping boundaries, system intended functions, UFSAR references, and components types subject to an AMR. The results of the staff’s review of SLRA Sections 2.3, 2.4, and 2.5, are further discussed in Section 2.3, “Scoping and Screening Results: Mechanical Systems;” Section 2.4, “Scoping and Screening Results: Structures;” and Section 2.5, “Scoping and Screening Results: Electrical and Instrumentation and Control.” The staff determined that the applicant’s process is consistent with the description provided in SLRA Sections 2.0, 2.1 through 2.1.4 and the guidance in SRP-SLR Section 2.1.

2.1.4.4.3 Conclusion

On the basis of its review of information contained in the SLRA, the staff finds that the applicant’s scoping methodology is consistent with the guidance contained in the SRP-SLR and identified those SSCs (1) that are safety related, (2) whose failure could affect safety-related intended functions, and (3) that are necessary to demonstrate compliance with the NRC’s regulations for fire protection, EQ, pressurized thermal shock, ATWS, and station blackout. The staff finds that the applicant's methodology is in compliance with the requirements of 10 CFR 54.4(a) and, therefore, is acceptable.

2.1.5 Screening Methodology

2.1.5.1 Summary of Technical Information in the Application

SLRA Section 2.1.1 states:

> 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 AMR were identified.

SLRA Section 2.1.1 further states:

> 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:

> The mechanical system screening process began with the results from the scoping process. 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. Component listings from the PAMS database were also reviewed to confirm that system components were considered during the process. In cases where the system piping and instrumentation diagram did not provide sufficient detail, such as for some large vendor supplied components (e.g., chillers, emergency diesel generators), the associated component drawings or vendor manuals were also reviewed. Plant walkdowns were performed when required for confirmation. Short-lived components were excluded from AMR. The bases for their exclusion were documented and notes were added to the system boundary drawings to identify their status.

SLRA Section 2.1.5.1 further states:

> Structures and structural components typically perform their functions without moving parts and without a change in configuration or properties. When a structure or structural component was determined to be within the scope of subsequent license renewal by the scoping process described in [SLRA] 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. In such a case, the basis for determining that the structural component was short-lived was documented.

SLRA Section 2.1.5.1 further states:

> Screening of electrical and I&C components within the in-scope electrical, I&C, and mechanical systems used a bounding approach as described in NEI 17-01. 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.

SLRA Section 2.1.5.3 "Stored Equipment," discussed the applicant's evaluation of stored equipment listed in the equipment database, which was evaluated along with the applicable system. The applicant had identified additional stored equipment that was staged for use in achieving safe shutdown following a fire. The identified stored equipment, either as part of the parent system or as individual components, was evaluated to determine whether the SCs were subject to an AMR.

SLRA Section 2.1.3.3, "Consumables," discussed the evaluation process of four groups for the purpose of SLR: (a) packing, gaskets, component seals, and O-rings, (b) structural sealants, (c) oil, grease, and components filters, and (d) system filters, fire extinguishers, fire hoses, and air packs. The applicant indicated that evaluation of consumables was consistent with the guidance provided in SRP-SLR, Table 2.1-3, "Specific Staff Guidance on Screening - Consumables."

2.1.5.2 Staff Evaluation

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

The staff reviewed SLRA Section 2.1.5, “Screening Procedure,” which, along with the associated subsections, described the screening process, during which the applicant’s staff evaluated the component types and commodity groups included within the scope of SLR, to determine those which were passive and long-lived and, therefore, subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). The staff reviewed SLRA Sections 2.1.1 and 2.1.5.1 that described the methodology for identifying the mechanical, structural, and electrical SCs within the scope of SLR that are subject to an AMR.

Mechanical

The staff reviewed the applicant’s methodology used for mechanical component screening as described in SLRA Sections 2.1.1 and 2.1.5.1. The staff determined that the applicant used the screening process described in these documents, along with the information contained in NEI 17-01 and the SRP-SLR, to identify the mechanical SCs subject to an AMR. The staff determined that the applicant had identified the SCs that met the passive criteria in accordance with the guidance contained in NEI 17-01, and among those SCs, those that were not subject to replacement based on a qualified life or specified time period (long lived). These passive, long-lived components were determined to be subject to an AMR.

Structural

The staff reviewed the applicant’s methodology used for structural component screening as described in SLRA Sections 2.1.1 and 2.1.5.1. The staff determined that the applicant used the screening process described in these documents, along with the information contained in NEI 17-01 and the SRP-SLR, to identify the structural SCs subject to an AMR. The staff determined that the applicant had identified the SCs that met the passive criteria in accordance with the guidance contained in NEI 17-01, and among those SCs, those that were not subject to replacement based on a qualified life or specified time period (long lived). These passive, long-lived components were determined to be subject to an AMR.

Electrical

The staff reviewed the applicant’s methodology used for electrical and I&C component screening as described in SLRA Section 2.1.1 and Section 2.1.5.1. The staff confirmed that the applicant had 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 and I&C SCs subject to an AMR. The staff determined that the applicant had identified electrical and I&C commodity groups that met the passive criteria in accordance with NEI 17-01, and among those passive SCs, those SCs that were not subject to replacement based on a qualified life or specified time period (long lived). The passive, long-lived components were determined to be subject to an AMR.

Stored Equipment

The staff reviewed the applicant’s methodology used for stored equipment screening as described in SLRA Section 2.1.5.3, “Stored Equipment.” The staff confirmed that the applicant had used the screening process described in the SLRA, along with the information contained in

NEI 17-01 and the SRP-SLR, to identify and evaluate stored equipment—passive, long-lived SCs associated with fire protection—that were determined to be subject to an AMR.

<u>Consumables</u>

The staff reviewed the applicant's methodology used for stored equipment screening as described in SLRA Section 2.1.5.4, "Consumables." The staff confirmed that the applicant had used the screening process described in the SLRA, along with the information contained in NEI 17-01 and the SRP-SLR, to identify and evaluate consumables—such as packing, gaskets, component seals, O-rings, and structural sealants—that were determined to be subject to an AMR.

2.1.6 Summary of Evaluation Findings

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

2.1.6.1 Conclusion

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

2.2 <u>Plant-Level Scoping Results</u>

2.2.1 Introduction

In SLRA Section 2.1, the applicant described its methodology for identifying SSC within the scope of SLR and subject to an AMR. SLRA Section 2.2, "Plant-Level Scoping Results," lists the NAPS systems, structures, and commodity groups that were evaluated to determine if they were within the scope of SLR.

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

(1) safety-related systems, structures, and components that are those relied upon to remain functional during and following DBEs (as defined in 10 CFR 50.49)

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

(3) 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), and station blackout (10 CFR 50.63)

2.2.2 Summary of Technical Information in the Application

SLRA Section 2.2 states:

> Table 2.2-1 [“Plant-Level Scoping Results”] lists the NAPS systems, structures and commodity groups that were evaluated to determine if they were within the scope of license renewal, using the methodology described in [SLRA] Section 2.1. A reference to the Section of the application that contains the scoping and screening results is provided for each in-scope mechanical system, structure and commodity group in the Table. For electrical systems, a relevant UFSAR reference is provided, if one exists.

SLRA Table 2.2-1, “Plant-Level Scoping Results,” lists the systems, structures, and commodity groups within the scope of subsequent license renewal.

2.2.3 Staff Evaluation

The staff evaluated the plant-level scoping implementation results in accordance with the guidance in NUREG-2192, “Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants” (SRP-SLR), Section 2.2, “Plant-Level Scoping Results.”

To verify that the applicant properly implemented its methodology, the staff’s review focused on the implementation results shown in SLRA Table 2.2-1 to confirm that the applicant did not omit any plant-level systems and structures within the scope of SLR.

The staff sampled the contents of the UFSAR based on the systems and structures listed in SLRA Table 2.2-1.

The staff determined there were no systems or structures with intended functions requiring inclusion within the scope of SLR, as defined by 10 CFR 54.4, that had been omitted from the scope of SLR. The staff determined that the applicant had properly identified the systems and structures within the scope of SLR in accordance with 10 CFR 54.4.

2.2.4 Conclusion

The staff reviewed SLRA Section 2.2, SLRA Table 2.2-1, and UFSAR supporting information to determine whether the applicant failed to identify any systems and structures within the scope of SLR. The staff finds no such omissions. On the basis of its review of the SLRA, the staff finds that the applicant, within the scope of SLR, is in compliance with the requirements of 10 CFR 54.4 and, therefore, the applicant’s plant-level scoping methodology is acceptable.

2.3 Scoping and Screening Results: Mechanical Systems

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

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

In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant must list the passive, long-lived SCs that are within the scope of license renewal and that are subject to an AMR. To verify that the applicant properly implemented its methodology, the staff focused its review on the implementation results. This focus allowed the staff to verify that the applicant identified the mechanical system SCs that met the scoping criteria and that were subject to an AMR, thus confirming that there were no omissions.

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

In its scoping evaluation, the staff reviewed the SLRA, applicable sections of the UFSAR, license renewal boundary drawings, 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 specified all intended functions defined by 10 CFR 54.4(a). The review then focused on identifying any components with intended functions defined by 10 CFR 54.4(a) that the applicant may have erroneously omitted from the scoping results.

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

2.3.1 Reactor Vessel, Internals, and Reactor Coolant System

SLRA Section 2.3.1, "Reactor Vessel, Internals, and Reactor Coolant System," identifies the reactor vessel, internals, and reactor coolant system, and steam generators as SCs subject to an AMR for license renewal. The applicant described the supporting SCs of the reactor coolant system in the following SLRA sections:

- SLRA Section 2.3.1.1, "Reactor Vessel"
- SLRA Section 2.3.1.2, "Reactor Vessel Internals"
- SLRA Section 2.3.1.3, "Reactor Coolant"
- SLRA Section 2.3.1.4, "Steam Generator"

Safety Evaluation Report (SER) Sections 2.3.1.1–2.3.1.4 include the staff's findings on its review of SLRA Sections 2.3.1.1–2.3.1.4, respectively.

2.3.1.1 Reactor Vessel

2.3.1.1.1 Summary of Technical Information in the Application

SLRA Section 2.3.1.1 describes the reactor pressure vessel components subject to an AMR and lists the license renewal boundary drawings that show the system boundaries. SLRA Table 2.3.1-1 lists the component types subject to an AMR and their intended functions. SLRA Table 3.1.2-1 provides the results of the applicant's AMR for reactor pressure vessel system SCs.

2.3.1.1.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant had 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 being within the scope of SLR to verify that it included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology described in SLRA Section 2.1 and the guidance in SRP-SLR Section 2.3, the staff reviewed the following:

- SLRA Section 2.3.1.1, "Reactor Vessel"
- SLRA Tables
  - Table 2.3.1-1, "Reactor Vessel"
  - Table 3.1.2-1, "Reactor Vessel. Internals, and Reactor Coolant System - Reactor Vessel - Aging Management Evaluation"
- UFSAR References
  - Section 5.4, "Reactor Vessel and Appurtenances"
  - Section 15.4, "Condition IV - Limiting Faults"
  - Table 5.2-22, "Reactor Coolant Pressure Boundary Materials"
- Drawings
  - 13075-SLRM-093C sheet 1
  - 13075-SLRM-093D sheet 1

2.3.1.1.3 Conclusion

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

2.3.1.2 Reactor Vessel Internals

2.3.1.2.1 Summary of Technical Information in the Application

SLRA Section 2.3.1.2 describes the reactor vessel internals components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.1 2 lists the component types subject to an AMR and their intended functions. SLRA Table 3.1.2-2 provides the results of the applicant's AMR for reactor vessel internals system SCs.

2.3.1.2.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant had 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 being within the scope of SLR to verify it included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology described in SLRA Section 2.1 and the guidance in SRP-SLR Section 2.3, the staff reviewed the following:

- SLRA Section 2.3.1.2, "Reactor Vessel Internals"
- SLRA Tables
  - Table 2.3.1-2, "Reactor Vessel Internals"
  - Table 3.1.2-2, "Reactor Vessel. Internals, and Reactor Coolant System - Reactor Vessel Internals - Aging Management Evaluation"
- UFSAR References
  - Section 4.2.2, "Reactor Vessel Internals"
  - Figure 4.2-16, "Lower Core Support Assembly (Core Barrel Assembly)"
  - Figure 4.2-17, "Upper Core Support Assembly"
  - Figure 4.2-18, "Plane View of Upper Core Support Structure"
  - Figure 4.2-19, "Rod Cluster Control and Drive Rod Assembly With Interfacing Components"
- Drawings
  - None

2.3.1.2.3 Conclusion

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

2.3.1.3 Reactor Coolant

2.3.1.3.1 Summary of Technical Information in the Application

SLRA Section 2.3.1.3 describes the reactor coolant components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.1-3 lists the component types subject to an AMR and their intended functions. SLRA Table 3.1.2-3 provides the results of the applicant's AMR for reactor coolant system SCs.

2.3.1.3.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA, UFSAR, and drawings to verify that the applicant had 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 being 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, the staff reviewed the following:

- SLRA Section 2.3.1.3, "Reactor Coolant"
- SLRA Tables
  - Table 2.3.1-3 "Reactor Coolant"
  - Table 3.1.2-3 "Reactor Vessel Internals, and Reactor Coolant System - Reactor Coolant - Aging Management Evaluation"
- UFSAR References
  - Section 3.1, "Conformance with [Atomic Energy Act of 1954, as amended] AEC General Design Criteria"
  - Section 5, "Reactor Coolant System"
  - Section 15, "Accident Analyses"
- Drawings
  - 11715-SLRM-079B sheet 5
  - 11715-SLRM-093A sheet 1–3
  - 11715-SLRM-093B sheet 1–3
  - 11715-SLRM-093E sheet 1
  - 12050-SLRM-079A sheet 5
  - 12050-SLRM-093A sheet 1–3
  - 12050-SLRM-093B sheet 1–3
  - 12050-SLRM-093E sheet 1
  - 13075-SLRM-093C sheet 1–2
  - 13075-SLRM-093D sheet 1–2

2.3.1.3.3 Conclusion

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

2.3.1.4 Reactor Coolant Pump Motor Oil Collection System

2.3.1.4.1 Summary of Technical Information in the Application

Dominion Energy's SLRA Section 2.3.1.3, "Reactor Coolant," describes the reactor coolant systems and components subject to an AMR and lists the SLR boundary drawings that show the reactor coolant system boundaries. SLRA Table 2.3.1-3, "Reactor Coolant" lists the reactor coolant oil collection system components subject to an AMR and their intended functions. SLRA Table 3.1.2-3, "Reactor Vessel, Internals, and Reactor Coolant System—Reactor Coolant—Aging Management Evaluation," provides the results of the applicant's AMR for reactor coolant oil collection systems and components.

2.3.1.4.2 Staff Evaluation

The staff reviewed the SLRA; NUREG-1766, "Safety Evaluation Report Related to License Renewal of North Anna Power Station, Units 1 and 2, and Surry Power Station, Units 1 and 2," December 2002 (Agencywide Document Access and Management System (ADAMS) Package Accession No. ML030160853); SLRA boundary drawings; the North Anna UFSAR, Section 9.5.1, "Fire Protection System," and the following fire protection CLB document listed in the North Anna Power Station, Units 1 and 2 License Condition 2.D:

- NRC's SER by the Office of Nuclear Reactor Regulation, Fire Protection Program for North Anna Power Station, Units 1 and 2, February 1979 (ADAMS Package Accession No. ML19283B801)

During its review, the staff evaluated the reactor coolant pump motor oil collection system and components described in the SLRA, UFSAR, and SLR boundary drawings to verify that the applicant included within the scope of SLR all components with their 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 SLR 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 Section 2.3.1.3 states that the reactor coolant system mitigates the consequences of DBEs and provides non-EQ safety-related instrumentation and containment isolation. Therefore, the reactor coolant system is within the scope of SLR in accordance with the criteria of 10 CFR 54.4(a)(1). The reactor coolant system contains nonsafety-related components whose failure could prevent satisfactory accomplishment of a safety-related function. Therefore, the reactor coolant system is within the scope of SLR in accordance with the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity. The reactor coolant system is relied upon for compliance with regulations for 10 CFR 50.48, "Fire Protection." SLRA Table 2.3.1-3 identifies the reactor coolant pump oil collection system component types that are within the scope of the SLR, with AMR results in SLRA Table 3.1.2-3.

The staff confirmed that the reactor coolant pump motor oil collection system and associated components are included in SLRA Table 2.3.1-3 with AMR results in SLRA Table 3.1.2-3. The staff confirmed that these components are highlighted in the SLR boundary drawings. On the basis of the information in the SLRA boundary drawings, the UFSAR, and the CLB document discussed above, the 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).

2.3.1.4.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.1.3.2 and on its review of the SLRA and the supplement, UFSAR, SLR boundary drawings, and the CLB document, the staff concludes that the applicant has appropriately identified the reactor coolant pump motor oil collection system and components within the scope of SLR, as required by 10 CFR 54.4(a). The staff also concludes that the applicant has adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.1.5 Steam Generator

2.3.1.5.1 Summary of Technical Information in the Application

SLRA Section 2.3.1.4 describes the steam generator components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.1-4 lists the component types subject to an AMR and their intended functions. SLRA Table 3.1.2-4 provides the results of the applicant's AMR for steam generator system SCs.

2.3.1.5.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant had 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 being within the scope of SLR to verify that it included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology described in SLRA Section 2.1 and the guidance in SRP-SLR Section 2.3, the staff reviewed the following:

- SLRA Section 2.3.1.4, "Steam Generator"
- SLRA Tables
  - Table 2.3.1-4 "Steam Generator"
  - Table 3.1.2-4 "Reactor Vessel. Internals, and Reactor Coolant System—Steam Generator—Aging Management Evaluation"
- UFSAR References
  - Section 5.2.1, "Design Criteria Methods and Procedures"
  - Section 5.5.2, "Steam Generator"
  - Section 10.3.2, "System Description"
  - Section 15.4, "Condition IV—Limiting Faults"

- Drawings
  - 11715-SLRM-093A sheet 1–3
  - 12050-SLRM-093A sheet 1–3

2.3.1.5.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.1.4.2 and on a review of the SLRA and UFSAR, the staff concludes that the applicant appropriately identified the mechanical components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.2 Engineered Safety Features

SLRA Sections 2.3.2, "Engineered Safety Features," identifies the quench spray, recirculation spray, residual heat removal, and safety injection SCs subject to an AMR for SLR. The applicant described the supporting SCs of the engineered safety features in the following SLRA sections:

- SLRA Section 2.3.2.1, "Quench Spray"
- SLRA Section 2.3.2.2, "Recirculation Spray"
- SLRA Section 2.3.2.3, "Residual Heat Removal"
- SLRA Section 2.3.2.4, "Safety Injection"

SER Sections 2.3.2.1–2.3.2.4 include the staff's findings on its review of SLRA Sections 2.3.2.1–2.3.2.4, respectively.

2.3.2.1 Quench Spray

2.3.2.1.1 Summary of Technical Information in the Application

SLRA Section 2.3.2.1 describes the quench spray components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.2 1 lists the component types subject to an AMR and their intended functions. SLRA Table 3.2.2-1 provides the results of the applicant's AMR for containment spray system SCs.

2.3.2.1.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA, UFSAR, and drawings to verify that the applicant had 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 being within the scope of SLR to verify that it included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology described in SLRA Section 2.1 and the guidance in SRP-SLR Section 2.3, the staff reviewed the following:

- SLRA Section 2.3.2.1, "Quench Spray"
- SLRA Tables

- Table 2.3.2-1, “Quench Spray”
- Table 3.2.2-1, “Engineering Safety Features–Quench Spray–Aging Management Evaluation”

- UFSAR References
  - Section 6.2.2, “Containment Heat Removal Systems–Containment Depressurization System”
  - Table 6.2-37, “Major Piping Penetrations Through the Reactor Containment Structure”
- Drawings
  - 11715-SLRM-091A sheet 1–2
  - 12050-SLRM-091A sheet 1–2

2.3.2.1.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.2.1.2 and on a review of the SLRA, UFSAR and drawings, the staff concludes that the applicant appropriately identified the quench spray components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.2.2 Recirculation Spray

2.3.2.2.1 Summary of Technical Information in the Application

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

2.3.2.2.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA, UFSAR and drawings to verify that the applicant had 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 being within the scope of SLR to verify that the applicant had included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology described in SLRA Section 2.1 and the guidance in SRP-SLR Section 2.3, the staff reviewed the following:

- SLRA Section 2.3.2.2, “Recirculation Spray”
- SLRA Tables
  - Table 2.3.2-2, “Recirculation Spray”
  - Table 3.2.2-2, “Engineering Safety Features—Recirculation Spray—Aging Management Evaluation“

- UFSAR References
  - Section 6.2.2, “Containment Heat Removal Systems—Containment Depressurization System”
  - Table 6.2-37, “Major Piping Penetrations Through the Reactor Containment Structure”
- Drawings
  - 11715-SLRM-091A sheet 3–4
  - 11715-SLRM-091B sheet 1
  - 12050-SLRM-091A sheet 3–4
  - 12050-SLRM-091B sheet 1

2.3.2.2.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.2.2.2 and on a review of the SLRA, UFSAR, and drawings, the staff concludes that the applicant appropriately identified the recirculation spray components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.2.3 Residual Heat Removal

2.3.2.3.1 Summary of Technical Information in the Application

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

2.3.2.3.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA, UFSAR, and drawings to verify that the applicant had 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 being within the scope of SLR to verify that it included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology described in SLRA Section 2.1 and the guidance in SRP-SLR Section 2.3, the staff reviewed the following:

- SLRA Section 2.3.2.3, “Residual Heat Removal”
- SLRA Tables
  - Table 2.3.2-3, “Residual Heat Removal”
  - Table 3.2.2-3, “Engineering Safety Features—Residual Heat Removal—Aging Management Evaluation”
- UFSAR References

- Section 5.5.4, “Residual Heat Removal System”
- Table 6.2-37, “Major Piping Penetrations Through the Reactor Containment Structure”

- Drawings
  - 11715-SLRM-094A sheet 1–2
  - 12050-SLRM-094A sheet 1–2

2.3.2.3.3 Conclusion

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

2.3.2.4 Safety Injection

2.3.2.4.1 Summary of Technical Information in the Application

SLRA Section 2.3.2.4 describes the safety injection components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.2-4 lists the component types subject to an AMR and their intended functions. SLRA Table 3.2.2-4 provides the results of the applicant’s AMR for safety injection system SCs.

2.3.2.4.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA, UFSAR, and drawings to verify that the applicant had 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 being within the scope of SLR to verify that it included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology described in SLRA Section 2.1 and the guidance in SRP-SLR Section 2.3, the staff reviewed the following:

- SLRA Section 2.3.2.4, “Safety Injection”
- SLRA Tables
  - Table 2.3.2-4, “Safety Injection”
  - Table 3.2.2-4, “Engineering Safety Features—Safety Injection—Aging Management Evaluation”
- UFSAR References
  - Section 6.3, “Emergency Core Cooling System”
  - Table 6.2-37, “Major Piping Penetrations Through the Reactor Containment Structure”

- Drawings
  - 11715-SLRM-096A sheet 1–3
  - 11715-SLRM-096B sheet 1–4
  - 12050-SLRM-096A sheet 1–3
  - 12050-SLRM-096B sheet 1–4
  - 12050-SLRM-096C sheet 1

2.3.2.4.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.2.4.2 and on a review of the SLRA, UFSAR, and drawings, the staff concludes that the applicant appropriately identified the safety injection components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant adequately identified the system components subject to an AMR in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3 Auxiliary Systems

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

- SLRA Section 2.3.3.1, "Fuel Pit Cooling"
- SLRA Section 2.3.3.2, "Refueling Purification"
- SLRA Section 2.3.3.3, "Primary Grade Water"
- SLRA Section 2.3.3.4, "Helium Vacuum Drying"
- SLRA Section 2.3.3.5, "Fuel Handling"
- SLRA Section 2.3.3.6, "Materials Handling"
- SLRA Section 2.3.3.7, "Service Water"
- SLRA Section 2.3.3.8, "Bearing Cooling"
- SLRA Section 2.3.3.9, "Circulating Water"
- SLRA Section 2.3.3.10, "Vacuum Priming"
- SLRA Section 2.3.3.11, "Domestic Water"
- SLRA Section 2.3.3.12, "Component Cooling"
- SLRA Section 2.3.3.13, "Neutron Shield Tank Cooling"
- SLRA Section 2.3.3.14, "Instrument Air"
- SLRA Section 2.3.3.15, "Service Air"
- SLRA Section 2.3.3.16, "Primary & Secondary Plant Gas Supplies"
- SLRA Section 2.3.3.17, "Penetration Electrical"
- SLRA Section 2.3.3.18, "Leakage Monitoring"
- SLRA Section 2.3.3.19, "Chemical & Volume Control"
- SLRA Section 2.3.3.20, "Boron Recovery"
- SLRA Section 2.3.3.21, "Sampling System"
- SLRA Section 2.3.3.22, "Incore Instrumentation"
- SLRA Section 2.3.3.23, "Decontamination"
- SLRA Section 2.3.3.24, "Drains—Aerated"
- SLRA Section 2.3.3.25, "Drains—Building Services"
- SLRA Section 2.3.3.26, "Drains—Gaseous"

- SLRA Section 2.3.3.27, “Gaseous Waste Disposal”
- SLRA Section 2.3.3.28, “Liquid & Solid Waste (Radioactive)”
- SLRA Section 2.3.3.29, “Oil Separation”
- SLRA Section 2.3.3.30, “Radioactive Waste”
- SLRA Section 2.3.3.31, “Sanitary Sewage”
- SLRA Section 2.3.3.32, “Vents—Gaseous”
- SLRA Section 2.3.3.33, “Containment Vacuum”
- SLRA Section 2.3.3.34, “Chilled Water”
- SLRA Section 2.3.3.35, “Heating & Ventilation”
- SLRA Section 2.3.3.36, “High Radiation Sampling”
- SLRA Section 2.3.3.37, “Post-Accident Hydrogen Removal”
- SLRA Section 2.3.3.38, “Radiation Monitoring”
- SLRA Section 2.3.3.39, “Alternate AC [alternating current]”
- SLRA Section 2.3.3.40, “Emergency Diesel Generator System”
- SLRA Section 2.3.3.41, “Security”
- SLRA Section 2.3.3.42, “Fire Protection”
- SLRA Section 2.3.3.43, “Containment Access”
- SLRA Section 2.3.3.44, “Generator Breaker Cooling”
- SLRA Section 2.3.3.45, “Water Treatment”

SER Sections 2.3.3.1–2.3.3.45 include the staff’s findings on its review of SLRA Sections 2.3.3.1–2.3.3.43, respectively.

2.3.3.1 Fuel Pit Cooling

2.3.3.1.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.1 describes the fuel pit cooling system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-1 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-1 provides the results of the applicant’s AMR for fuel pit cooling system SCs.

2.3.3.1.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Using the evaluation methodology described in SLRA Section 2.1 and the guidance in SRP-SLR Section 2.3, the staff reviewed the following:

- SLRA Tables
  - Table 2.3.3-1, “Fuel Pit Cooling”
  - Table 3.3.2-1, “Auxiliary Systems—Fuel Pit Cooling—Aging Management Evaluation”
- UFSAR References

    - Section 9.1.3, “Fuel Pit Cooling and Refueling Purification System”
    - Table 9.1-1, “Fuel Pit Cooling and Refueling Purification System Design Data”
- SLRA Boundary Drawings
    - 11715-SLRM-088A sheets 1–5

2.3.3.1.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.1.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the fuel pit cooling system components within the scope of SLR as required by 10 CFR 54.4(a). 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).

2.3.3.2 Refueling Purification

2.3.3.2.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.2 describes the refueling purification system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-2 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-1 provides the results of the applicant’s AMR for refueling purification system SCs.

2.3.3.2.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG--2192, Section 2.3, “Scoping and Screening Results: Mechanical Systems,” the staff reviewed:

- SLRA Tables
    - Table 2.3.3-2, “Refueling Purification”
    - Table 3.3.2-2, “Auxiliary Systems—Refueling Purification—Aging Management Evaluation”
- UFSAR References
    - Section 9.1.3, “Fuel Pit Cooling and Refueling Purification System”
    - Table 9.1-1, “Fuel Pit Cooling and Refueling Purification System Design Data”
- SLRA Boundary Drawings
    - 11715-SLRM-088A sheets 1–5

2.3.3.2.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the refueling purification system components within the scope of SLR as required by 10 CFR 54.4(a). 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).

2.3.3.3 Primary Grade Water

2.3.3.3.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.3 describes the primary grade water system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-3 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-3 provides the results of the applicant's AMR for primary grade water system SCs.

2.3.3.3.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.3, "Primary Grade Water"
- SLRA Tables
  - Table 2.3.3-3, "Primary Grade Water"
- UFSAR References
  - Section 9.3.5, "Boron Recovery System" (Primary Grade is contained in Section 9.3.5.2)
  - Table 9.3-7, "Boron Recovery System Component Design Data"
- SLRA Boundary Drawings
  - 11715-SLRM-086C sheets 1–4
  - 11715-SLRM-086D sheets 1–3
  - 11715-SLRM-093B sheet 2
  - 11715-SLRM-095B sheet 1
  - 11715-SLRM-096A sheet 3
  - 12050-SLRM-093B sheet 2
  - 12050-SLRM-095B sheet 1
  - 12050-SLRM-096A sheet 3

2.3.3.3.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.3.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the primary grade water system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.4 Helium Vacuum Drying

2.3.3.4.1 Summary of Technical Information in the Application

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

2.3.3.4.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.3-4, "Helium Vacuum Drying"
  - Table 3.3.2-4, "Auxiliary Systems—Helium Vacuum Drying—Aging Management Evaluation"
- UFSAR References
  - Section 9.5.9, "Decontamination Facility"
- SLRA Boundary Drawings
  - 11715-SLRM-114A Sheet 2

2.3.3.4.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.4.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the helium vacuum dryer system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.5 Fuel Handling

2.3.3.5.1 Summary of Technical Information in the Application

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

2.3.3.5.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.3-5, "Fuel Handling"
  - Table 3.3.2-5, "Auxiliary Systems—Fuel Handling—Aging Management Evaluation"
- UFSAR References
  - Section 6.2.4, "Containment Isolation System"
  - Section 9.1.2, "Spent-Fuel Storage"
  - Section 9.1.4, "Fuel Handling System"
  - Table 6.2-37, "Major Piping Penetrations Through the Reactor Containment Structure"
- SLRA Boundary Drawings
  - 11715-SLRM-088A sheet 2
  - 11715-SLRM-088A sheet 3

2.3.3.5.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.5.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the fuel handling system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.6 Materials Handling

2.3.3.6.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.6 describes the materials handling system components subject to an AMR. SLRA Table 2.3.3-6 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-6 provides the results of the applicant's AMR for materials handling system SCs.

2.3.3.6.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.3-6, "Materials Handling"
  - Table 3.3.2-6, "Auxiliary Systems - Materials Handling - Aging Management Evaluation"
- UFSAR References
  - Section 9.1.2, "Spent-Fuel Storage"
  - Section 9.1.4, "Fuel Handling System"
  - Section 9.6, "Control of Heavy Loads"
- SLRA Boundary Drawings
  - None

2.3.3.6.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.6.2 and on a review of the SLRA and UFSAR, the staff concludes that the applicant identified the materials handling components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the materials handling system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.7 Service Water

2.3.3.7.1 Summary of Technical Information in the Application

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

2.3.3.7.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.7, “Service Water”
- SLRA Tables
  - Table 2.3.3-7, “Service Water”
- UFSAR References
  - Section 9.2.1, “Service Water System”
  - Table 9.2-4, “Service Water System Component Design Data”
- SLRA Boundary Drawings
  - 11715-SLRB-040D sheets 1–2
  - 11715-SLRM-078A sheets 1–5
  - 11715-SLRM-078B sheets 1 and 3
  - 11715-SLRM-078C sheets 1–2
  - 11715-SLRM-078G sheets 1–2
  - 11715-SLRM-078H sheet 1
  - 11715-SLRM-078J sheet 1
  - 11715-SLRM-078K sheet 1
  - 11715-SLRM-078L sheets 1–2

The staff’s review identified an area in which additional information was necessary to complete the review of the applicant’s scoping and screening results. This resulted in the issuance of RAI 2.3.3.7-1. This RAI, dated April 1, 2021, is documented in ADAMS Accession No. ML21091A000 and the applicant’s response, dated April 29, 2021, is documented in ADAMS Accession No. ML21119A287.

In RAI 2.3.3.7-1, the staff noted that Sheet 2 of the SLRA Drawing 11715 SLRM 78L “Subsequent License Renewal—Service Water System—North Anna Power Station Unit 1,” displayed Level Indicator 2-SW-LI-203. This drawing also displayed Calgon Chemical Feeders and Pump 2-SW-P-22 as “Base-Mounted Components.”

At issue, neither Table 2.3.3-7, “Service Water,” nor Table 3.3.2-7 of the SLRA contained: (a) a line item that corresponded to the component type “Level Indicator” or “Sight Glass,” (b) a line item for the component type Calgon Chemical Feeder with an intended function of “Structural Integrity,” or (c) a line item for the component Pump 2-SW-P-22 with an intended function of “Structural Integrity.”

The staff requested that the applicant identify where the SLRA addresses the AMR for these "Component Types" and its respective "Environment" associated with the Unit 2 Turbine Building. The applicant responded that component 2-SW-LI-203 is in-scope and subject to an AMR. Based on the staff's observation, the applicant revised Tables 2.3.3-7 and 3.3.2-7 to include this component.

The applicant provided clarification that the Calgon Chemical Feeders and 2-SW-P-22 are subject to an AMR and are addressed in Table 2.3.3-7 and Table 3.3.2-7 as component type "Tank (chemical mixing chamber)" and "Pump Casing (chemical addition)," respectively. The leakage boundary intended function assigned to these components includes the structural integrity function, where applicable, as defined in SLRA Table 2.1-1. Therefore, issues (b) and (c) required no revision of the SLRA.

Additionally, the applicant noted that:

> … while determining the material for 2-SW-LI-203, the materials for two other components on drawing 11715-SLRM-078L, Sh. 2 were determined to be misidentified. The "Pump casing (chemical addition makeup)" and "Tank (polymer storage)" in SLRA Section 3.3.2.1.7 and Table 3.3.2-7 are updated to address aging management for the correct materials.

The staff found that the applicant's response fully addressed the staff's documented concern. The staff found the response acceptable, since the applicant comprehensively evaluated the perceived SLRA deficiencies and provided a change to SLRA Section 3.3.2.1.7, SLRA Table 2.3.3-7 and SLRA Table 3.3.2-7, consistent with the requirements of 10 CFR 54.4(a), "Scope," and 10 CFR 54.21(a), "Contents of application—technical information," and the guidance of NUREG-2192, Section 2.1.3.1.2, "Nonsafety-Related."

2.3.3.7.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.7.2 and on a review of the SLRA, UFSAR, SLR boundary drawings, and the applicant's response to RAI 2.3.3.7-1, the staff concludes that the applicant identified the service water system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.8 Bearing Cooling

2.3.3.8.1 Summary of Technical Information in the Application

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

2.3.3.8.2 Staff Evaluation

The bearing cooling system was not included in the initial license renewal application for a 10 CFR Part 54 renewed operating license but was incorporated into the SLRA. Due to the potential impact on safety-related SSCs, the applicant included the bearing cooling system within the scope of SLRA in accordance with the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

Using the evaluation methodology described in SLRA Section 2.1 and the guidance in NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.8, “Bearing Cooling”
- SLRA Tables
  - Table 2.3.3-8, “Bearing Cooling”
- UFSAR References
  - Section 10.4.7, “Bearing Cooling Water System”
  - Table 10.4-6, “Design Data for Major Components of the Bearing Cooling Water System”
- SLRA Boundary Drawings
  - 11715-SLRB-040C sheet 3
  - 11715-SLRB-040D sheets 1 and 3
  - 11715-SLRM-080A sheets 1–2
  - 11715-SLRM-080B sheet 1
  - 11715-SLRM-080C sheet 1
  - 11715-SLRM-081A sheet 1
  - 11715-SLRM-089F sheet 2
  - 12050-SLRM-080A sheets 1–2
  - 12050-SLRM-080B sheet 1
  - 12050-SLRM-081A sheet 1

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff’s review identified an area in which additional information was necessary to complete the review of the applicant’s scoping and screening results. This resulted in the issuance of RAI 2.3.3.8-1. This RAI, dated April 1, 2021, is documented in ADAMS Accession No. ML21091A000 and the applicant’s response, dated April 29, 2021, is documented in ADAMS Accession No. ML21119A287.

In RAI 2.3.3.8-1, the staff noted that Sheet 1 of SLRA Drawing No. 11715-SLRB-040D “Subsequent License Renewal—Service Water System—North Anna Power Station Unit 1,” displays, at Coordinates B-3 and E-7, nonsafety-related piping (i.e., 4”-WBC-102-151 & 4’WBC-103-151, respectively) within the Safety-Related Turbine Building. The staff noted that there are no “structural” identifiers on the drawing to ensure that the structural integrity of the nonsafety-related piping “anchors” are managed for aging effects consistent with the provisions of SLRA Section 2.1.4.2, “Nonsafety-Related Affecting Safety-Related—10 CFR 54.4(a)(2),” during the period of extended operations. In particular, the subject SLRA drawing does not display seismically qualified equivalent supports for the two interfaces of these (a)(1)/(a)(2) system piping components. The staff requested that the applicant justify the lack of a seismically qualified equivalent anchor for the interfaces of these (a)(1)/(a)(2) system piping components.

The applicant responded that the subject bearing cooling system nonsafety-related piping displayed on SLR Drawing 11715-SLRB-040D transitions to Coordinates L-2 and L-4 on Sheet 1 of SLRA Drawing 11715-SLRM-080A, “Subsequent License Renewal—Bearing Cooling System—North Anna Power Station Unit 1.” Equivalent anchor notations (i.e., F.4.4) are indicated on Sheet 1 of Drawing 11715-SLRM-080A for the subject nonsafety-related bearing cooling piping. Additionally, while not specifically labeled as such, the central station air conditioner units are base-mounted components that also serve as structural integrity endpoints.

The staff finds the applicant’s response acceptable, since the applicant clarified that the staff’s perceived SLRA deficiency was nonexistent. Furthermore, the staff concludes that SLRA Drawing 11715-SLRB-040D, Sheet 1, accurately reflects the guidance of NUREG-2192, Section 2.1.3.1.2, “Nonsafety-Related.”

2.3.3.8.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.8.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the bearing cooling system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.9 Circulating Water

2.3.3.9.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.9 describes the circulating water system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-9 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-9 provides the results of the applicant’s AMR for circulating water system SCs.

2.3.3.9.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.9, “Circulating Water”
- SLRA Tables

- Table 2.3.3-9, “Circulating Water”
- UFSAR References
  - Section 10.4.2, “Circulating Water System”
- SLRA Boundary Drawings
  - 11715-SLRM-077A sheets 1–2
  - 11715-SLRM-99A sheet 1
  - 12050-SLRM-077A sheets 1–2
  - 12050-SLRM-99A sheet 1

2.3.3.9.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.9.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the circulating water system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.10 Vacuum Priming

2.3.3.10.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.10 describes the vacuum priming system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-10 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-10 provides the results of the applicant’s AMR for vacuum priming system SCs.

2.3.3.10.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.10, “Vacuum Priming”
- SLRA Tables
  - Table 2.3.3-10, “Vacuum Priming”
- UFSAR References
  - Section 10.4.2, “Circulating Water System” (Section 10.4.2.2)
  - Table 6.2-37, “Major Piping Penetrations Through the Reactor Containment Structure”

- SLRA Boundary Drawings
  - 11715-SLRM-072A sheets 1–2
  - 11715-SLRM-081A sheet 1
  - 12050-SLRM-072A sheets 1–2
  - 12050-SLRM-081A sheet 1

2.3.3.10.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.10.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the vacuum priming system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.11 Domestic Water

2.3.3.11.1 Summary of Technical Information in the Application

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

2.3.3.11.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had included within the scope of SLR all components with intended functions delineated under 10 CFR 54.4(a)(2). The staff then reviewed those components that Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.11, "Domestic Water"
- SLRA Tables
  - Table 2.3.3-11, "Domestic Water"
  - Table 3.3.2-11, "Auxiliary Systems—Domestic Water—Aging Management Evaluation"
- UFSAR References
  - Section 9.2.3.1, "Domestic Water System"
  - Table 9.2-10, "Domestic Water Supply Components Design Data"
- SLRA Boundary Drawings
  - 11715-SLRB-040C sheets 1–3
  - 11715-SLRB-041D sheet 5

2.3.3.11.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.11.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the domestic water system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.12 Component Cooling

2.3.3.12.1 Summary of Technical Information in the Application

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

2.3.3.12.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.12, "Component Cooling"
- SLRA Tables
  - Table 2.3.3-12, "Component Cooling"
- UFSAR References
  - Section 9.2.2, "Component Cooling System"
  - Table 9.2-5, "Component Cooling Water Subsystem Component Design Data"
- SLRA Boundary Drawings
  - 11715-SLRM-079A sheets 1–3
  - 11715-SLRM-079B sheets 1–5
  - 11715-SLRM-079C sheets 1–5
  - 11715-SLRM-079D sheets 3–4
  - 12050-SLRM-079A sheets 1–5
  - 12050-SLRM-079B sheet 3

2.3.3.12.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.12.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the component cooling system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.13 Neutron Shield Tank Cooling

2.3.3.13.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.13 describes the neutron shield tank cooling system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-13 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-13 provides the results of the applicant's AMR for neutron shield tank cooling system SCs.

2.3.3.13.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.13, "Neutron Shield Tank Cooling"
- SLRA Tables
  - Table 2.3.3-13, "Neutron Shield Tank Cooling"
- UFSAR References
  - Section 9.2.2, "Component Cooling System"
  - Table 9.2-7, "Neutron Shield Tank Cooling Subsystem Components Design Data"
- SLRA Boundary Drawings
  - 11715-SLRM-079B sheet 5
  - 12050-SLRM-079A sheet 5

2.3.3.13.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.13.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the neutron shield tank cooling system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.14 Instrument Air

2.3.3.14.1 Summary of Technical Information in the Application

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

2.3.3.14.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.14, "Instrument Air"
- SLRA Tables
  - Table 2.3.3-14, "Instrument Air"
  - Table 3.3.2-14, "Auxiliary Systems—Instrument Air—Aging Management Evaluation"
- UFSAR References
  - Section 9.3.1, "Compressed Air System"
  - Table 6.2-37, "Major Piping Penetrations Through the Reactor Containment Structure"
- SLRA Boundary Drawings
  - 11715-SLRM-082A sheets 1–3
  - 11715-SLRM-082B sheets 1–4
  - 11715-SLRM-082C sheets 1–2
  - 11715-SLRM-082M sheet 1
  - 11715-SLRM-082N sheets 1–2
  - 12050-SLRM-082A sheets 1–2
  - 12050-SLRM-082A sheet 3
  - 12050-SLRM-082B sheets 1–2
  - 12050-SLRM-082C sheets 1–2

The staff's review identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. This resulted in the issuance of RAI 2.3.3.14-1. This RAI, dated April 1, 2021, is documented in ADAMS Accession No. ML21091A000 and the applicant's response, dated April 29, 2021, is documented in ADAMS Accession No. ML21119A287.

In RAI 2.3.3.14-1, the staff noted that Sheet 2 of SLRA Drawing 12050-SLRM-082C, “Subsequent License Renewal—Instrument Air System—North Anna Power Station Unit 2,” at Coordinates F-7 and F-8, displays 3" nonsafety-related piping on both sides of Containment Penetration 112 as not being structurally supported. The staff noted that there are no “structural” identifiers on the drawing to ensure that the structural integrity of the nonsafety-related piping “anchors” are managed for aging effects consistent with the provisions of SLRA Section 2.1.4.2, “Nonsafety-Related Affecting Safety-Related—10 CFR 54.4(a)(2),” during the period of extended operations. In particular, the subject SLRA drawing does not display seismically qualified equivalent supports for the two interfaces of these (a)(1) and (a)(2) system piping components. The staff requested that the applicant justify the lack of a seismically qualified equivalent anchor for the interfaces of these (a)(1) and (a)(2) system piping components.

The applicant responded that the piping depicted in the subject drawing:

> …consists of safety-related containment penetration piping (highlighted in blue) with dead-ended sections of nonsafety-related piping attached both inside and outside containment. All the attached nonsafety-related piping is highlighted orange [for leakage boundary or structural integrity (a)(2) function], is within the scope of SLR, and subject to an aging management review...

The applicant noted that:

> …Anchor notations do not identify specific component supports that must be included within scope, but [rather] identify the endpoint of piping that must be included within scope to ensure adequate support of attached safety-related piping…As noted in NEI 95-10, Appendix F.4 (referenced in NEI 17-01), “An alternative to specifically identifying a seismic anchor or series of equivalent anchors that support the SR/NS [Safety-Related/Non Safety] piping interface is to include enough of the NS piping run to ensure these anchors are included and thereby ensure the piping and anchor intended functions are maintained”…Since all of the attached nonsafety-related piping is within scope, the specific location of the anchors is not depicted…

The applicant stated that the subject anchors or supports are addressed as structural commodities in SLRA Section 2.4.1.38 “Component Supports.”

The staff finds the applicant’s response acceptable, since the applicant clarified that the subject anchors are subject to an AMR consistent with the guidance of NUREG-2192, Section 2.1.3.1.2, “Nonsafety-Related.”

2.3.3.14.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.14.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the instrument air system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.15 Service Air

2.3.3.15.1 Summary of Technical Information in the Application

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

2.3.3.15.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.15, "Service Air"
- SLRA Tables
  - Table 2.3.3-15, "Service Air"
- UFSAR References
  - Section 9.3.1, "Compressed Air Systems"
  - Table 6.2-37, "Major Piping Penetrations Through the Reactor Containment Structure"
- SLRA Boundary Drawings
  - 11715-SLRM-082B sheets 1–3
  - 11715-SLRM-082F sheets 1–2

The staff's review identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. This resulted in the issuance of RAI 2.3.3.15-1. This RAI, dated April 1, 2021, is documented in ADAMS Accession No. ML21091A000 and the applicant's response, dated April 29, 2021, is documented in ADAMS Accession No. ML21119A287.

In RAI 2.3.3.15-1, the staff noted that:

(a) Sheet 1 of SLRA Drawing 11715-SLRM-082F, "Subsequent License Renewal—Service Air System—North Anna Power Station Unit 1," at Coordinate C-7, displays a 2" nonsafety-related line inside containment connected to safety-related piping at Containment Penetration 42, and

(b) Sheet 2 of SLRA Drawing Number 12050-SLRM-082F, "Subsequent License Renewal—Service Air System—North Anna Power Station Unit 2," at Coordinate D-6, displays a 2" nonsafety-related line inside containment connected to safety-related piping at Containment Penetration 42.

The staff noted that there are no “structural” identifiers on either of the subject drawings to ensure that the structural integrity of the nonsafety-related piping “anchors,” inside either Containment, are managed for aging effects consistent with the provisions of SLRA Section 2.1.4.2, “Nonsafety-Related Affecting Safety-Related—10 CFR 54.4(a)(2),” during the period of extended operations. In particular, the subject SLRA drawings do not display seismically qualified equivalent supports for either of the two interfaces of these (a)(1) and (a)(2) system piping components. The staff requested that the applicant justify the lack of a seismically qualified equivalent anchor(s) within either Containment for the interfaces of the (a)(1) and (a)(2) system piping components.

The applicant responded that:

> [t]he nonsafety-related piping components inside each Containment that are connected to the safety-related Containment Penetration 42…[and] consist of several branches of compressed air supply piping and associated valves that dead-end within Containment. All of the attached nonsafety-related piping and valves are highlighted orange [for leakage boundary or structural integrity (a)(2) function], are within the scope of SLR and are subject to an aging management review.

The applicant noted that:

> …Anchor notations do not identify specific component supports that must be included within scope, but [rather] identify the endpoint of piping that must be included within scope to ensure adequate support of attached safety-related piping…As noted in NEI 95-10, Appendix F.4 (referenced in NEI 17-01), "An alternative to specifically identifying a seismic anchor or series of equivalent anchors that support the SR/NS [Safety Related/Non Safety] piping interface is to include enough of the NS piping run to ensure these anchors are included and thereby ensure the piping and anchor intended functions are maintained." … Since there is no more attached nonsafety-related piping that could be added to scope to ensure that the required support piping was included, the specific location of the anchors is not depicted.

The applicant stated that the subject anchors or supports are addressed as structural commodities in SLRA Section 2.4.1.38 “Component Supports.”

The staff finds the applicant’s response acceptable, since the applicant clarified that the subject anchors are subject to an AMR consistent with the guidance of NUREG-2192, Section 2.1.3.1.2, “Nonsafety-Related.”

2.3.3.15.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.15.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the service air system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.16 Primary & Secondary Plant Gas Supplies

2.3.3.16.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.16 describes the primary and secondary plant gas supplies system components subject to an AMR and lists the license renewal boundary drawings that show the system boundaries. SLRA Table 2.3.3-16 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-16 provides the results of the applicant's AMR for primary and secondary plant gas supplies system SCs.

2.3.3.16.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.16, "Primary & Secondary Plant Gas Supplies"
- SLRA Tables
  - Table 2.3.3-16, "Primary & Secondary Plant Gas Supplies"
- UFSAR References
  - Section 5.5.8.2, "Safety and Relief Valves"
  - Section 6.2.5, "Combustible Gas Control in Containment—Containment Atmosphere Cleanup System"
- SLRA Boundary Drawings
  - 11715-SLRM-105A sheets 1–3
  - 11715-SLRM-105B sheets 1–3
  - 11715-SLRM-105C sheet 1
  - 11715-SLRM-106A sheets 1–2

2.3.3.16.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.16.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the primary and secondary plant gas supplies system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.17 Penetration Electrical

2.3.3.17.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.17 describes the penetration electrical system components subject to an AMR. SLRA Table 2.3.3-17 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-17 provides the results of the applicant's AMR for penetration electrical system SCs.

2.3.3.17.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant had 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.17, "Penetration Electrical"
- SLRA Tables
  - Table 2.3.3-17, "Penetration Electrical"
  - Table 3.3.2-17, "Auxiliary Systems—Penetration Electrical—Aging Management Evaluation"
- UFSAR
  - Section 3.8.2, "Containment Structures"
- Drawing
  - None

2.3.3.17.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.17.2 and on a review of the SLRA and UFSAR, the staff concludes that the applicant identified the penetration electrical system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.18 Leakage Monitoring

2.3.3.18.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.18 describes the leakage monitoring system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-18 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-18 provides the results of the applicant's AMR leakage monitoring system SCs.

2.3.3.18.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.18, “Leakage Monitoring”
- SLRA Tables
  - Table 2.3.3-18, “Leakage Monitoring”
  - Table 3.3.2-18, “Auxiliary Systems—Leakage Monitoring—Aging Management Evaluation”
- UFSAR References
  - Section 6.2.7, “Leakage Monitoring System”
  - Table 6.2-37, “Major Piping Penetrations Through the Reactor Containment Structure”
- Drawings
  - 11715-SLRM-092A sheet 1
  - 12050-SLRM-092A sheet 1

2.3.3.18.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.18.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the leakage monitoring system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.19 Chemical and Volume Control

2.3.3.19.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.19 describes the chemical and volume control system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-19 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-19 provides the results of the applicant’s AMR for chemical and volume control system SCs.

2.3.3.19.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion

Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.19, “Chemical & Volume Control”
- SLRA Tables
  - Table 2.3.3-19, “Chemical & Volume Control”
  - Table 3.3.2-19, “Auxiliary Systems—Chemical & Volume Control—Aging Management Evaluation”
- UFSAR References
  - Section 9.3.4, “Chemical and Volume Control System”
  - Table 9.3-5, “Principal Component Data Summary”
- Drawings
  - 11715-SLRM-095A sheets 1–4
  - 11715-SLRM-095B sheets 1–2
  - 11715-SLRM-095C sheets 1–2
  - 11715-SLRM-095D sheets 1–2
  - 12050-SLRM-095A sheets 1–2
  - 12050-SLRM-095B sheets 1–2
  - 12050-SLRM-095C sheets 1–2
  - 12050-SLRM-095D sheets 1–2

2.3.3.19.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.19.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the chemical and volume control system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.20 Boron Recovery

2.3.3.20.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.20 describes the boron recovery system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-20 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-20 provides the results of the applicant’s AMR for boron recovery system SCs.

2.3.3.20.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.20, "Boron Recovery"
- SLRA Tables
  - Table 2.3.3-20, "Boron Recovery"
  - Table 3.3.2-20, "Auxiliary Systems—Boron Recovery—Aging Management Evaluation"
- UFSAR References
  - Section 9.3.5, "Boron Recovery System"
  - Table 9.3-7, "Boron Recovery System Component Design Data"
- Drawings
  - 11715-SLRM-086A sheets 1–3
  - 11715-SLRM-086B sheets 1–3
  - 11715-SLRM-086C sheets 2–3

2.3.3.20.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.20.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the boron recovery system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.21 Sampling System

2.3.3.21.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.21 describes the sampling system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-21 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-21 provides the results of the applicant's AMR for sampling system SCs.

2.3.3.21.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion

Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.21, “Sampling System”
- SLRA Tables
  - Table 2.3.3-21, “Sampling System”
  - Table 3.3.2-21, “Auxiliary Systems—Sampling System—Aging Management Evaluation”
- UFSAR References
  - Section 9.3.2.1, “Sampling System—Normal Operations”
- Drawings
  - 11715-SLRM-087C sheet 1
  - 11715-SLRM-089A sheets 1–2
  - 11715-SLRM-089B sheets 1–4
  - 11715-SLRM-089C sheet 1
  - 11715-SLRM-089D sheet 1
  - 11715-SLRM-089E sheet 1
  - 11715-SLRM-089F sheets 1–3
  - 11715-SLRM-089G sheets 1–2
  - 11715-SLRM-089H sheet 1
  - 11715-SLRM-098A sheet 1
  - 11715-SLRM-103A sheet 1
  - 11715-SLRM-73A sheet 1
  - 12050-SLRM-089A sheets 1–4
  - 12050-SLRM-089B sheet 1
  - 12050-SLRM-089C sheet 1
  - 12050-SLRM-089D sheets 1–2
  - 12050-SLRM-089E sheets 1–3
  - 12050-SLRM-089F sheet 1
  - 12050-SLRM-098A sheet 1
  - 12050-SLRM-73A sheet 1

2.3.3.21.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.21.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the sampling system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.22 Incore Instrumentation

2.3.3.22.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.22 describes the incore instrumentation system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-22 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-22 provides the results of the applicant's AMR for incore instrumentation system SCs.

2.3.3.22.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.22, "Incore Instrumentation"
- SLRA Tables
  - Table 2.3.3-22, "Incore Instrumentation"
  - Table 3.3.2-22, "Auxiliary Systems—Incore Instrumentation—Aging Management Evaluation"
- UFSAR
  - Section 7.7.1.9, "Incore Instrumentation"
- Drawings
  - None

2.3.3.22.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.22.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the incore instrumentation system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.23 Decontamination

2.3.3.23.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.23 describes the decontamination system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-23 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-23 provides the results of the applicant's AMR for decontamination system SCs.

2.3.3.23.2 Staff Evaluation

The decontamination system was not included in the application for an initial renewed operating license but was incorporated into the SLRA. Due to the potential impact on safety-related SSCs, the applicant included the decontamination system within the scope of SLRA in accordance with the criterion of 10 CFR 54.4(a)(2) for spatial interaction.

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.23, "Decontamination"
- SLRA Tables
  - Table 2.3.3-23, "Decontamination"
  - Table 3.3.2-23, "Auxiliary Systems—Decontamination—Aging Management Evaluation"
- UFSAR
  - Section 9.5.9, "Decontamination Facility"
- Drawing
  - 11715-SLRM-101A sheet 1

2.3.3.23.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.23.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the decontamination system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.24 Drains—Aerated

2.3.3.24.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.24 describes the drains—aerated system components—subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-24 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-24 provides the results of the applicant's AMR for drains—aerated system SCs.

2.3.3.24.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.24, "Drains—Aerated"
- SLRA Tables
    - Table 2.3.3-24, "Drains—Aerated"
    - Table 3.3.2-24, "Auxiliary Systems—Drains"
- UFSAR
    - Section 3.8.2, "Containment Structures"
    - Section 9.3.3, "Vent and Drain System"
    - Table 9.3-3, "Vent and Drain System Component Design Data"
- Drawings
    - 11715-SLRM-090A sheets 1–2
    - 11715-SLRM-090B sheet 1
    - 11715-SLRM-090C sheet 3
    - 12050-SLRM-090A sheet 3
    - 12050-SLRM-090B sheet 1

2.3.3.24.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.24.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the drains—aerated system components—within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.25 Drains—Building Services

2.3.3.25.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.25 describes the drains—building services system components—subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-25 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-25 provides the results of the applicant's AMR for drains—building services system SCs.

2.3.3.25.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.25, "Drains—Building Services"
- SLRA Tables
  - Table 2.3.3-25, "Drains—Building Services"
  - Table 3.3.2-25, "Auxiliary Systems—Drains—Building Services—Aging Management Evaluation"
- UFSAR
  - Section 2.4.10, "Flood Protection Requirements"
  - Section 9.3.3, "Vent and Drain System"
- Drawings
  - 11715-SLRB-035A sheet 2
  - 11715-SLRB-201A sheets 1–3

2.3.3.25.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.25.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the drains—building services system components—within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.26 Drains—Gaseous

2.3.3.26.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.26 describes the drains—gaseous system components—subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-26 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-26 provides the results of the applicant's AMR for drains—gaseous system SCs.

2.3.3.26.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.26, "Drains—Gaseous"
- SLRA Tables
  - Table 2.3.3-26, "Drains—Gaseous"
  - Table 3.3.2-26, "Auxiliary Systems—Drains—Gaseous—Aging Management Evaluation"
- UFSAR
  - Section 9.3.3, "Vent and Drain System"
  - Table 9.3-3, "Vent and Drain System Component Design Data"
- Drawings
  - 11715-SLRM-090C sheets 1–2
  - 12050-SLRM-090A sheets 1–2

2.3.3.26.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.26.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the drains—gaseous system components—within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.27 Gaseous Waste Disposal

2.3.3.27.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.27 describes the gaseous waste disposal system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-27 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-27 provides the results of the applicant's AMR for gaseous waste disposal system SCs.

2.3.3.27.2 Staff Evaluation

The gaseous waste disposal system was not included in the application for initial renewed operating license but was incorporated into the SLRA. The applicant included the gaseous waste disposal system within the scope of SLRA in accordance with the criterion of 10 CFR 54.4(a)(3) since SSCs of the system are relied upon for compliance with environmental qualification (10 CFR 50.49) regulations.

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.27, “Gaseous Waste Disposal”
- SLRA Tables
  - Table 2.3.3-27, “Gaseous Waste Disposal”
  - Table 3.3.2-27, “Auxiliary Systems—Gaseous Waste Disposal—Aging Management Evaluation”
- UFSAR
  - Section 11.3, “Gaseous Waste Disposal System”
  - Section 15.3.5, “Waste Gas Decay Tank Rupture”
- Drawings
  - 11715-SLRM-097B sheet 1

2.3.3.27.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.27.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the gaseous waste disposal system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.28 Liquid and Solid Waste (Radioactive)

2.3.3.28.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.28 describes the liquid and solid waste system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-28 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-28 provides the results of the applicant’s AMR for liquid and solid waste system SCs.

2.3.3.28.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.28, “Liquid & Solid Waste (Radioactive)”
- SLRA Tables
  - Table 2.3.3-28, “Liquid & Solid Waste (Radioactive)”
  - Table 3.3.2-28, “Auxiliary Systems—Liquid & Solid Waste (Radioactive)—Aging Management Evaluation”
- UFSAR
  - Section 11.2, “Liquid Waste Disposal System”
  - Section 11.5, “Solid Waste System”
- Drawings
  - 11715-SLRM-087A sheets 1–3
  - 11715-SLRM-087B sheets 1–2
  - 11715-SLRM-087C sheets 1, 3–4
  - 11715-SLRM-087E sheet 1

2.3.3.28.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.28.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the liquid and solid waste system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.29 Oil Separation

2.3.3.29.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.29 describes the oil separation system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-29 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-29 provides the results of the applicant’s AMR for oil separation system SCs.

2.3.3.29.2 Staff Evaluation

The oil separation system was not included in the application for initial renewed operating license but was incorporated into the SLRA. Due to the potential impact on safety-related

SSCs, the applicant included the oil separation system within the scope of SLRA in accordance with the criterion of 10 CFR 54.4(a)(2) for spatial interaction.

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.29, "Oil Separation"
- SLRA Tables
  - Table 2.3.3-29, "Oil Separation"
  - Table 3.3.2-29, Auxiliary Systems—Oil Separation—Aging Management Evaluation
- UFSAR
  - None
- Drawings
  - 11715-SLRB-144D sheet 1

2.3.3.29.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.29.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the oil separation system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.30 Radioactive Waste

2.3.3.30.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.30 describes the radioactive waste system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-30 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-30 provides the results of the applicant's AMR for radioactive waste system SCs.

2.3.3.30.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy has 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.30, “Radioactive Waste”
- SLRA Tables
  - Table 2.3.3-30, “Radioactive Waste”
  - Table 3.3.2-30, “Auxiliary Systems—Radioactive Waste—Aging Management Evaluation”
- UFSAR
  - Section 11.5.2.1, “Spent Resins”
  - Section 11.5.3.3, “Spent Resin Handling Operation”
- Drawings
  - 11715-SLRM-086C sheet 3
  - 11715-SLRM-087D sheets 1–3

2.3.3.30.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.30.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the radioactive waste system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.31 Sanitary Sewage

2.3.3.31.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.31 describes the sanitary sewage system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-31 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-31 provides the results of the applicant’s AMR for sanitary sewage system SCs.

2.3.3.31.2 Staff Evaluation

The sanitary sewage system was not included in the application for initial renewed operating license but was incorporated into the SLRA. Due to the potential impact on safety-related SSCs, the applicant included the sanitary sewage system within the scope of SLRA in accordance with the criterion of 10 CFR 54.4(a)(2) for spatial interaction.

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.31, “Sanitary Sewage”

- SLRA Tables
  - Table 2.3.3-31, “Sanitary Sewage”
  - Table 3.3.2-31, “Auxiliary Systems—Sanitary Sewage—Aging Management Evaluation”
- UFSAR
  - None
- Drawings
  - 11715-SLRB-202A sheet 1

2.3.3.31.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.31.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the sanitary sewage system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.32 Vents—Gaseous

2.3.3.32.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.32 describes the vents—gaseous system components—subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-32 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-32 provides the results of the applicant’s AMR for vents—gaseous system SCs.

2.3.3.32.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had included within the scope of SLR all components with intended functions delineated under 10 CFR 54.4(a)(2). The staff then reviewed those components that Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.32, “Vents—Gaseous”
- SLRA Tables
  - Table 2.3.3-32, “Vents—Gaseous”
  - Table 3.3.2-32, “Auxiliary Systems—Vents -Gaseous—Aging Management Evaluation”
- UFSAR
  - None

- Drawings
  - 11715-SLRM-090C sheet 1
  - 12050-SLRM-090A sheet 1

2.3.3.32.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.32.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the vents—gaseous system components—within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.33 Containment Vacuum

2.3.3.33.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.33 describes the containment vacuum system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-33 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-33 provides the results of the applicant's AMR for containment vacuum system SCs.

2.3.3.33.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.33, "Containment Vacuum"
- SLRA Tables
  - Table 2.3.3-33, "Containment Vacuum"
  - Table 3.3.2-33, "Auxiliary Systems—Containment Vacuum—Aging Management Evaluation"
- UFSAR
  - Section 6.2.6, "Containment Vacuum System"
  - Table 6.2-37, "Major Piping Penetrations Through the Reactor Containment Structure"
- Drawings
  - 11715-SLRM-072B sheet 1
  - 11715-SLRM-092A sheet 2
  - 12050-SLRM-092A sheet 2

2.3.3.33.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.33.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the Information containment vacuum system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.34 Chilled Water

2.3.3.34.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.34 describes the chilled water system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-34 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-34 provides the results of the applicant's AMR chilled water system SCs.

2.3.3.34.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.34, "Chilled Water"
- SLRA Tables
  - Table 2.3.3-34, "Chilled Water"
  - Table 3.3.2-34, "Auxiliary Systems—Chilled Water—Aging Management Evaluation"
- UFSAR
  - Section 9.2.2, "Component Cooling System"
  - Section 9.4.1, "Main Control Room and Relay Rooms"
  - Table 9.2-6, "Chilled Water Subsystem Component Design Data"
- Drawings
  - 11715-SLRB-040C sheets 1–3
  - 11715-SLRM-079D sheets 1–5
  - 12050-SLRM-079B sheets 1–3
  - 12050-SLRM-079D sheet 1

2.3.3.34.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.34.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the chilled water system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.35 *Heating and Ventilation*

2.3.3.35.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.35 describes the heating and ventilation system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-35 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-35 provides the results of the applicant's AMR for heating and ventilation system SCs.

2.3.3.35.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.35, "Heating & Ventilation"
- Dominion Energy, NAPS Units 1 and 2, Update to SLRA, Supplement 1, dated February 4, 2021 (ADAMS Accession No. ML21035A303)
- SLRA Tables
  - Table 2.3.3-35, "Heating & Ventilation"
  - Table 3.3.2-35, "Auxiliary Systems—Heating & Ventilation—Aging Management Evaluation"
- UFSAR
  - Section 9.4, "Air-Conditioning, Heating, Cooling, and Ventilation Systems"
  - Table 6.2-37, "Major Piping Penetrations Through the Reactor Containment Structure"
- Drawings
  - 11715-SLRB-006A sheets 1–3
  - 11715-SLRB-040E sheets 1–3
  - 11715-SLRB-34A sheet 1
  - 11715-SLRB-34B sheet 1

- 11715-SLRB-34C sheet 1
- 11715-SLRB-34D sheet 1
- 11715-SLRB-34E sheet 1
- 11715-SLRB-44C sheet 1
- 11715-SLRB-44E sheet 1
- 11715-SLRB-44F sheet 1
- 12050-SLRB-34A sheet 1
- 12050-SLRB-34B sheet 1

2.3.3.35.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.35.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the heating and ventilation system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.36 High Radiation Sampling

2.3.3.36.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.36 describes the high-radiation sampling system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-36 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-36 provides the results of the applicant's AMR for high-radiation sampling system SCs.

2.3.3.36.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.36, "High Radiation Sampling"
- SLRA Tables
  - Table 2.3.3-36, "High Radiation Sampling"
  - Table 3.3.2-36, "Auxiliary Systems—High Radiation Sampling—Aging Management Evaluation"
- UFSAR
  - Section 9.3.2.2, "High Radiation Sampling System—Post-Accident"

- Drawings
  - 11715-SLRM-090C sheet 3
  - 11715-SLRM-108A sheet 1
  - 11715-SLRM-108B sheet 1
  - 11715-SLRM-108C sheet 1
  - 11715-SLRM-108E sheet 1
  - 12050-SLRM-090A sheet 3

2.3.3.36.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.36.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the high-radiation sampling system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.37 Post-Accident Hydrogen Removal

2.3.3.37.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.37 describes the post-accident hydrogen removal system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-37 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-37 provides the results of the applicant's AMR post-accident hydrogen removal system SCs.

2.3.3.37.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.37, "Post-Accident Hydrogen Removal"
- SLRA Tables
  - Table 2.3.3-37, "Post-Accident Hydrogen Removal"
  - Table 3.3.2-37, "Auxiliary Systems—Post-Accident Hydrogen Removal—Aging Management Evaluation"
- UFSAR
  - Section 6.2.5, "Combustible Gas Control in Containment–Containment Atmosphere Cleanup System"

- Drawings
  - 11715-SLRM-106A sheets 1–4

2.3.3.37.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.37.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the post-accident hydrogen removal system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.38 Radiation Monitoring

2.3.3.38.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.38 describes the radiation monitoring system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-38 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-38 provides the results of the applicant's AMR for radiation monitoring system SCs.

2.3.3.38.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had included within the scope of SLR all components with intended functions delineated under 10 CFR 54.4(a)(2). The staff then reviewed those components that Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.38, "Radiation Monitoring"
- SLRA Tables
  - Table 2.3.3-38, "Radiation Monitoring"
  - Table 3.3.2-38, "Auxiliary Systems—Radiation Monitoring—Aging Management Evaluation"
- UFSAR
  - Section 11.4, "Process And Effluent Radiation Monitoring System"
  - Table 6.2-37, "Major Piping Penetrations Through the Reactor Containment Structure"
- Drawings
  - 11715-SLRM-082N sheet 3
  - 12050-SLRM-082B sheet 2

The staff's review identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. This resulted in the issuance of RAI 2.3.3.38-1. The staff issued this RAI by email, dated April 1, 2021 (ADAMS Accession

No. ML21091A000), and the applicant responded by letter, dated April 29, 2021 (ADAMS Accession No. ML21119A287).

In RAI 2.3.3.38-1, the staff cited that:

(a) SLRA Drawing 11715-SLRM-082N, “Subsequent License Renewal—Radiation Monitoring System—North Anna Power Station Unit 1,” Sheet 3 displays:

  (i) A 1" nonsafety-related line inside Containment, “Open to Reactor Containment,” connected to the safety-related piping at Containment Penetration 43, at Coordinate C-4

  (ii) A 1" nonsafety-related line inside Containment from, “Vent Duct Piping,” connected to safety-related piping at Containment Penetration 44 at Coordinate D-4

(b) SLRA Drawing 12050-SLRM-082B, “Subsequent License Renewal—Instrument Air System—North Anna Power Station Unit 2,” Sheet 2 displays:

  (i) A 1" nonsafety-related line inside Containment, “Open to Reactor Containment,” connected to safety-related piping at Containment Penetration 43 at Coordinate C-8

  (ii) A 1" line inside Containment from, “Vent Duct Piping,” connected to safety-related piping at Containment Penetration 44 at Coordinate D-8

The staff noted that there are no “structural” identifiers on either of the subject drawings to ensure that the structural integrity of the nonsafety-related piping “anchors” inside containment are managed for aging effects consistent with the provisions of SLRA Section 2.1.4.2, “Nonsafety-Related Affecting Safety-Related—10 CFR 54.4(a)(2),” during the period of extended operations. In particular, the subject SLRA drawings do not display seismically qualified equivalent supports for either of the two interfaces of these (a)(1) and (a)(2) system piping components. The staff requested that the applicant justify the lack of a seismically qualified equivalent anchor(s) within containment for the interfaces of the (a)(1) and (a)(2) system piping components.

The applicant responded that the nonsafety-related piping shown on the subject SLRA drawings is radiation monitor supply piping between the containment ventilation ring ducts and the safety-related containment penetration piping. All of this piping is shown highlighted orange [for leakage boundary or structural integrity (a)(2) function] on the subject drawings and is connected to in-scope ductwork as displayed on the containment ventilation drawings (i.e., SLRA Drawing 11715-SLRB-006A, sheet 1, “Subsequent License Renewal—Heating & Ventilation System—North Anna Power Station Unit 1,” and sheet 2, “Subsequent License Renewal—Heating & Ventilation System—North Anna Power Station Unit 2”). The applicant noted that:

> … Anchor notations do not identify specific component supports that must be included within scope, but [rather] identify the endpoint of piping that must be included within scope to ensure adequate support of attached safety-related piping…As noted in NEI 95-10, Appendix F.4 (referenced in NEI 17-01), "An alternative to specifically identifying a seismic anchor or series of equivalent anchors that support the SR/NS [Safety Related/Non Safety] piping interface is to include enough of the NS piping run to ensure these anchors are included and thereby ensure the piping and anchor intended functions are maintained"…Since all of the attached nonsafety-related piping is within scope, the specific location

of the anchors is not depicted (there is no more attached piping that could be added to scope to encompass them).

The applicant stated that the subject anchors or supports are addressed as structural commodities in SLRA Section 2.4.1.38, “Component Supports.”

The staff finds the applicant’s response acceptable, since the applicant clarified that the subject anchors are subject to an AMR consistent with the guidance of NUREG-2192, Section 2.1.3.1.2, “Nonsafety-Related.”

2.3.3.38.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.38.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the radiation monitoring system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.39 Alternate AC

2.3.3.39.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.39 describes the alternate AC system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-39 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-39 provides the results of the applicant’s AMR for alternate alternating current (AC) system SCs.

2.3.3.39.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.39, “Alternate AC”
- SLRA Tables
  - Table 2.3.3-39, “Alternate AC”
  - Table 3.3.2-39, “Auxiliary Systems—Alternate AC—Aging Management Evaluation”
- UFSAR
  - Section 8.1.2, “Onsite Electric System”
  - Section 9.5.11, “Alternate AC (AAC) Diesel and its Supporting Systems”
- Drawings
  - 11715-SLRM-113A sheet 1

- 11715-SLRM-113B sheet 1
- 11715-SLRM-113C sheet 1
- 11715-SLRM-113D sheet 1
- 11715-SLRM-113E sheet 1

2.3.3.39.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.39.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the alternate AC system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.40 Emergency Diesel Generator System

2.3.3.40.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.40 describes the emergency diesel generator system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-40 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-40 provides the results of the applicant's AMR for emergency diesel generator system SCs.

2.3.3.40.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.40, "Emergency Diesel Generator System"
- SLRA Tables
  - Table 2.3.3-40, "Emergency Diesel Generator System"
  - Table 3.3.2-40, "Auxiliary Systems—Emergency Diesel Generator System—Aging Management Evaluation"
- UFSAR
  - Section 8.3.1.1.1, "Description (i.e., Station Service Power System)"
  - Section 8.3.1.1.2.1, "Compliance with NRC Criteria"
  - Section 9.5.4, "Emergency Diesel Generator Fuel-Oil Storage and Transfer System"
  - Section 9.5.5, "Diesel-Generator Cooling Water System"
  - Section 9.5.6, "Diesel-Generator Starting System"

- Section 9.5.7, “Diesel-Generator Lubrication System”
- Section 9.5.8, “Diesel-Generator Ventilation and Combustion Air Intake and Exhaust System”

- Drawings
  - 11715-SLRB-035A sheets 1–2
  - 11715-SLRB-035C sheets 1–4
  - 11715-SLRM-107A sheets 1–4
  - 11715-SLRM-107B sheets 1–2
  - 11715-SLRM-107C sheets 1–2
  - 11715-SLRM-107D sheets 1–2
  - 12050-SLRM-107A sheets 1–4
  - 12050-SLRM-107B sheets 1–2
  - 12050-SLRM-107C sheets 1–2
  - 12050-SLRM-107D sheets 1–2

2.3.3.40.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.40.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the emergency diesel generator system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.41 Security

2.3.3.41.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.41 describes the security system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-41 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-41 provides the results of the applicant’s AMR for security system SCs.

2.3.3.41.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.41, “Security”
- SLRA Tables

- Table 2.3.3-41, “Security”
- Table 3.3.2-41, “Auxiliary Systems—Security—Aging Management Evaluation”

- UFSAR
  - Section 9.5.3, “Lighting Systems”
- Drawings
  - None

2.3.3.41.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.41.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the security system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.42 Fire Protection

2.3.3.42.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.42, “Fire Protection,” describes the fire protection systems and components subject to an AMR and lists the SLR boundary drawings that show the fire protection system boundaries. SLRA Table 2.3.3-42, “Fire Protection” lists the fire protection component types subject to an AMR and their intended functions. SLRA Table 3.3.2-42, “Auxiliary Systems—Fire Protection—Aging Management Evaluation,” provides the results of the applicant’s AMR for fire protection systems and components.

2.3.3.42.2 Staff Evaluation

The staff reviewed the SLRA, NUREG-1766, SLRA boundary drawings, UFSAR Section 9.5.1, and the following fire protection CLB document listed in the North Anna Power Station, Units 1 and 2 License Condition 2.D:

- NRC’s SER by the Office of Nuclear Reactor Regulation, Fire Protection Program for North Anna Power Station, Units 1 and 2, February 1979, ADAMS Package Accession No. ML19283B801.

During its review, the staff evaluated the fire protection components described in the SLRA, UFSAR, and SLR boundary drawings to verify that the applicant included within the scope of SLR all components with their intended functions, as described in 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of SLR 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 Section 2.3.3.42 states that the purpose of the fire protection system is to detect and suppress fires to minimize damage to the plant equipment and to achieve plant safe shutdown. Further, SLRA Section 2.3.3.42 states portions of the fire protection system perform a safety-related containment isolation function. The North Anna Power Station, Units 1 and 2, fire protection system consists of a smoke detection system, fire water suppression system, and carbon dioxide and halon fire extinguishing system. The sources of water for the water-based fire suppression system are the circulating water intake structure (motor-driven pump), the service water reservoir (diesel-driven pump), and the circulating water pump bay (pressure maintenance pump).

The evaluation boundary for the fire protection systems and components subject to an AMR includes the fire protection system motor-driven and diesel-driven pumps (including the fuel oil supply), yard piping, and distribution piping and components associated with all sprinkler, spray, and hose station suppression features within the protected area. The evaluation boundary also includes fire damper assemblies installed in ventilation system ducts and fire barrier penetrations. SLRA Table 2.3.3-42 identifies the types of fire protection system components that are within the scope of the SLR, with AMR results shown in SLRA Table 3.3.2-42.

SLRA Section 2.3.3.42 lists the fire protection boundary drawings that reflect the boundaries for SLR. The drawings are highlighted to identify those portions of the system that are within the scope of SLR. The staff compared the SLRA drawings to the system descriptions in the UFSAR and SERs listed in NAPS License Condition 2.D to ensure that they were representative of the fire protection systems. To verify that the applicant included the applicable portions of the fire protection system within the scope of SLR, the staff focused its review on those portions of the fire protection systems that were not identified as within the scope of SLR and confirmed that they did not meet the scoping criteria of 10 CFR 54.4(a).

A virtual audit was held with Dominion Energy staff for fire protection scoping and screening topics through a breakout session on December 10, 2020. The staff discussed two fire protection scoping and screening audit questions, interviewed Dominion Energy's staff, and reviewed documentation provided by Dominion Energy. During the discussion, the Dominion Energy staff clarified the staff's concerns identified in the two audit questions related to Section 2.3.3.42 of the SLRA. The Dominion Energy staff stated that the compressor assembly and components were inadvertently excluded from the scope of SLR (i.e., not highlighted) on SLRA Drawing 11715-SLRB-41B sheet 1. In an SLRA supplement, submitted by letter dated February 4, 2021 (ADAMS Accession No. ML21035A303), Dominion Energy included the compressor assembly and components within the scope of SLR, and the boundary drawing has been revised to highlight the compressor assembly and components. The component types for this system were also added in Table 2.3.3-42 with an aging management evaluation in SLRA Table 3.3.2-42.

Further, the supplement indicated that the components in the diesel-driven fire pump engine are included in the scope of SLR. The diesel engines include various components necessary to support engine operation. The staff confirmed that the subcomponents of the fire pump diesel engine, except for the diesel engine heat exchanger, do not meet the AMR criteria of 10 CFR 54.21(a)(1)(i). NUREG-2192, Table 2.1-6, indicates that the fire pump diesel engines are not subject to an AMR. However, SRP-SLR Table 2.3-2, "Examples of Mechanical Components Screening and Basis for Disposition" notes that diesel engine jacket water heat exchangers are passive, long-lived components that are subject to an AMR, even though the diesel engine is considered active.

During the staff's review of industry operating experience, the staff found a reference to Dominion Energy's correction action report CA3064396, "Perform MRule [Maintenance Rule] Functional Failure Evaluation for 1-FP-P-2 Coolant Leak, where Dominion Energy classified tube leaks as functional failures in 2017.

Based on the information found, the staff questioned whether the diesel fire pump engine heat exchanger could be excluded from an AMR by considering it as being part of an "active assembly," as discussed in SLRA Section 2.1.5.1. The tube leaks mentioned in corrective action report CA3064396 did not appear to support Dominion Energy's position that testing and monitoring of the entire "active assembly" is sufficient to identify degradation of the passive, long-lived subcomponents before a loss of intended function. Consequently, the staff issued RAI B2.1.15-1. The staff's request and Dominion Energy's response are documented in ADAMS Accession No. ML21091A187. In its response, Dominion Energy stated that inspection of the heat exchanger tube bundle for degradation is not practical due to the small tube diameter and alternatively chose to periodically replace the tube bundle, making it exempt from an AMR.

Because periodic replacement of a heat exchanger tube bundle was relatively uncommon, in conjunction with additional NRC-identified plant-specific operating experience, the staff questioned the 20-year replacement frequency of the heat exchanger tube bundle. This issue was discussed during public meetings on May 13, 2021 (ADAMS Accession No. ML21145A211) and May 27, 2021 (ADAMS Accession No. ML21221A129). In SLRA Supplement 3, dated July 29, 2021 (ADAMS Accession No. ML21210A396), Dominion Energy submitted additional information to support the 20-year replacement frequency. The staff found the information provided sufficient bases to justify the 20-year replacement frequency of the diesel engine heat exchanger.

The staff confirmed that the fire protection systems and associated components are included in the revised SLRA Table 2.3.3-42 with AMR results in SLRA Table 3.3.2-42 in the supplement dated August 26, 2021 (ADAMS Accession No. ML21238A297). The staff confirmed that these components are highlighted in the SLR boundary drawings. On the basis of the information in the boundary drawings in the SLRA and its supplement, the UFSAR, and the above-mentioned CLB document, the staff did not identify any omissions by Dominion Energy in the scoping of the fire protection systems and components in accordance with 10 CFR 54.4(a).

2.3.3.42.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.42.2 and its review of the SLRA and its supplement, UFSAR, SLR boundary drawings, and the CLB document, the staff concludes that Dominion Energy has appropriately identified the fire protection system components within the scope of SLR, as required by 10 CFR 54.4(a). The staff also concludes that Dominion Energy has adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.43 Containment Access

2.3.3.43.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.43 describes the containment access system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-43 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-43 provides the results of the applicant's AMR for containment access system SCs.

2.3.3.43.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.43, “Containment Access”
- SLRA Tables
  - Table 2.3.3-43, “Containment Access”
  - Table 3.3.2-43, “Auxiliary Systems—Containment Access—Aging Management Evaluation”
- UFSAR
  - None
- Drawings
  - 11715-SLRB-100A sheet 1
  - 12050-SLRB-100A sheet 1

2.3.3.43.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.43.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the containment access system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.44 Generator Breaker Cooling

2.3.3.44.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.43 describes the generator breaker cooling system components subject to an AMR and lists the license renewal boundary drawings that show the system boundaries. SLRA Table 2.3.3-43 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-43 provides the results of the applicant’s AMR for generator breaker cooling system SCs.

2.3.3.44.2 Staff Evaluation

The generator breaker cooling system was not included in the application for initial renewed operating license but was incorporated into the SLRA. Due to the potential impact on safety-related SSCs, the applicant included the generator breaker cooling system within the scope of SLRA in accordance with the criterion of 10 CFR 54.4(a)(2) for spatial interaction.

The staff evaluated the system functions described in the SLRA and UFSAR]] to verify that Dominion Energy had 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 Dominion

Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Section 2.3.3.44, “Generator Breaker Cooling”
- SLRA Tables
  - Table 2.3.3-44, “Generator Breaker Cooling”
  - Table 3.3.2-44, “Auxiliary Systems—Generator Breaker Cooling—Aging Management Evaluation”
- UFSAR
  - None
- Drawings
  - 11715-SLRM-111A sheet 1
  - 11715-SLRM-111B sheet 1

2.3.3.44.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.43.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the generator breaker cooling system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.45 Water Treatment

2.3.3.45.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.43 describes the water treatment system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.3-43 lists the component types subject to an AMR and their intended functions. SLRA Table 3.3.2-43 provides the results of the applicant’s AMR for water treatment system SCs.

2.3.3.45.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.3-45, “Water Treatment”

- Table 3.3.2-45, “Auxiliary Systems—Water Treatment—Aging Management Evaluation”

- UFSAR References
  - Section 9.2.3.2, “Water Treatment System”
  - Section 10.4.3.2, “[Condensate and Feedwater] System Description”
  - Table 6.2-37, “Major Piping Penetrations Through the Reactor Containment Structure”
- SLRA Boundary Drawings
  - 11715-SLRM-102A sheets 1 and 2
  - 11715-SLRM-102B sheet 1
  - 11715-SLRM-112A sheet 1
  - 11715-SLRM-84A sheet 1
  - 12050-SLRM-102A sheets 1 and 2
  - 12050-SLRM-102B sheet 1
  - 12050-SLRM-84A sheet 1
  - 13075-SLRM-102C sheet 1

2.3.3.45.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.43.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the water treatment system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.4 Steam and Power Conversion Systems

SLRA Section 2.3.4, “Steam and Power Conversion Systems,” identifies the steam and power conversion systems SCs subject to an AMR for SLR. The applicant described the supporting SCs of the steam and power conversion systems in the following SLRA sections:

- SLRA Section 2.3.4.1, “Main Steam”
- SLRA Section 2.3.4.2, “Auxiliary Boilers”
- SLRA Section 2.3.4.3, “Extraction Steam”
- SLRA Section 2.3.4.4, “Auxiliary Steam”
- SLRA Section 2.3.4.5, “Feedwater”
- SLRA Section 2.3.4.6, “Condensate”
- SLRA Section 2.3.4.7, “Condensate Polishing”
- SLRA Section 2.3.4.8, “Steam Drains”
- SLRA Section 2.3.4.9, “Blowdown”
- SLRA Section 2.3.4.10, “Lubricating Oil”
- SLRA Section 2.3.4.11, “Main Generator Seal Oil”
- SLRA Section 2.3.4.12, “Electro-Hydraulic Control”

2.3.4.1 Main Steam

2.3.4.1.1 Summary of Technical Information in the Application

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

2.3.4.1.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.4-1, "Main Steam"
  - Table 3.4.2-1, "Steam and Power Conversion System—Main Steam—Aging Management Evaluation"
- UFSAR References
  - Section 10.2, "Turbine Generator"
  - Section 10.3, "Main Steam System"
  - Table 6.2-37, "Major Piping Penetrations through the Reactor Containment Structure"
- SLRA Boundary Drawings
  - 11715-SLRM-070A sheets 1–4
  - 11715-SLRM-070B sheets 1–3
  - 11715-SLRM-100A sheets 1–3
  - 12050-SLRM-070A sheets 1–4
  - 12050-SLRM-070B sheets 1–3
  - 12050-SLRM-100A sheets 1–2

2.3.4.1.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.4.1.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the main steam system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the main steam system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.2 Auxiliary Boilers

2.3.4.2.1 Summary of Technical Information in the Application

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

2.3.4.2.2 Staff Evaluation

The auxiliary boiler system was not included in the initial license renewal application for a 10 CFR Part 54 renewed operating license but was incorporated into the SLRA. Due to the potential impact on safety-related SSCs, the applicant included the auxiliary boiler system within the scope of SLRA in accordance with the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.4-2, "Auxiliary Boilers"
  - Table 3.4.2-2, "Steam and Power Conversion System—Auxiliary Boilers—Aging Management Evaluation"
- UFSAR References
  - Section 10.4.1.2, "Auxiliary Steam System"
- SLRA Boundary Drawings
  - 11715-SLRB-035A sheet 1
  - 11715-SLRM-103A sheet 1
  - 11715-SLRM-103B sheet 1

2.3.4.2.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.4.2.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the auxiliary boiler system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the auxiliary boiler requirements in 10 CFR 54.21(a)(1).

2.3.4.3 Extraction Steam

2.3.4.3.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.3 describes the extraction steam system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.4 3 lists the component types subject to an AMR and their intended functions. SLRA Table 3.4.2-3 provides the results of the applicant's AMR for extraction steam system SCs.

2.3.4.3.2 Staff Evaluation

The extraction steam system was not included in the initial license renewal application for a 10 CFR Part 54 renewed operating license but was incorporated into the SLRA. The applicant explained that the system provides non-EQ safety-related instrumentation. The system also includes components for which failure has the potential to impact safety-related SSCs. The applicant included the extraction steam system within the scope of SLRA in accordance with the criteria of 10 CFR 54.4(a)(1) and 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.4-3, "Extraction Steam"
  - Table 3.4.2-3, "Steam and Power Conversion System—Extraction Steam—Aging Management Evaluation"
- UFSAR References
  - Section 10.4.1, "Auxiliary Steam System"
- SLRA Boundary Drawings
  - 11715-SLRM-71A sheet 1
  - 12050-SLRM-71A sheet 1

2.3.4.3.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.4.3.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the extraction steam system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the extraction steam system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.4 Auxiliary Steam

2.3.4.4.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.4 describes auxiliary steam system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.4-4 lists the component types subject to an AMR and their intended functions. SLRA Table 3.4.2-4 provides the results of the applicant's AMR for auxiliary steam system SCs.

2.3.4.4.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.4-4, "Auxiliary Steam"
  - Table 3.4.2-4, "Steam and Power Conversion System—Auxiliary Steam—Aging Management Evaluation"
- UFSAR References
  - Section 10.4.1, "Auxiliary Steam System"
- SLRA Boundary Drawings
  - 11715-SLRM-072A sheets 1–3
  - 11715-SLRM-072B sheet 1
  - 11715-SLRM-079D sheet 2
  - 11715-SLRM-103A sheet 1
  - 12050-SLRM-072A sheets 1–3
  - 12050-SLRM-079B sheet 2

2.3.4.4.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.4.4.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the auxiliary steam system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.5 Feedwater

2.3.4.5.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.5 describes the feedwater system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.4-5 lists the component types subject to an AMR and their intended functions. SLRA Table 3.4.2-5 provides the results of the applicant's AMR for feedwater system SCs.

2.3.4.5.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.4-5, "Feedwater"
  - Table 3.4.2-5, "Steam and Power Conversion System—Feedwater—Aging Management Evaluation"
- UFSAR References
  - Section 10.4.3, "Condensate and Feedwater Systems"
  - Tables 6.2-37, "Major Piping Penetrations through the Reactor Containment Structure"
  - Table 10.4-2, "Design Data for Major Components of Condensate and Feedwater Systems"
- SLRA Boundary Drawings
  - 11715-SLRM-074A sheets 1–4
  - 11715-SLRM-074B sheet 1
  - 11715-SLRM-074C sheet 1
  - 11715-SLRM-078B sheet 3
  - 11715-SLRM-080A sheet 2
  - 12050-SLRM-074A sheets 1-4
  - 12050-SLRM-074B sheet 1
  - 12050-SLRM-074C sheet 1
  - 12050-SLRM-080A sheet 1

2.3.4.5.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.4.5.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the feedwater system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.6 Condensate

2.3.4.6.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.6 describes the condensate system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.4-6 lists the component types subject to an AMR and their intended functions. SLRA Table 3.4.2-6 provides the results of the applicant's AMR for condensate system SCs.

2.3.4.6.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.4-6, "Condensate"
  - Table 3.4.2-6, "Steam and Power Conversion System—Condensate—Aging Management Evaluation"
- UFSAR References
  - Section 10.4.3, "Condensate and Feedwater Systems"
  - Table 10.4-2, "Design Data for Major Components of Condensate and Feedwater Systems"
- SLRA Boundary Drawings
  - 11715-SLRM-072A sheet 2
  - 11715-SLRM-074A sheet 3
  - 11715-SLRM-080A sheet 1
  - 11715-SLRM-73A sheet 1–2
  - 11715-SLRM-73D sheets 1
  - 12050-SLRM-072A sheet 2
  - 12050-SLRM-074A sheet 3

- 12050-SLRM-080A sheet 1
- 12050-SLRM-73A sheets 1-2
- 12050-SLRM-73C sheet 1

2.3.4.6.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.4.6.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the condensate system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.7 Condensate Polishing

2.3.4.7.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.7 describes the condensate polishing system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.4-7 lists the component types subject to an AMR and their intended functions. SLRA Table 3.4.2-7 provides the results of the applicant's AMR for condensate polishing steam system SCs.

2.3.4.7.2 Staff Evaluation

The condensate polishing system was not included in the initial license renewal application for a 10 CFR Part 54 renewed operating license but was incorporated into the SLRA. Due to the potential impact on safety-related SSCs, the applicant included the condensate polishing system within the scope of SLRA in accordance with the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.4-7, "Condensate Polishing"
  - Table 3.4.2-7, "Steam and Power Conversion System—Condensate Polishing—Aging Management Evaluation"
- UFSAR References
  - Section 10.4.8, "Condensate Polishing System—Powdered-Resin Type"
- SLRA Boundary Drawings
  - 11715-SLRM-73B sheet 1

- 11715-SLRM-73B sheet 4
- 12050-SLRM-73B sheet 1
- 12050-SLRM-73B sheet 4

2.3.4.7.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.4.7.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the condensate polishing system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.8 Steam Drains

2.3.4.8.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.8 describes the steam drain system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.4-8 lists the component types subject to an AMR and their intended functions. SLRA Table 3.4.2-8 provides the results of the applicant's AMR for steam drains system SCs.

2.3.4.8.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.4-8, "Steam Drains"
  - Table 3.4.2-8, "Steam and Power Conversion System—Steam Drains—Aging Management Evaluation"
- UFSAR References
  - Section 10.1 "Summary Description"
- SLRA Boundary Drawings
  - 11715-SLRM-072A sheet 2
  - 11715-SLRM-75A sheets 1–4
  - 11715-SLRM-76A sheets 1–2
  - 11715-SLRM-85A sheet 1
  - 12050-SLRM-072A sheet 2
  - 12050-SLRM-75A sheets 1–3

- 12050-SLRM-76A sheets 1–3
- 12050-SLRM-76C sheet 1
- 12050-SLRM-85A sheets 1–2

2.3.4.8.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.4.8.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the steam drain system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.9 Blowdown

2.3.4.9.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.9 describes the blowdown system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.4-9 lists the component types subject to an AMR and their intended functions. SLRA Table 3.4.2-9 provides the results of the applicant's AMR for blowdown system SCs.

2.3.4.9.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.4-9, "Blowdown"
  - Table 3.4.2-9, "Steam and Power Conversion System—Blowdown—Aging Management Evaluation"
- UFSAR References
  - Section 7.7.1.14, "Anticipated Transient Without Scram (ATWS) Mitigation System Description"
  - Section 10.4.6, "Secondary Vent and Drain Systems"
  - Section 15.4.3, "Steam Generator Tube Rupture"
  - Tables 6.2-37, "Major Piping Penetrations through the Reactor Containment Structure"
- SLRA Boundary Drawings
  - 11715-SLRM-077A sheet 2

- 11715-SLRM-098A sheets 1–5
- 12050-SLRM-077A sheet 2
- 12050-SLRM-098A sheets 1–5

2.3.4.9.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.4.9.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the blowdown system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.10 Lubricating Oil

2.3.4.10.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.10 describes the lubricating oil system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.4-10 lists the component types subject to an AMR and their intended functions. SLRA Table 3.4.2-10 provides the results of the applicant's AMR for lubricating oil system SCs.

2.3.4.10.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.4-10, "Lubricating Oil"
  - Table 3.4.2-10, "Steam and Power Conversion System—Lubricating Oil—Aging Management Evaluation"
- UFSAR References
  - Sections 10.2, "Turbine Generator"
  - Section 10.4.5, "Lubricating Oil System"
- SLRA Boundary Drawings
  - 11715-SLRM-083A sheet 1
  - 11715-SLRM-083B sheet 1
  - 11715-SLRM-083C sheet 1
  - 11715-SLRM-110A sheet 1
  - 12050-SLRM-083B sheet 1

- 12050-SLRM-110A sheet 1
- 12050-SLRM-83A sheet 1

2.3.4.10.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.4.10.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the lubricating oil system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.11 Main Generator Seal Oil

2.3.4.11.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.11 describes the main generator seal oil system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.4-11 lists the component types subject to an AMR and their intended functions. SLRA Table 3.4.2-11 provides the results of the applicant's AMR for main generator seal oil system SCs.

2.3.4.11.2 Staff Evaluation

The main generator seal oil system was not included in the initial license renewal application for a 10 CFR Part 54 renewed operating license but was incorporated into the SLRA. Due to the potential impact on safety-related SSCs, the applicant included the main generator seal oil system within the scope of SLRA in accordance with the criterion of 10 CFR 54.4(a)(2) for spatial interaction and structural integrity.

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of license renewal to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.4-11, "Main Generator Seal Oil"
  - Table 3.4.2-11, "Steam and Power Conversion System—Main Generator Seal Oil—Aging Management Evaluation"
- UFSAR References
  - Section 10.2, "Turbine Generator"
- SLRA Boundary Drawings
  - 11715-SLRM-080A sheets 1–2

- 11715-SLRM-104A sheet 1
- 11715-SLRM-104B sheet 1
- 11715-SLRM-110A sheet 1
- 12050-SLRM-080A sheets 1–2
- 12050-SLRM-104A sheet 1
- 12050-SLRM-110A sheet 1

2.3.4.11.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.4.11.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the main generator seal oil system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.12 Electro-Hydraulic Control

2.3.4.12.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.11 describes the electro-hydraulic control system components subject to an AMR and lists the SLR boundary drawings that show the system boundaries. SLRA Table 2.3.4-11 lists the component types subject to an AMR and their intended functions. SLRA Table 3.4.2-11 provides the results of the applicant's AMR for electro-hydraulic control system SCs.

2.3.4.12.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.3, the staff reviewed:

- SLRA Tables
  - Table 2.3.4-12, "Electro-Hydraulic Control"
  - Table 3.4.2-12, "Steam and Power Conversion System—Electro-Hydraulic Control—Aging Management Evaluation"
- UFSAR References
  - Sections 10.2, "Turbine Generator"
- SLRA Boundary Drawings
  - 11715-SLRM-109A sheet 1
  - 12050-SLRM-109A sheet 1

2.3.4.12.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.4.12.2 and on a review of the SLRA, UFSAR, and SLR boundary drawings, the staff concludes that the applicant identified the electro-hydraulic control system components within the scope of SLR as required by 10 CFR 54.4(a). The staff also concludes that the applicant identified the system components subject to an AMR in compliance with the requirements in 10 CFR 54.21(a)(1).

2.4 Scoping and Screening Results: Structures

This section documents the staff's review of the applicant's scoping and screening results for SCs. 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's review focused on the implementation results. This focus allowed the staff to confirm that there were no omissions of SCs that meet the scoping criteria and that are subject to an AMR.

The staff's evaluation of the information in the SLRA was the same for all SCs. The objective was to determine whether the applicant has identified, in accordance with 10 CFR 54.4, SCs that meet the SLR scoping criteria. Similarly, the staff evaluated the applicant's screening results to verify that all passive, long-lived SCs were subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

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

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

2.4.1 Summary of Technical Information in the Application

SLRA Sections 2.4.1.1 through 2.4.1.40, as listed below, describe the structures and structural components subject to an AMR and the boundaries of the structure. SLRA Section 2.4 evaluates fire barrier walls, floors, ceilings, and other structural fire barrier commodities with the individual structures in which they are installed. SLRA Tables 2.4.1-1 through 2.4.1-40 list the structures and structural component types subject to an AMR and their intended functions. SLRA Tables 3.5.2-1 through 3.5.2-40 provide the results of the applicant's AMR for SCs.

- SLRA Section 2.4.1.1, "Containment"
- SLRA Section 2.4.1.2, "Administration Building"
- SLRA Section 2.4.1.3, "Auxiliary Building"
- SLRA Section 2.4.1.4, "Auxiliary Feedwater Pump House"

- SLRA Section 2.4.1.5, “Auxiliary Feedwater Tunnel”
- SLRA Section 2.4.1.6, “Boron Recovery Building”
- SLRA Section 2.4.1.7, “Casing Cooling Pump House”
- SLRA Section 2.4.1.8, “Circulating Water Intake Tunnel Header”
- SLRA Section 2.4.1.9, “Containment Mat Subsurface Pump Access Shaft”
- SLRA Section 2.4.1.10, “Decontamination Building”
- SLRA Section 2.4.1.11, “Dikes, Firewalls, and Equipment Foundations”
- SLRA Section 2.4.1.12, “Discharge Tunnel & Seal Pit”
- SLRA Section 2.4.1.13, “Domestic Water Treatment Building”
- SLRA Section 2.4.1.14, “Duct Banks”
- SLRA Section 2.4.1.15, “Flood Protection Dike”
- SLRA Section 2.4.1.16, “Fuel Building”
- SLRA Section 2.4.1.17, “Fuel Oil Pump House”
- SLRA Section 2.4.1.18, “Intake Structure”
- SLRA Section 2.4.1.19, “Main Steam Valve House”
- SLRA Section 2.4.1.20, “Maintenance Building”
- SLRA Section 2.4.1.21, “Manholes”
- SLRA Section 2.4.1.22, “New Fuel Receiving Building”
- SLRA Section 2.4.1.23, “Quench Spray Pump House”
- SLRA Section 2.4.1.24, “Safeguards Building”
- SLRA Section 2.4.1.25, “SBO [Station Blackout] Building”
- SLRA Section 2.4.1.26, “SBO Structures for Offsite Power”
- SLRA Section 2.4.1.27, “Security Diesel Building”
- SLRA Section 2.4.1.28, “Security Lighting Poles”
- SLRA Section 2.4.1.29, “Service Building”
- SLRA Section 2.4.1.30, “Service Water Pump House”
- SLRA Section 2.4.1.31, “Service Water Reservoir”
- SLRA Section 2.4.1.32, “Service Water Valve House”
- SLRA Section 2.4.1.33, “Tank Foundations and Missile Barriers”
- SLRA Section 2.4.1.34, “Turbine Building”
- SLRA Section 2.4.1.35, “Vaults, Enclosures, and Pits”
- SLRA Section 2.4.1.36, “Waste Disposal Building”
- SLRA Section 2.4.1.37, “Waste Solidification Building”
- SLRA Section 2.4.1.38, “Component Supports”
- SLRA Section 2.4.1.39, “Miscellaneous Structural Commodities”
- SLRA Section 2.4.1.40, “NSSS Supports”

2.4.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it 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 NUREG-2192, Section 2.4, “Scoping and Screening Results: Structures,” the staff reviewed:

- SLRA Sections 2.4.1.1 through 2.4.1.40 and Tables 2.4.1.1 through 2.4.1.40

- UFSAR sections referenced in SLRA Section 2.4.1

The staff noted that SLRA Sections 2.4.1.18 and 2.4.1.30 state that, "the traveling screens are active components and are not subject to an AMR." However, by letter dated July 29, 2021 (ADAMS Accession No. ML21210A396), the applicant supplemented the application and updated Sections 2.3.3.7 and 2.3.3.9 to provide an AMR line item for the screen elements. The staff's review of this supplement is discussed in the Fire Water System AMP write-up (SER Section 3.0.3.2.9).

2.4.3 Conclusion

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

2.5 Scoping and Screening Results: Electrical and Instrumentation and Control Systems

2.5.1 Summary of Technical Information in the Application

SLRA Section 2.5.1 describes the electrical and I&C system components (commodity groups) subject to an AMR, and the boundaries of the structure. SLRA Tables 2.5.1-1 list the electrical and instrumentation component types subject to an AMR and their intended functions. SLRA Table 3.6.2-1 provides the results of the applicant's AMR for cables and connections; SLRA Table 3.6.2-3 provides the result of the applicant's AMR for high-voltage insulators; and SLRA Table 3.6.2-3 provides the result of the applicant's AMR for a metal-enclosed bus.

2.5.2 Staff Evaluation

The staff's review of the SLRA for this section relates to the scoping and screening of electrical and I&C system components subject to an AMR in accordance with 10 CFR 54.4 and 10 CFR 54.21.

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had 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 Dominion Energy identified as within the scope of SLR to verify that it included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

Regulations in 10 CFR 54.4(a) require a list of plant SSCs within the scope of licensee renewal, and 10 CFR 54.4(b) states, in part, that the intended functions of these SSCs must be shown to fulfill 10 CFR 54.21. In accordance with the requirements of 10 CFR 54.21(a)(1), Dominion Energy must identify and list passive, long-lived SSCs within the scope of the SLR and subject to an AMR. NUREG-2192, Section 2.1, "Scoping and Screening Methodology," and NEI 17-01 provide guidance on scoping and screening for SLR.

The staff used the SRP-SLR and NEI 17-01 guidance to evaluate the methodology used by the applicant in performing the scoping and screening for the SCs within the scope of the SLR. The staff reviewed the scoping methodology and results pertaining to the electrical and I&C system components using the scoping methodology described in SRP-SLR, Section 2.5, "Scoping and

Screening Results: Electrical," and NEI 17-01. The staff finds that the scoping methodology described in the SLRA was consistent with the SRP-SLR and NEI 17-01 guidance.

The scoping criteria in 10 CFR 54.4(a)(3) require, in part, an applicant to consider "[a]ll systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for …station blackout [SBO] (10 CFR 50.63)."

The staff evaluated the system functions described in the SLRA and UFSAR to verify that Dominion Energy had included within the scope of the SLRA all SBO components with intended functions delineated under 10 CFR 54.4(a). Dominion Energy, in SLRA Section 2.1.1 (Scoping and Screening Methodology—Introduction), explained that electrical and I&C components that are part of in-scope electrical and I&C systems and in-scope mechanical systems are included within the scope of the SLR. In addition, Dominion Energy noted in Section 2.1.3.4, "10 CFR 54.4(a)(3)—Regulated Events," that SSCs classified as satisfying 10 CFR 54.4(a)(3) related to SBO (e.g., alternate AC power sources) are within the scope of SLR. The boundaries for electric equipment for SBO are shown in SLRA Figure 2.1-1, "SBO Recovery Path."

The staff reviewed those components that Dominion Energy identified as within the scope of SLR to verify that Dominion Energy had included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). The staff also verified whether Dominion Energy had omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

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

In Section 2.5 of the SLRA, Dominion Energy identified the following list of passive electrical component and commodity groups that meet the screening criteria of 10 CFR 54.21(a)(1)(i):

- cables and connections
- cable connections (metallic parts)
- connector contacts for electrical connections exposed to borated water leakage
- electrical insulation material for electrical cables and connections
- fuse holders—not part of active equipment (insulation material)
- fuse holders—not part of active equipment (metallic clamps)
- switchyard bus and connections
- transmission conductors
- transmission connectors
- cable tie-wraps
- uninsulated ground conductors
- metal-enclosed bus
- high-voltage insulators
- containment electrical and I&C penetrations

Dominion Energy eliminated cable tie-wraps from the electrical commodities with intended functions. Cable tie-wraps are used in cable installations as cable ties. Cable tie-wraps hold groups of cables together for restraint and ease of maintenance. Cable tie-wraps are used to bundle wires and cables together to keep the wire and cable runs neat and orderly. Cable tie-wraps are used to restrain wires and cables within raceways to facilitate cable installation. There are no CLB requirements that cable tie-wraps remain functional during and following DBEs. Cable tie-wraps are not credited for maintaining cable ampacity, ensuring maintenance of cable minimum bending radius, or maintaining cables within vertical raceways. The seismic qualification of cable trays does not credit the use of cable tie-wraps. Cable tie-wraps are not credited in the design basis in terms of any 10 CFR 54.4 intended function. Therefore, cable tie-wraps are not in scope of license renewal and are not subject to an AMR. Based on its review of this information, the staff finds that the exclusion of cable tie-wraps from the electrical commodities subject to an AMR is acceptable.

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

Dominion Energy noted that electrical and I&C components and commodities included in the Environmental Qualification Program (10 CFR 50.49) are excluded because they have defined qualified lives and are replaced before the expiration of their qualified lives. Therefore, no electrical and I&C components and commodities within the EQ Program are subject to an AMR in accordance with the screening criterion of 10 CFR 54.21(a)(1)(ii). Dominion Energy also described the screening analysis for in-scope containment electrical and I&C penetrations that are managed by either the EQ Program or fall under the cable and connections commodity group. The pressure boundary and structural support intended functions of electrical penetrations are included in the staff's evaluation of containment in SLRA Sections 2.4.1.1, SER Section 3.0.3.2.16 (IWE ASME AMP B2.1.29).

The final results of applying screening criteria in accordance with 10 CFR 54.21(a)(1)(i) and 10 CFR 54.21(a)(1)(ii) and component types subject to an AMR are listed in the SLRA Table 2.5.1-1, "Cables and Connections"; Table 2.5.1-2, "High Voltage Insulators"; and Table 2.5.1-3, "Metal Enclosed Bus."

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

Using the evaluation methodology described in SLRA Sections 2.1 (electrical portion), 2.2 (electrical portion), and 2.5, and the guidance in NUREG-2192, Section 2.5, “Scoping and Screening Results: Electrical and Instrumentation and Controls Systems,” the staff reviewed:

- NAPS SLRA
- Station Blackout Coping and Recovery Paths Figure
- UFSAR
- NUREG-2192, Standard Review Plans for Review of Subsequent License Renewal Application for Nuclear Power Plants
- NEI 17-01, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal”

2.5.3 Conclusion

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

2.6 Conclusion for Scoping and Screening

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

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

SECTION 3 AGING MANAGEMENT REVIEW RESULTS

This section of the safety evaluation report (SER) contains the U.S. Nuclear Regulatory Commission (NRC) staff's evaluation of Virginia Electric and Power Company's (Dominion Energy's or the applicant's) aging management reviews (AMRs) and aging management programs (AMPs) for North Anna Power Station, Units 1 and 2 (NAPS, North Anna, or applicant).

Dominion Energy describes these AMRs and AMPs in its subsequent license renewal application (SLRA) for NAPS. SLRA Section 3 provides the results of the applicant's AMRs for those systems and components (SCs) identified in SLRA Section 2 as within the scope of license renewal and subject to an AMR. SLRA Appendix B lists the 48 AMPs that the applicant will rely on to manage or monitor the aging of passive, long-lived structures and components (SCs).

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

(1) Reactor Vessel, Internals, and Reactor Coolant System (SER Section 3.1)

(2) Engineered Safety Features (SER Section 3.2)

(3) Auxiliary Systems (SER Section 3.3)

(4) Steam and Power Conversion Systems (SER Section 3.4)

(5) Containment, Structures, and Component Supports (SER Section 3.5)

(6) Electrical and Instrumentation and Controls (SER 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," dated July 2017 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML17187A031 and ML17187A204) (GALL-SLR Report), for programs and AMR items as modified by:

- SLR-ISG-2021-04-ELECTRICAL (ADAMS Accession No. ML20181A395)
- SLR-ISG-2021-02-MECHANICAL (ADAMS Accession No. ML20181A434)
- SLR-ISG-2021-03-STRUCTURES (ADAMS Accession No. ML20181A381)
- SLR-ISG-2021-01-PWRVI (ADAMS Accession No. ML20217L203).

Per 10 CFR 54.29(a)(1), a renewed license may be issued if the NRC finds that actions have been identified and have been or will be taken with respect to managing 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 certain material, environment, and aging effect combinations

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,” dated July 2017 (ADAMS Accession No. ML17188A158) (SRP-SLR), and the guidance provided by Nuclear Energy Institute (NEI) 17-01, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal,” dated March 2017 (ADAMS Accession No. ML17339A599), which the NRC endorsed as acceptable for use in performing AMRs and drafting SLRAs (ADAMS Accession No. ML18029A368).

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 provided a summary of the alignment between the NAPS 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 Table 1 is consistent with the GALL-SLR Report, consistent with the GALL-SLR Report but uses a different AMP to manage aging effects, or is not applicable at NAPS. Each Table 1 item provides a summary of 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 Dominion Energy’s AMR items and the AMPs listed in SLRA Appendix A and Appendix B that are credited for managing the effects of aging:

(1) For items that the applicant stated are consistent with the GALL-SLR Report, the staff conducted either an audit or a technical review to determine consistency. Because the GALL-SLR Report AMPs and AMR analyses are one acceptable method for managing

the effects of aging, the staff did not re-evaluate those AMPs and AMRs that they 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 each 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 portions of the GALL-SLR Report AMP that the applicant does not intend to implement.

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

As part of its SLRA review, the staff conducted a regulatory audit from October 13, 2020, to January 8, 2021, in accordance with the audit plan dated October 9, 2020 (ADAMS Accession No. ML20276A192), and as detailed in the audit report dated March 4, 2019 (ADAMS Accession No. ML21036A060).

These audits and technical reviews were conducted to determine if the NRC can make the findings of 10 CFR 54.29(a)(1) such that there is reasonable assurance that activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis (CLB); that is, if actions have been taken or will be taken with respect to managing 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).

3.0.2.1 Review of AMPs

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

(1) "<u>scope of program</u>" - should include the specific SCs subject to an AMR for SLR.

(2) "<u>preventive actions</u>" - should prevent or mitigate aging degradation.

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

(4) "<u>detection of aging effects</u>" - 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) "<u>monitoring and trending</u>" - 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 actions 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" - these actions, including root cause determination and prevention of recurrence, 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" - adding the operating experience applicable to the AMP, including past corrective actions resulting in program enhancements or additional programs, should provide objective evidence to support the conclusion that the effects of aging will be adequately managed so that the SC-intended function(s) will be maintained during the subsequent period of extended operation. Operating experience with existing programs should be discussed.

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

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

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

The staff reviewed the information regarding the "operating experience" program element and documented its evaluation in SER Sections 3.0.3 and 3.0.5.

3.0.2.2 Review of AMR Results

Each SLRA Table 2 contains information concerning whether the AMRs identified by the applicant align with the GALL-SLR Report AMRs. For a given AMR in a Table 2, the staff reviewed the intended function, material, environment, aging effect requiring management, and AMP combination for a particular system component type. Items in column seven, "NUREG-2191 Item," of each SLRA Table 2, correlate to an AMR combination as identified in the GALL-SLR Report. The staff also conducted a technical review of combinations not consistent with the GALL-SLR Report. The next column, "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 the identified exceptions to the GALL-SLR Report AMPs have been reviewed and accepted.

Note C indicates that the component for the AMR item is different from 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 identified in the GALL-SLR Report a different component with the same material, environment, and 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 from 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 identified in the GALL-SLR Report a different component with the same material, environment, and aging effect, and AMP as the component under review. However, note D is used to indicate that the applicant has taken 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 the identified exceptions to the GALL-SLR Report AMPs have been reviewed and accepted.

Note E indicates that the AMR item is consistent with the GALL-SLR Report for material, environment, and aging effect but 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.

3.0.2.3 Updated Final Safety Analysis Report Supplement

10 CFR 54.21(d) requires that each application contains an updated final safety analysis report (UFSAR) supplement. Per 10 CFR 54.21(d), the UFSAR supplement for the facility must contain a summary description of the programs and activities for managing the effects of aging and the evaluation of time-limited aging analyses (TLAAs) for the period of extended operation determined by the integrated plant assessment and the evaluation of TLAAs. Consistent with the SRP-SLR, the staff reviewed the UFSAR 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 staff examined the applicant’s justifications, as documented in the audit summary report, to verify that the applicant’s activities and programs were 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

SER Table 3.0-1 below presents the AMPs credited by the applicant and described in SLRA Appendix B, “Aging Management Programs.” The Table also indicates (a) whether the AMP is an existing or new program, (b) the staff’s final disposition of the AMP, (c) the GALL-SLR Report program to which the applicant’s AMPs were compared, and (d) the SER Section that documents the staff’s evaluation of the program. The SER sections are based on the applicant’s initial comparison to the GALL-SLR Report, NUREG-2191.

Table 3.0-1 NAPS Aging Management Programs

NAPS Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	SLRA Comparison to the NUREG-2191 GALL-SLR Report	NUREG-2191 GALL Report AMPs	SER Section (Ordered Based On SLRA Disposition)
ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	A1.1 B2.1.1	Existing	Consistent with Enhancements	XI.M1, ASME [American Society of Mechanical Engineers] Section XI Inservice Inspections, Subsections IWB, IWC, AND IWD	3.0.3.2.1
Water Chemistry (Primary and Secondary)	A1.2 B2.1.2	Existing	Consistent	XI.M2, Water Chemistry	3.0.3.1.1
Reactor Head Closure Stud Bolting (addressed by inservice inspection (ISI) Program)	A1.3 B2.1.3	Existing	Consistent with Exceptions	XI.M3, Reactor Head Closure Stud Bolting	3.0.3.2.2

NAPS Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	SLRA Comparison to the NUREG-2191 GALL-SLR Report	NUREG-2191 GALL Report AMPs	SER Section (Ordered Based On SLRA Disposition)
Not Applicable to a pressurized water reactor (PWR)	N/A	N/A	N/A	XI.M4, BWR [Boiling Water Reactor] Vessel ID Attachment Welds	
N/A	N/A	N/A	N/A	XI.M5, DELETED	
N/A	N/A	N/A	N/A	XI.M6, DELETED	
Not Applicable to a PWR	N/A	N/A	N/A	XI.M7, BWR Stress Corrosion Cracking	
Not Applicable to a PWR	N/A	N/A	N/A	XI.M8, BWR Penetrations	
Not Applicable to a PWR	N/A	N/A	N/A	XI.M9, BWR VESSEL INTERNALS	
Boric Acid Corrosion	A1.4 B2.1.4	Existing	Consistent	XI.M10, Boric Acid Corrosion	3.0.3.1.2
Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components	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	3.0.3.1.3
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)	3.0.3.1.4
PWR Vessel Internals	A1.7 B2.1.7	Existing	Consistent with Enhancements	XI.M16A, PWR Vessel Internals, as modified by SLR-ISG-2021-01-PWRVI, Updated Aging Management Criteria for Reactor Vessel Internal Components of Pressurized Water Reactors of Subsequent License Renewal Guidance	3.0.3.2.3
Flow-Accelerated Corrosion	A1.8 B2.1.8	Existing	Consistent with Enhancements	XI.M17, Flow-Accelerated Corrosion	3.0.3.2.4
Bolting Integrity	A1.9 B2.1.9	Existing	Consistent with Enhancements	XI.M18, Bolting Integrity	3.0.3.2.5
Steam Generators	A1.10 B2.1.10	Existing	Consistent	XI.M19, Steam Generators	3.0.3.1.5
Open-Cycle Cooling Water System	A1.11 B2.1.11	Existing	Consistent with Exceptions	XI.M20, Open-Cycle Cooling Water System	3.0.3.2.6

NAPS Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	SLRA Comparison to the NUREG-2191 GALL-SLR Report	NUREG-2191 GALL Report AMPs	SER Section (Ordered Based On SLRA Disposition)
Closed Treated Water Systems	A1.12 B2.1.12	Existing	Consistent with Enhancements	XI.M21A, Closed Treated Water Systems	3.0.3.2.7
Not applicable. This material is not used in the NAPS spent fuel pool racks	N/A	N/A	N/A	XI.M22, Boraflex Monitoring	
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	A1.13 B2.1.13	Existing	Consistent	XI.M23, Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	3.0.3.1.6
Compressed Air Monitoring	A1.14 B2.1.14	Existing	Consistent	XI.M24, Compressed Air Monitoring	3.0.3.1.7
Not Applicable to a PWR	N/A	N/A	N/A	XI.M25, BWR Reactor Water Cleanup System	
Fire Protection	A1.15 B2.1.15	Existing	Consistent with Enhancements	XI.M26, Fire Protection, as modified by SLR-ISG-2021-02-MECHANICAL, “Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance”	3.0.3.2.8
Fire Water System	A1.16 B2.1.16	Existing	Consistent with Enhancements and Exceptions	XI.M27, Fire Water System	3.0.3.2.9
Outdoor and Large Atmospheric Metallic Storage Tanks	A1.17 B2.1.17	Existing	Consistent with Enhancements and Exceptions	XI.M29, Outdoor and Large Atmospheric Metallic Storage Tanks	3.0.3.2.10
Fuel Oil Chemistry	A1.18 B2.1.18	Existing	Consistent with Enhancements and Exceptions	XI.M30, Fuel Oil Chemistry	3.0.3.2.11
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 with Enhancements	XI.M33, Selective Leaching	3.0.3.1.10
ASME Code Class 1 Small-Bore Piping	A1.22 B2.1.22	New	Consistent	XI.M35, ASME Code Class 1 Small-Bore Piping	3.0.3.1.11

NAPS Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	SLRA Comparison to the NUREG-2191 GALL-SLR Report	NUREG-2191 GALL Report AMPs	SER Section (Ordered Based On SLRA Disposition)
External Surfaces Monitoring of Mechanical Components	A1.23 B2.1.23	Existing	Consistent with Enhancements	XI.M36, External Surfaces Monitoring of Mechanical Components	3.0.3.2.12
Flux Thimble Tube Inspection	A1.24 B2.1.24	Existing	Consistent	XI.M37, Flux Thimble Tube Inspection	3.0.3.1.12
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	3.0.3.2.13
Lubricating Oil Analysis	A1.26 B2.1.26	Existing	Consistent	XI.M39, Lubricating Oil Analysis	3.0.3.1.13
Not Applicable. NAPS spent fuel storage racks do not include any neutron-absorbing materials	N/A	N/A	N/A	XI.M40, Monitoring of Neutron-Absorbing Materials Other Than Boraflex	3.0.3.3.1
Buried and Underground Piping and Tanks	A1.27 B2.1.27	Existing	Consistent with Enhancements	XI.M41, Buried and Underground Piping and Tanks	3.0.3.2.14
Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	A1.28 B2.1.28	Existing	Consistent with Enhancements and Exceptions	XI.M42, Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks, as modified by SLR-ISG-2021-02-MECHANICAL, Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance	3.0.3.1.1 3.0.3.1.4 3.0.3.2.15
ASME Section XI, Subsection IWE	A1.29 B2.1.29	Existing	Consistent with Enhancements	XI.S1, ASME Section XI, Subsection IWE	3.0.3.2.16
ASME Section XI, Subsection IWL	A1.30 B2.1.30	Existing	Consistent	XI.S2, ASME Section XI, Subsection IWL	3.0.3.1.14
ASME Section XI, Subsection IWF	A1.31 B2.1.31	Existing	Consistent with Enhancements	XI.S3, ASME Section XI, Subsection IWF	3.0.3.2.17
10 CFR Part 50, Appendix J	A1.32 B2.1.32	Existing	Consistent	XI.S4, 10 CFR Part 50, Appendix J	3.0.3.1.15
Masonry Walls	A1.33 B2.1.33	Existing	Consistent	XI.S5, Masonry Walls	3.0.3.1.16

NAPS Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	SLRA Comparison to the NUREG-2191 GALL-SLR Report	NUREG-2191 GALL Report AMPs	SER Section (Ordered Based On SLRA Disposition)
Structures Monitoring	A1.34 B2.1.34	Existing	Consistent with Enhancements	XI.S6, Structures Monitoring, as modified by SLR-ISG-2021-03-STRUCTURES, Updated Aging Management Criteria for Structures Portions of Subsequent License Renewal Guidance	3.0.3.2.18
Inspection of Water-Control Structures Associated with Nuclear Power Plants	A1.35 B2.1.35	Existing	Consistent with Enhancements	XI.S7, Inspection of Water-Control Structures Associated with Nuclear Power Plants	3.0.3.2.19
Protective Coating Monitoring and Maintenance	A1.36 B2.1.36	Existing	Consistent	XI.S8, Protective Coating Monitoring and Maintenance	3.0.3.1.17
Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	A1.37 B2.1.37	Existing	Consistent with Enhancements	XI.E1, Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.2.20
Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	A1.38 B2.1.38	Existing	Consistent with Enhancements	XI.E2, Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrument Circuits	3.0.3.2.21
Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	A1.39 B2.1.39	Existing	Consistent with Enhancements	XI.E3A, Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.2.22

NAPS Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	SLRA Comparison to the NUREG-2191 GALL-SLR Report	NUREG-2191 GALL Report AMPs	SER Section (Ordered Based On SLRA Disposition)
Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	A1.40 B2.1.40	New	Consistent	XI.E3B, Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirement and SLR-ISG-2021-04-ELECTRICAL, Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance	3.0.3.1.18
Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	A1.41 B2.1.41	New	Consistent	XI.E3C, Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.1.19
Metal-Enclosed Bus	A1.42 B2.1.42	Existing	Consistent with Enhancements	XI.E4, Metal-Enclosed Bus	3.0.3.2.23
Fuse Holders	A1.43 B2.1.43	Existing	Consistent	XI.E5, Fuse Holders	3.0.3.1.20
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	3.0.3.1.21
High-Voltage Insulators	A1.45 B2.1.45	New	Consistent	XI.E7, High-Voltage Insulators as modified by SLR-ISG-2021-04-ELECTRICAL, “Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance”	3.0.3.1.22
Fatigue Monitoring	A2.1 B3.1	Existing	Consistent with Enhancements	X.M1, Fatigue Monitoring	3.0.3.2.24

NAPS Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	SLRA Comparison to the NUREG-2191 GALL-SLR Report	NUREG-2191 GALL Report AMPs	SER Section (Ordered Based On SLRA Disposition)
Neutron Fluence Monitoring	A2.2 B3.2	Existing	Consistent with Exception	GALL-SLR Report AMP X.M2, “Neutron Fluence Monitoring” as modified by SLR-ISG-2021-02-MECHANICAL, Updated Aging Management Criteria for Mechanical Portions of the Subsequent License Renewal Guidance	3.0.3.2.25
Environmental Qualification of Electric Equipment	A2.3 B3.3	Existing	Consistent	X.E1, Environmental Qualification of Electrical Equipment	3.0.3.1.24
Not applicable. NAPS Containments do not have post tensioned tendon groups	N/A	N/A	N/A	X.S1, Concrete Containment Unbounded Tendon Prestress	

3.0.3.1 AMPs Consistent with the GALL-SLR Report

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

- Water Chemistry (Primary and Secondary)
- 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 CASS
- Steam Generators
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems
- Compressed Air Monitoring
- Reactor Vessel Material Surveillance
- Flux Thimble Tube Inspection
- Lubricating Oil Analysis
- ASME Section XI, Subsection IWL
- 10 CFR Part 50, Appendix J
- Masonry Walls
- Protective Coating Monitoring and Maintenance

- Fuse Holders
- Environmental Qualification of Electric Equipment

In the following sections, the staff discusses the results of the evaluation for all of these AMPs, listing any amendments to the programs during the review, a summary of the staff's determination of consistency, any requests for information and applicant responses, operating experience, and a review of the applicant's UFSAR supplement summary of the program.

3.0.3.1.1 Water Chemistry (Primary and Secondary)

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-Mechanical-2020-XX. The staff noted that, subsequent to Dominion Energy's submittal of its SLRA, draft SLR-ISG-Mechanical-2020-XX was issued as final SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance," dated February 2021 (ADAMS Accession No. ML20181A434). By letter dated March 17, 2021 (ADAMS Accession No. ML21076B025), Dominion Energy stated that the NUREG-2191 consistency statement in the Water Chemistry Program had been updated with the document number of the final issued SLR-ISG.

<u>Staff Evaluation</u>. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 Dominion Energy's SLRA program to the corresponding program elements in GALL-SLR Report AMP XI.M2, as modified by SLR-ISG-2021-02-MECHANICAL.

The staff conducted an audit to verify Dominion Energy'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 in GALL-SLR Report AMP XI.M2, as modified by SLR-ISG-2021-02-MECHANICAL.

<u>Operating Experience</u>. SLRA Section B2.1.2 summarizes operating experience related to the Water Chemistry Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the audit report (ADAMS Accession No. ML21036A060), the staff conducted a search 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Water Chemistry Program was evaluated.

<u>UFSAR Supplement</u>. SLRA Section A1.2 provides the UFSAR supplement for the Water Chemistry Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01.

The staff also noted that Dominion Energy committed to ongoing implementation of the 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 UFSAR supplement is an adequate summary description of the program.

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

3.0.3.1.2 Boric Acid Corrosion

SLRA Section B2.1.4 states that the Boric Acid Corrosion Program is an existing program that is consistent with the program elements in the GALL-SLR Report AMP XI.M10, "Boric Acid Corrosion."

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.M10. The staff concluded the program was consistent with the corresponding AMP.

Operating Experience. SLRA Section B2.1.4 summarizes operating experience related to the Boric Acid Corrosion Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the audit report, the staff reviewed the plant operating experience information provided by Dominion Energy on its ePortal for this program to 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 operation. The staff did not identify any operating experience indicating that Dominion Energy should modify its proposed program.

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

UFSAR Supplement. SLRA Section A1.4 provides the UFSAR supplement for the Boric Acid Corrosion 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 Dominion Energy 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 UFSAR supplement is an adequate summary description of the program.

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

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

SLRA Section B.2.1.5 describes the existing Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components 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 (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.M11B.

The staff conducted an audit to verify Dominion Energy'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 in GALL-SLR Report AMP XI.M11B. The staff finds that the AMP is adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.1.5 summarizes operating experience related to the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents 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 regarding the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent period of extended operation. The staff noted that one example exists in the 2012 North Anna operating experience that discussed a failure of the ultrasonic testing (UT) to identify cracking due to primary water stress corrosion cracking in a steam generator nozzle to safe-end dissimilar metal (DM) butt weld. Dominion Energy and industry as a whole addressed the causes and revised the ultrasonic procedures and practices for the DM welds in an effort to improve overall UT reliability. The staff verified that Dominion Energy has implemented the latest industry guidance under Nuclear Energy Institute (NEI) 03-08, "Guideline for the Management of Materials Issues" (ADAMS Accession No. ML19079A256), that was developed for the UT of DM welds based on lessons learned from the 2012 North Anna operating experience. The staff also verified that Dominion Energy has implemented the guidance in Electric Power Research Institute Report 3002017288, "Materials Reliability Program: Guideline for Nondestructive Examination of Reactor Vessel Upper Head Penetrations, Revision 1 (MRP-384)," as required by NEI 03-08. The staff did not identify any operating experience indicating that Dominion Energy should modify its proposed program.

Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components Program was evaluated.

UFSAR Supplement. SLRA Section A.1.5 provides the UFSAR supplement for the Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components. 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 Dominion Energy 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 UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of Dominion Energy's Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in Reactor Coolant Pressure Boundary Components, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.4 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)

SLRA Section B2.1.6 describes the existing Thermal Aging Embrittlement of 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 (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 Dominion Energy's SLRA program to the corresponding program elements in GALL-SLR Report AMP XI.M12. For the "detection of aging effects," the applicant used a flaw tolerance evaluation approach to demonstrate that the susceptible CASS elbows and straight piping at the hot leg, crossover leg, and cold leg locations have tolerance for large flaws for the duration of the subsequent period of extended operation. The staff finds that the applicant's plant-specific flaw tolerance evaluation is acceptable because: (a) it was performed in accordance with the procedures and acceptance criteria in Appendix C of the 2019 Edition of ASME Code, Section XI, with guidance provided in NRC NUREG-2191 and NRC SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance, Interim Staff Guidance" (ADAMS Accession No. ML20181A434); (b) the bounding piping loads and thermal transients from North Anna, Units 1 and 2 were used; and (c) the fracture toughness values for the thermally embrittled CASS were estimated in accordance with NRC NUREG/CR-4513, Revision 2, "Estimation of Fracture Toughness of Cast Stainless Steels during Thermal Aging in LWR [Light Water Reactors] Systems." Based on the results of the flaw tolerance analysis, the staff finds that the applicant has demonstrated that the thermally embrittled CASS piping at Units 1 and 2 has tolerance for large flaws, such that even if it had an undetected flaw that would grow with time, the final flaw size in 80-year plant life will be significantly less than the critical flaw size. Therefore, the flaw tolerance analysis demonstrates that the thermally embrittled CASS piping would not affect the structural integrity of the piping during the subsequent period of extended operation.

The staff conducted an audit to verify Dominion Energy'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 in GALL-SLR Report AMP XI.M12. The staff finds that the AMP is adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B2.1.6 summarizes operating experience related to the Thermal Aging Embrittlement of CASS Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff conducted an independent search of the plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database, and (b) 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 operation. The staff did not identify any operating experience indicating that Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Thermal Aging Embrittlement of CASS Program was evaluated.

UFSAR Supplement. SLRA Section A1.6 provides the UFSAR supplement for the Thermal Aging Embrittlement of CASS 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 Dominion Energy 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 UFSAR supplement is an adequate summary description of the program.

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

3.0.3.1.5 Steam Generators

SLRA Section B2.1.10 describes the existing Steam Generators Program as consistent with GALL-SLR Report AMP XI.M19, "Steam Generators."

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 Dominion Energy’s program to the corresponding program elements in GALL-SLR Report AMP XI.M19.

The staff conducted an audit to verify Dominion Energy’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 in GALL-SLR Report AMP XI.M19.

Operating Experience. SLRA Section B2.1.10 summarizes operating experience related to the Steam Generators Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Steam Generators Program was evaluated.

UFSAR Supplement. SLRA Section A1.10 provides the UFSAR supplement for the Steam Generators 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 Dominion Energy 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 UFSAR supplement is an adequate summary description of the program.

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

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

SLRA Section B2.1.13 describes the existing Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program as consistent with GALL-SLR Report AMP XI.M23, “Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems.”

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy’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 Dominion Energy’s program to the corresponding program elements in GALL-SLR Report AMP XI.M23.

The staff conducted an audit to verify Dominion Energy’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 in GALL-SLR Report AMP XI.M23.

Operating Experience. SLRA Section B2.1.13 summarizes operating experience related to the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents 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 regarding the ability of the applicant’s proposed AMPs to manage the effects of aging in the subsequent period of extended operation.

Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program was evaluated.

During its review, the staff noted that the operating experience summary (items 1 and 4) of the SLRA states that the interiors of the polar crane box girders were inspected for Units 1 and 2 in 2016 and 2010, respectively. These inspections were completed to address commitments from the plant’s initial license renewal and identified small patches of minor surface rust. As noted in the audit report, the staff reviewed documents that showed the interior of the box girders were coated with an epoxy primer, which would offer protection against corrosion. Based on the results of the one-time inspections of the interior of the box girder and the ongoing inspections of the exterior of the girder, and the recent results of the applicant’s AMP effectiveness reviews outlined in operating experience summary item 7, the staff finds the AMP adequate to manage aging of the box girders during the subsequent period of extended operation, without focused inspections of the box girder interior.

UFSAR Supplement. SLRA Section A1.13 provides the UFSAR supplement for the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program. The staff reviewed this UFSAR supplement description of the program and noted that in general it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that Dominion Energy committed to ongoing implementation of the existing Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program for managing the effects of aging for applicable components during the 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 Dominion Energy’s Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be consistent with the

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

3.0.3.1.7 Compressed Air Monitoring

SLRA Section B2.1.14 describes the existing Compressed Air Monitoring, which is consistent with GALL-SLR Report AMP XI.M24, “Compressed Air Monitoring.”

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy’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 Dominion Energy’s program to the corresponding program elements in GALL-SLR Report AMP XI.M24.

The staff conducted an audit to verify Dominion Energy’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 in GALL-SLR Report AMP XI.M24.

Operating Experience. SLRA Section B2.1.14 summarizes operating experience related to the Compressed Air Monitoring Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Compressed Air Monitoring Program was evaluated.

UFSAR Supplement. SLRA Section A1.14 provides the UFSAR supplement for the Compressed Air Monitoring 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 Dominion Energy 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 UFSAR supplement is an adequate summary description of the program.

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

3.0.3.1.8 Reactor Vessel Material Surveillance

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

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 Dominion Energy's program to the corresponding program elements in GALL-SLR Report AMP XI.M31.

The staff conducted an audit to verify Dominion Energy'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 in GALL-SLR Report AMP XI.M31.

Operating Experience. SLRA Section B2.1.19 summarizes operating experience related to the reactor vessel (RV) Material Surveillance Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the RV Material Surveillance Program was evaluated.

UFSAR Supplement. SLRA Section A1.19 provides the UFSAR supplement for the RV Material Surveillance 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 Dominion Energy committed (Commitment No. 19) to ongoing implementation of the existing RV Material Surveillance 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 Dominion Energy's RV Material Surveillance Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.9 One-Time Inspection

SLRA Section B2.1.20 describes a new program, that, when implemented, will be consistent with GALL-SLR Report AMP XI.M32, "One-Time Inspection."

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.M32.

The staff conducted an audit to verify Dominion Energy'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 in GALL-SLR Report AMP XI.M32.

Operating Experience. SLRA Section B2.1.20 summarizes operating experience related to the One-Time Inspection Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the One-Time Inspection Program was evaluated.

UFSAR Supplement. SLRA Section A1.20 provides the UFSAR supplement for the One-Time Inspection Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted Dominion Energy committed to implementing the new One-Time Inspection Program to 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 to 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 for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of Dominion Energy's One-Time Inspection Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be 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).

3.0.3.1.10 Selective Leaching

SLRA Section B2.1.21 describes the new Selective Leaching Program as consistent with GALL-SLR Report AMP XI.M33, "Selective Leaching." Dominion Energy amended this SLRA section by letters dated February 4, 2021 (ADAMS Accession No. ML21035A303), and April 1, 2021 (ADAMS Accession No. ML21091A187).

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 Dominion Energy's program to the corresponding program elements of GALL-SLR Report AMP XI.M33.

For the "detection of aging effects" program element, the staff determined the need for additional information regarding the following: (a) basis for using the extent of inspections in GALL-SLR Report AMP XI.M33 for gray cast iron piping and piping components exposed to soil (based on recent operating experience documented in NRC Information Notice 2020-04, "Operating Experience Regarding Failure of Buried Fire Protection Main Yard Piping" (ADAMS Accession No. ML20223A333)); and (b) basis for selecting a single 10-foot section of gray cast iron piping exposed to soil as meeting the extent of inspection guidance in GALL-SLR Report AMP XI.M33 (i.e., eight visual and mechanical inspections and two destructive examinations per population for a two-unit site). The staff's need for additional information resulted in the issuance of RAI B2.1.21 1 (associated with issue (a) above) and RAI B2.1.21-2 (associated with issue (b) above). RAIs B2.1.21-1 and B2.1.21-2, and draft followup RAIs B2.1.21-1a and B2.1.21-2a were discussed during a public meeting on June 24, 2021 (see ADAMS Accession No. ML21174A310 for public meeting announcement), and Dominion Energy's responses are documented in ADAMS Accession Nos. ML21063A540, ML21091A187, and ML21210A396. The staff noted that in its supplemental response, dated July 29, 2021 (ADAMS Accession No. ML21210A396), the applicant added Enhancement 5 to the Buried and Underground Piping and Tanks Program to address the staff's concerns in draft followup RAIs B2.1.21-1a and B2.1.21-2a. The staff evaluation of this enhancement (and resolution of these RAIs) is documented in SER Section 3.0.3.2.14.

For the "detection of aging effects" program element, the staff determined the need for additional information regarding the basis for utilizing the multi-unit site inspection sample size reduction provisions in GALL-SLR Report AMP XI.M33 for components exposed to a soil environment. Prior to the issuance of an RAI, Dominion Energy provided a supplemental response addressing the staff's concern. Dominion Energy revised SLRA Section B2.1.21 to state "[t]he soil corrosivity analysis performed on soil samples was consistent between the two units. The soil analysis demonstrated that the soil environment was not evaluated as severely corrosive or corrosive." The staff finds Dominion Energy's supplemental response and changes to SLRA Section B2.1.21 acceptable because soil testing has demonstrated that soil corrosivity is consistent across the site, thereby justifying the use of the multi-unit site inspection sample size reduction provisions in GALL-SLR Report AMP XI.M33 for components exposed to a soil environment.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA (as supplemented), and Dominion Energy's responses to RAIs B2.1.21-1, B2.1.21-1a, B2.1.21-2, and B2.1.21-2a, 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 operating experience related to the Selective Leaching Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed plant operating experience information provided by Dominion Energy 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 Dominion Energy 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 Selective Leaching Program was evaluated.

UFSAR Supplement. SLRA Section A1.21 provides the UFSAR supplement for the Selective Leaching Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted Dominion Energy committed to implement the new Selective Leaching Program and begin inspections 10 years before 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 Dominion Energy 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 UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of Dominion Energy's Selective Leaching Program and the above-referenced RAI responses, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff concludes that Dominion Energy 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).

3.0.3.1.11 ASME Code Class 1 Small-Bore Piping

SLRA Section B.2.1.22 states that the ASME Code Class 1 Small-Bore Piping is a new program that will be consistent with the program elements in the GALL-SLR Report AMP XI.M35, "ASME Code Class 1 Small-Bore Piping."

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.M35.

The staff conducted an audit to verify Dominion Energy'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 in GALL-SLR Report AMP XI.M35.

Operating Experience. SLRA Section B.2.1.22 summarizes operating experience related to the ASME Code Class 1 Small-Bore Piping Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents 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 regarding the ability of the applicant's proposed AMP to manage the effects of aging on the subsequent period of extended operation. The staff did not identify any operating experience indicating that Dominion Energy should modify its proposed program.

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

UFSAR Supplement. SLRA Section A1.22 provides the UFSAR supplement for ASME Code Class 1 Small-Bore Piping Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted Dominion Energy committed to implementing the new ASME Code Class 1 Small-Bore Piping Program within 6 years prior to the start of the subsequent period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of Dominion Energy's ASME Code Class 1 Small-Bore Piping Program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be 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).

3.0.3.1.12 Flux Thimble Tube Inspection

SLRA Section B2.1.24 describes the existing Flux Thimble Tube Inspection Program as consistent with GALL-SLR Report AMP XI.M37, "Flux Thimble Tube Inspection."

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 Dominion Energy's program to the corresponding program elements in GALL-SLR Report AMP XI.M37.

The staff conducted an audit to verify Dominion Energy'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 in GALL-SLR Report AMP XI.M37.

Operating Experience. SLRA Section B2.1.24 summarizes operating experience related to the Flux Thimble Tube Inspection Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Flux Thimble Tube Inspection Program was evaluated.

UFSAR Supplement. SLRA Section A1.24 provides the UFSAR supplement for the Flux Thimble Tube Inspection 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 Dominion Energy committed (Commitment No. 24) to ongoing implementation of the existing Flux Thimble Tube Inspection 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 Dominion Energy's Flux Thimble Tube Inspection Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be 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).

3.0.3.1.13 Lubricating Oil Analysis

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

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 Dominion Energy's program to the corresponding program elements in GALL-SLR Report AMP XI.M39.

The staff conducted an audit to verify Dominion Energy'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 in GALL-SLR Report AMP XI.M39.

Operating Experience. SLRA Section B2.1.26 summarizes operating experience related to the Lubricating Oil Analysis Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Lubricating Oil Analysis Program was evaluated.

UFSAR Supplement. SLRA Section A1.26 provides the UFSAR supplement for the Lubricating Oil Analysis Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI.M39. The staff also noted that Dominion Energy 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 UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of Dominion Energy's Lubricating Oil Analysis Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be 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).

3.0.3.1.14 ASME Section XI, Subsection IWL

SLRA Section B2.1.30 describes the existing ASME Section XI, Subsection IWL Program as consistent with GALL-SLR Report AMP XI.S2, "ASME Section XI, Subsection IWL."

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 Dominion Energy's Program to the corresponding program elements in GALL-SLR Report AMP XI.S2.

The staff conducted an audit to verify Dominion Energy'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 in GALL-SLR Report AMP XI.S2.

Operating Experience. SLRA Section B2.1.30 summarizes operating experience related to the ASME Section XI, Subsection IWL Program. The staff reviewed operating experience by reviewing the information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the ASME Section XI, Subsection IWL Program was evaluated.

UFSAR Supplement. SLRA Section A1.30 provides the UFSAR supplement for the ASME Section XI, Subsection IWL Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that Dominion Energy committed to ongoing implementation of the existing ASME Section XI, Subsection IWL 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 audit and its review of Dominion Energy's ASME Section XI, Subsection IWL Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be 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).

3.0.3.1.15 10 CFR Part 50, Appendix J

SLRA Section B2.1.32 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 (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements of the SLRA of Dominion Energy's program to the corresponding program elements in GALL-SLR Report AMP XI.S4.

The staff conducted an audit to verify Dominion Energy'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," and "acceptance criteria" program elements are consistent with the corresponding program elements in GALL-SLR Report AMP XI.S4.

Operating Experience. SLRA Section B2.1.32 summarizes operating experience related to the 10 CFR Part 50, Appendix J AMP. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession

No. ML21036A060), the staff conducted an independent search of the plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) 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 operation. The staff did not identify any operating experience indicating that Dominion Energy should modify its proposed AMP.

Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the "10 CFR Part 50, Appendix J" AMP was evaluated.

UFSAR Supplement. SLRA Section A1.32 provides the UFSAR supplement for the 10 CFR Part 50, Appendix J AMP. 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 Dominion Energy committed to ongoing implementation of the existing 10 CFR Part 50, Appendix J AMP for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of Dominion Energy's 10 CFR Part 50, Appendix J AMP, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be 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 Masonry Walls

SLRA Section B2.1.33 describes the existing Masonry Walls Program as consistent with GALL-SLR Report AMP XI.S5, "Masonry Walls."

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements of the SLRA of Dominion Energy's program to the corresponding program elements in GALL-SLR Report AMP XI.S5. The staff conducted the audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on its audit and its review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements are consistent with the corresponding program elements in GALL-SLR Report AMP XI.S5.

Operating Experience. SLRA Section B2.1.33 summarizes operating experience related to the Masonry Walls AMP. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff conducted an independent search of the plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions regarding 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 operating experience indicating that Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Masonry Walls AMP was evaluated.

UFSAR Supplement. SLRA Section A1.33 provides the UFSAR supplement for the Masonry Walls AMP. 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 Dominion Energy 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 UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of Dominion Energy's Masonry Walls AMP, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be 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).

3.0.3.1.17 Protective Coating Monitoring and Maintenance

SLRA Section B2.1.36 describes the existing Protective Coating Monitoring and Maintenance Program as consistent with GALL-SLR Report AMP XI.M36, "Protective Coating Monitoring and Maintenance," 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 (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy's claim of consistency with the GALL-SLR Report as modified by the SLR-ISG. 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 Dominion Energy's program to the corresponding program elements in GALL-SLR Report AMP XI.S8.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report as modified by the SLR-ISG. 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 in GALL-SLR Report AMP XI.S8.

Operating Experience. SLRA Section B2.1.36 summarizes operating experience related to the Protective Coating Monitoring and Maintenance Program. The staff evaluated operating experience information by reviewing the SLRA and conducting an audit (ADAMS Accession No ML21036A060). During the audit, the staff reviewed the plant operating experience information provided in the basis documents to determine whether any previously unknown or recurring aging effects were identified. The staff did not identify any operating experience indicating that Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Protective Coating Monitoring and Maintenance Program was evaluated.

UFSAR Supplement. SLRA Section A1.36 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 Dominion Energy 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. On the basis of its review of Dominion Energy's Protective Coating Monitoring and Maintenance Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed Dominion Energy's proposed implementation of the SLR-ISG to the Protective Coating Monitoring and Maintenance Program and found it acceptable based on plant-specific operating experience and past program performance in maintaining the protective coatings. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be 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).

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

SLRA Section B2.1.40 states that the Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program that will be consistent with the program elements in the GALL-SLR Report AMP XI.E3B, "Electrical Insulation for Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," as modified by Interim Staff Guidance SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance."

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored/inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements in GALL-SLR Report AMP XI.E3B, as modified by SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance."

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP XI.E3B, as modified by SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance."

Operating Experience. SLRA Section B2.1.40 summarizes operating experience related to the Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program was evaluated.

UFSAR Supplement. SLRA Section A1.40 provides the UFSAR supplement for the Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements 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 Dominion Energy committed to implementing the new program 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 Dominion Energy's Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program, as modified by SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance," the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff concludes that Dominion Energy 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).

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

SLRA Section B2.1.41 states that the Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program that will be consistent with the program elements in the 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."

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored/inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements in GALL-SLR Report AMP XI.E3C, as modified by SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance."

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP XI.E3C, as modified by SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance."

Operating Experience. SLRA Section B2.1.41 summarizes operating experience related to the Electrical Insulation for Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed operating experience corrective actions program examples provided by Dominion Energy 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to Environmental Qualification Requirements Program is evaluated.

UFSAR Supplement. SLRA Section A1.41 provides the UFSAR supplement for the Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements 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 Dominion Energy committed to implementing the program enhancements 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 Dominion Energy's Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program, as modified by SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance," the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff concludes that Dominion Energy 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).

3.0.3.1.20 Fuse Holders

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

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 Dominion Energy's program to the corresponding program elements in GALL-SLR Report AMP XI.E5.

The staff conducted an audit to verify Dominion Energy'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 in GALL-SLR Report AMP XI.E5.

Operating Experience. SLRA Section B2.1.43 summarizes operating experience related to the Fuse Holders Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff conducted a review of examples of the plant operating experience information provided by Dominion Energy 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Fuse Holders Program was evaluated.

UFSAR Supplement. SLRA Section A1.43 provides the UFSAR supplement for the Fuse Holders Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that Dominion Energy committed to ongoing implementation of the existing Fuse Holders 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 Dominion Energy's Fuse Holders Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be 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).

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

SLRA Section B2.1.44 describes a new program, that, when implemented, will be 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 (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 Dominion Energy's program to the corresponding program elements in GALL-SLR Report AMP XI.E6.

The staff conducted an audit to verify Dominion Energy'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 in GALL-SLR Report AMP XI.E6.

Operating Experience. SLRA Section B2.1.44 summarizes operating experience related to the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff conducted a review of examples of plant operating experience information provided by Dominion Energy 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program was evaluated.

UFSAR Supplement. SLRA Section A1.43 provides the UFSAR supplement for the Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program. The staff reviewed the UFSAR supplement's 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 Dominion Energy committed to implementing the new Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program 6 months prior to the subsequent period of operation. This will allow it to manage 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 Dominion Energy's Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.22 High-Voltage Insulators

SLRA Section B2.1.45 describes a new program, that, when implemented, will be consistent with GALL-SLR Report AMP XI.E7, “High-Voltage Insulators.”

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy’s claim of consistency with the GALL-SLR Reports, as modified by SLR-ISG-2021-04-ELECTRICAL, “Updated Aging Management Criteria for Electrical 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 of Dominion Energy’s program to the corresponding program elements in GALL-SLR Report AMP XI.E7, as modified by SLR-ISG-2021-04-ELECTRICAL, “Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance.”

The staff conducted an audit to verify Dominion Energy’s claim of consistency with the GALL-SLR Reports as modified by SLR-ISG-2021-04-ELECTRICAL, “Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal 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 are consistent with the corresponding program elements in GALL-SLR Report AMP XI.E7, as modified by SLR-ISG-2021-04-ELECTRICAL, “Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance.”

Operating Experience. SLRA Section B2.1.45 summarizes operating experience related to the High-Voltage Insulators Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff conducted a review of examples of the plant operating experience information provided by Dominion Energy 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the High-Voltage Insulators program, as modified by SLR-ISG-2021-04-ELECTRICAL, “Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance” was evaluated.

UFSAR Supplement. SLRA Section A1.45 provides the UFSAR supplement for the High-Voltage Insulators 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 as modified by SLR-ISG-2021-04-ELECTRICAL, “Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance.” The staff also noted that Dominion Energy committed to implementing the new High-Voltage Insulators Program 6 months prior to the subsequent period of operation. This will allow it to manage 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 Dominion Energy's High-Voltage Insulators Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report, as modified by SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance," are consistent. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.23 Environmental Qualification of Electric Equipment

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

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 Dominion Energy's program to the corresponding program elements in GALL-SLR Report AMP X.E1.

The staff conducted an audit to verify Dominion Energy'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 in GALL-SLR Report AMP X.E1.

Operating Experience. SLRA Section B3.3 summarizes operating experience related to the Environmental Qualification of Electric Equipment Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff conducted a review of examples of plant operating experience information provided by Dominion Energy 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Environmental Qualification of Electric Equipment Program was evaluated.

UFSAR Supplement. SLRA Section A2.3 provides the UFSAR supplement for the Environmental Qualification of Electric Equipment 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 X-01. The staff also noted that Dominion Energy committed to ongoing implementation of the existing Environmental Qualification of Electric Equipment Program for managing the effects of aging for applicable components during the period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

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

3.0.3.2 AMPs Consistent with the GALL-SLR Report with Exceptions, 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:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- Reactor Head Closure Stud Bolting (addressed by ISI Program)
- PWR Vessel Internals
- Flow-Accelerated Corrosion
- Bolting Integrity
- Open-Cycle Cooling Water System
- Closed Treated Water Systems
- Fire Protection
- Fire Water System
- Outdoor and Large Atmospheric Metallic Storage Tanks
- Fuel Oil Chemistry
- External Surfaces Monitoring of Mechanical Components
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components
- Buried and Underground Piping and Tanks
- Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks
- ASME Section XI, Subsection IWE
- ASME Section XI, Subsection IWF
- 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 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits
- Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- Metal-Enclosed Bus
- Fatigue Monitoring
- Neutron Fluence Monitoring

For AMPs that the applicant claimed are consistent with the GALL-SLR Report with exception(s) and/or enhancement(s), the staff performed an audit and review to confirm that those attributes or features of the program for which the applicant claimed consistency with the GALL-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 ASME Section XI Inservice 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 that will be consistent with the program elements in the GALL-SLR Report AMP XI.M1, "ASME Section XI Inservice Inspections, Subsections IWB, IWC, and IWD," except for the enhancements identified in the SLRA.

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.M1.

For the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements, the staff finds the SLRA AMP B2.1.1 program elements are consistent with the GALL-SRP Report. The staff also reviewed the portions of the "detection of aging effects" program element associated with the enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of the enhancements is as follows:

Enhancement 1. SLRA Section B2.1.1 includes Enhancement 1 to the "detection of aging effects" program element, which (1) is related to inspections of the welds associated with sentinel locations assessed under the ASME Code, Section XI, Appendix L, "Operating Plant Fatigue Assessment," for the safety injection cold leg nozzle once per 10 years for either Unit 1 or Unit 2, and (2) is related to inspections of the pressurizer spray nozzle stainless steel-to-safe-end weld once per 10 years for each unit. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M1. The staff finds that GALL-SLR Report AMP XI.M1 does not mention the inspection of this piping with respect to fatigue. The staff finds that this enhancement is an improvement in monitoring structural integrity of the subject piping. Therefore, the staff finds this enhancement acceptable because, when it is implemented, Dominion Energy will inspect these additional components to ensure structural integrity.

Enhancement 2. SLRA Section B2.1.1 includes Enhancement 2 to the "detection of aging effects" program element, which is related to periodic volumetric inspections of the steam generator feedwater nozzle thermal sleeves. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M1. The staff finds that GALL-SLR Report AMP XI.M1 does not mention inspections of these thermal sleeves. The staff finds that this enhancement is an improvement in monitoring structural integrity of the subject piping. Therefore, the staff finds this enhancement acceptable because, when it is implemented, Dominion Energy will inspect these additional components to ensure structural integrity.

Operating Experience. SLRA Section B.2.1.1 summarizes operating experience related to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents to: (a) identify examples of age-related degradation, as documented in Dominion Energy's corrective action program database; and (b) provide a basis for the staff's conclusions regarding the ability of Dominion Energy's proposed AMP to manage the effects of aging during the subsequent period of extended operation. The staff did not identify any operating experience indicating that Dominion Energy should modify its proposed program.

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

UFSAR Supplement. SLRA Section A1.1 provides the UFSAR supplement for the AMP B2.1.1, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD. 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, with enhancements. The staff notes that the UFSAR supplement in SLRA Section A1.1 includes the augmented inspection for various safety-related components. The staff finds that the augmented inspection is an improvement to monitor structural integrity of the safety-related components and is, therefore, acceptable. The staff noted that Dominion Energy committed to ongoing implementation of the existing ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD 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. On the basis of its review of Dominion Energy's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancements and concluded that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.2 Reactor Head Closure Stud Bolting (Addressed by ISI Program)

SLRA Section B2.1.3 states that the Reactor Head Closure Stud Bolting (addressed by the ISI Program) Program is an existing program 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 (ADAMS Accession ML21036A060), the staff reviewed Dominion Energy’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 SLRA to the corresponding program elements in GALL-SLR Report AMP XI.M3. The staff also reviewed the portions of the “preventive actions” and “corrective actions” program elements associated with the exception to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation is as follows:

Exception. SLRA Section B.2.1.3 includes an exception to the “preventive actions” and “corrective actions” program elements related to the tensile yield strength for the reactor head closure studs bolting. The GALL-SLR program recommends use of material that has an actual measured yield strength less than 150 kilopounds per square inch (ksi) for newly installed studs, or 170 ksi ultimate tensile strength for existing studs. Above this strength level, the alloy’s susceptibility to stress corrosion cracking (SCC) is known to increase. Dominion Energy stated that the procurement document for NAPS’s installed and spare reactor head closure studs did not require the material to have a measured yield strength of less than 150 ksi. Therefore, Dominion Energy’s program has taken exception to the GALL-SLR program. The staff reviewed this exception against the corresponding program elements in GALL-SLR Report AMP XI.M3 and found it acceptable because the potential for SCC of studs has been monitored by the volumetric examination performed in accordance with ASME Code, Section XI, Table IWB-2500-1, using the Appendix VIII qualified UT technique. There have been no recordable planar indications identified in the NAPS reactor head closure studs bolting by the UT performed. In addition, Dominion Energy will continue to perform the ASME Code, Section XI, Table IWB-2500-1, Examination Category B-G-1 required examinations of the reactor head closure studs and associated components during the period of extended operation as part of this AMP.

The staff conducted an audit to verify Dominion Energy’s claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria” and “corrective actions” program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP XI.M3. The staff also reviewed the exception 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.

Operating Experience. SLRA Section B.2.1.3 summarizes operating experience related to the Reactor Head Closure Stud Bolting. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Reactor Head Closure Stud Bolting Program was evaluated.

UFSAR Supplement. SLRA Section A1.3 provides the UFSAR supplement for the Reactor Head Closure Stud Bolting 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 Dominion Energy committed to ongoing implementation of the existing Reactor Head Closure Stud Bolting 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 Dominion Energy's Reactor Head Closure Stud Bolting Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the exception and finds that, with the exception implemented, the AMP will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.3 PWR Vessel Internals

SLRA Section B2.1.7 states that the PWR Vessel Internals Program is an existing program that will be consistent with the program elements in the GALL-SLR Report AMP XI.M16A, "PWR Vessel Internals," except for the enhancements identified in the SLRA. Dominion Energy amended this SLRA Section by letter dated February 4, 2021 (ADAMS Accession No. ML21063A552).

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.M16A, as modified by the NRC's SLR interim staff guidance for aging management of PWR vessel internal (PWRVI) components in SLR-ISG3.0.3.2.3-2021-01-PWRVI.

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

Enhancement 1. SLRA Section B2.1.7, as amended by letter dated February 4, 2021, includes an enhancement to the "detection of aging effects" program element. This enhancement will update plant procedures for performing inspections of the PWRVI components, as specified in the enhancement items "a" through "u" in the amended SLRA section. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M16A, as modified per SLR-ISG-2021-01-PWRVI. The staff noted that these inspection procedure updates will implement the latest NRC-approved inspection and evaluation (I&E) guidelines in Electric Power Research Institute (EPRI) Topical Report MRP-227, Revision 1-A (ADAMS Accession No. ML19249B102), as supplemented by the results of the applicant's MRP-227, Revision 1-A gap analysis to address aging management criteria for the subsequent period of extended operation. The staff finds this enhancement acceptable because, when it is implemented, it will ensure that the effects of aging for these PWRVI components will be managed in a manner that is consistent with the recommendations in GALL-SLR Report AMP XI.M16A, as modified per SLR-ISG-2021-01-PWRVI.

Enhancement 2. SLRA Section B2.1.7, as amended by letter dated February 4, 2021, includes an enhancement to the "detection of aging effects" and "acceptance criteria" program elements. This enhancement will update plant procedures to provide guidance and acceptance criteria for inspections of the thermal shield flexures, lower support forging, and upper core plate. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M16A, as modified per SLR-ISG-2021-01-PWRVI. The staff noted that these procedure updates will implement the latest NRC-approved I&E guidelines in MRP-227, Revision 1-A, as supplemented by the results of the applicant's gap analysis, to address aging management criteria for the subsequent period of extended operation for these components. The staff finds this enhancement acceptable because, when it is implemented, it will ensure that the effects of aging for these PWRVI components will be managed consistent with the recommendations in GALL-SLR Report AMP XI.M16A, as modified per SLR-ISG-2021-01-PWRVI.

Enhancement 3. SLRA Section B2.1.7, as amended by letter dated February 4, 2021, includes an enhancement to the "detection of aging effects" and "acceptance criteria" program elements. This enhancement will update plant procedures to provide guidance and acceptance criteria for one-time inspections of the core barrel middle axial welds and lower axial welds (LAWs) in accordance with industry interim I&E guidance for Westinghouse core barrel welds and Combustion Engineering (CE) core support barrel welds in EPRI Letter MRP 2019-009. MRP 2019-009 was written to address emergent operating experience with flaws detected in core support barrel axial welds at a CE plant in 2018.

The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M16A, as modified per SLR-ISG-2021-01-PWRVI. The staff noted that the MRP 2019-009 interim guidance cited for this enhancement is recommended as "Good Practice" per the NEI 03-08 industry guidelines, which are endorsed in SLR-ISG-2021-01-PWRVI. The staff also noted that this enhancement is consistent with the results of the applicant's MRP-227, Revision 1-A gap analysis for the core barrel axial welds. The staff finds this enhancement acceptable because, when it is implemented, it will ensure that the effects of aging for these PWRVI components will be managed in a manner that is consistent with the recommendations in GALL-SLR Report AMP XI.M16A, as modified per SLR-ISG-2021-01-PWRVI.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, as amended by letter dated February 4, 2021 (ADAMS Accession No. ML21036A060), 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 Dominion Energy claimed consistency with the GALL-SLR Report will be consistent with the corresponding program elements in GALL-SLR Report AMP XI.M16A, as modified per SLR-ISG-2021-01-PWRVI, following implementation of the three enhancements. In addition, the staff reviewed the enhancements associated with the "detection of aging effects" and "acceptance criteria" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Review of License Renewal Applicant Action Items. GALL-SLR Report AMP XI.M16A, as modified per SLR-ISG-2021-01-PWRVI, states that the applicant's AMP may be based on an existing plant program that is consistent with MRP-227, Revision 1-A, as supplemented by a 60- to 80-year gap analysis. In the staff's final safety evaluation (SE) for MRP-227, Revision 1-A (the NRC SE is included in the MRP-227, Revision 1-A report), the staff issued one applicant/licensee action item pertaining to an applicant's or licensee's evaluation of cracking in Westinghouse-designed baffle-former bolts. As addressed in SLR-ISG-2021-01-PWRVI, it is acceptable for the applicant to address this action item as part of its evaluation of plant-specific operating experience in the AMP technical basis documentation that the staff reviews during the AMP audit. Accordingly, an SLRA Section addressing this action item is not necessary.

Operating Experience. SLRA Section B2.1.7 summarizes operating experience related to the PWR Vessel Internals Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents to: (a) identify age-related degradation for PWRVI components, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions regarding the ability of the applicant's AMP to manage the effects of aging during the subsequent period of extended operation. The staff did not identify any operating experience indicating that Dominion Energy should modify its proposed program beyond what was incorporated during the SLRA development and staff review. With respect to plant-specific evaluation of baffle-former bolting degradation specified in the licensee/applicant action item for MRP-227, Revision 1-A, the staff's audit confirmed that the applicant satisfied the criteria for a 10-year reinspection interval, and the applicant's relatively limited bolting degradation does not meet the criteria of the action item for submittal of the evaluation of bolting degradation to the NRC. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the PWR Vessel Internals Program was evaluated.

UFSAR Supplement. SLRA Section A1.7 provides the UFSAR supplement for the PWR Vessel Internals Program. The staff reviewed this UFSAR supplement description of the program, as amended by letter dated February 4, 2021, and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01, as modified per SLR-ISG-2021-01-PWRVI. The staff also noted that Dominion Energy committed to implementing the three enhancements for the PWR Vessel Internals Program 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement, as amended by letter dated February 4, 2021, is an adequate summary description of the program.

Conclusion. Based on its review of Dominion Energy's PWR Vessel Internals Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with GALL-SLR Report AMP XI.M16A, as modified per SLR-ISG-2021-01-PWRVI. The staff also reviewed the program enhancements and finds that, when the enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.4 Flow-Accelerated Corrosion

SLRA Section B2.1.8 states that the Flow-Accelerated Corrosion Program is an existing program that, following an enhancement, will be consistent with the program elements in GALL-SLR Report AMP XI.M17, "Flow-Accelerated Corrosion." Dominion Energy amended this SLRA section by letter dated April 29, 2021 (ADAMS Accession No. ML21119A287), by stating that changes to the Flow-Accelerated Corrosion Program related to the enhancement had been completed. Consequently, the program will continue to be considered as consistent, after completion of the enhancement.

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M17.

For the "detection of aging effects" program element, the staff determined the need for additional information, which resulted in the issuance of RAI B2.1.8-1. The staff's request and Dominion Energy's response are documented in ADAMS Accession No. ML21119A287. Additional information was requested because Dominion Energy was not conducting and documenting its operating experience reviews in accordance with its program procedure ER-AA-FAC-1003, "Flow-Accelerated Corrosion Operational Experience Reviews," Revision 6. In item 3 of the RAI, the staff asked whether personnel interviews for the operational review and maintenance of the flow-accelerated corrosion operating experience database would be performed as provided in the current version of the procedure or whether the procedure would be modified to reflect how these two aspects are currently being performed.

As clarified in the cover letter for SLRA Supplement 3 (ADAMS Accession No. ML21210A396), Dominion Energy stated that the responsibilities delineated in procedure ER-AA-FAC-1003 had been reviewed and reinforced with responsible program owners and analysts to assure that the operational experience reviews with operations personnel and the maintenance of the flow-accelerated corrosion operating experience database are consistently performed such that further enhancements to the procedure are not required. The staff finds Dominion Energy's clarification acceptable because performing and documenting the operational reviews and maintaining the flow-accelerated corrosion database in accordance with the reviewed and approved procedure is consistent with the "administrative controls" program element provided in the GALL-SLR Report AMP XI.M17. The staff notes that the process delineated in the existing procedure included appropriate considerations to meet the intent of the operating experience reviews provided in GALL-SLR Report AMP XI.M17.

In its responses to other items in the RAI, Dominion Energy provided information relating to actions taken to address operating experience issues included in NRC IN-2019-08, "Flow-Accelerated Corrosion Events." These actions related to (a) inspections of components downstream of restricting orifices, (b) changes to implementing procedures for inspecting components upstream and downstream of locations found below minimum allowable wall thickness, and (c) a programmatic evaluation to determine the accuracy of the flow-accelerated corrosion modeling.

During its evaluation of Dominion Energy's response, the staff finds that (although the operating experience reviews were not performed in accordance with the associated implementing procedure, and documentation of these reviews was not captured in the prescribed outage summary reports), Dominion Energy's responses and changes to the planned outage inspections sufficiently demonstrate that operating experience is being appropriately considered during the selection of outage inspection samples.

Also, for the "detection of aging effects" program element, the staff determined the need for additional information, which resulted in the issuance of RAI B2.1.8-2. The staff's request and Dominion Energy's response are documented in ADAMS Accession No. ML21119A287. In its response, Dominion Energy stated that alternate plant configurations are evaluated for possible erosion effects and unexpected erosion is not likely to occur because the associated evaluation of configurations with a duration of more than 90 days considers possible erosion effects and determines whether a need exists for engineering assistance and a 10 CFR 50.59 assessment.

During its evaluation of Dominion Energy's response, the staff noted that the Erosion Susceptibility Evaluation is periodically updated based on relevant operating experience, and the erosion susceptibility includes consideration of operating procedures that could change the configuration of piping during normal operation. The staff finds Dominion Energy's response acceptable because operational changes that could affect erosion are evaluated, which will make unexpected erosion unlikely to occur.

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

Enhancement 1. SLRA Section B2.1.8 includes an enhancement to the "scope of program" and "detection of aging effects" program elements, which relates to evaluating systems that have initially been excluded from the program based on usage less than 2 percent of plant operating time. This engineering evaluation will confirm the scope of components that will qualify for the exclusion being extended into the subsequent period of extended operation. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M17 and finds it acceptable because after implementation Dominion Energy will have confirmed that there is sufficient technical basis to continue excluding low usage systems from the program.

The staff notes that, although Dominion Energy's letter dated April 29, 2021 (ADAMS Accession No ML21119A287), states that Enhancement 1 was completed, verification of the completion of the associated enhancement activities will need to be performed during license renewal inspection activities.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, and Dominion Energy's responses to RAIs B2.1.8-1 and B2.1.8-2, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M17. In addition, the staff reviewed the enhancement associated with the "scope of program" and "detection of aging effects" program elements and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B2.1.8 summarizes operating experience related to the Flow-Accelerated Corrosion Program. The staff reviewed operating experience information in the application and during the audit. As discussed in its audit report, the staff reviewed the plant operating experience information provided by Dominion Energy on the ePortal 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 notes that program reviews of operating experience, as it relates to inspection sample selection for flow-accelerated corrosion and erosion issues, were addressed above in the Staff Evaluation section for RAI B2.1.8-1 and RAI B2.1.8-2. The staff did not identify any operating experience indicating that Dominion Energy should modify its proposed program beyond that incorporated during the staff review of the SLRA.

Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Flow-Accelerated Corrosion Program was evaluated.

UFSAR Supplement. SLRA Section A1.8 provides the UFSAR supplement for the Flow-Accelerated Corrosion Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01.

The staff also noted that Dominion Energy's commitments credited 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 UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of Dominion Energy's Flow-Accelerated Corrosion Program and the above-referenced RAI responses, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancement, and finds that, when implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.5 Bolting Integrity

SLRA Section B2.1.9 states that the Bolting Integrity Program is an existing 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 (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.M18.

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 evaluation of these three enhancements is as follows:

Enhancement 1. SLRA Section B2.1.9 includes an enhancement to the "detection of aging effects," program element, which relates to including inspections of bolting in inaccessible areas when the bolting becomes accessible by means such as excavation, dewatering, or shielding removal. 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 incorporate the guidance in the GALL-SLR Report to conduct inspections of bolted joints that are not readily visible when they are made accessible.

Enhancement 2. SLRA Section B2.1.9 includes an enhancement to the "detection of aging effects" program element, which relates to inspecting closure bolting in locations that preclude detection of joint leakage, such as submerged environments, air or gas systems, or systems not normally pressurized. These inspections will be performed in each 10-year period based on a representative sample of bolts with a similar 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 align the applicant's program with the GALL-SLR Report guidance for inspecting bolts in joint locations that preclude detection of leakage. This includes incorporating the guidance for parameters to be inspected and representative inspection sample sizes and frequencies.

Enhancement 3. SLRA Section B2.1.9 includes an enhancement to the "monitoring and trending," "acceptance criteria," and "corrective actions" program elements. This enhancement relates to developing procedures to evaluate the sampling-based inspection results against acceptance criteria to confirm that the inspection sampling bases (e.g., selection, size and frequency) continue to remain adequate or are appropriately adjusted for the subsequent period of extended operation. The enhancement further notes that, if the cause of identified degradation is not corrected for all components constructed of the same material and exposed to the same environment, additional inspections will be conducted on a sample of similar bolts to determine extent of condition and appropriate corrective action. 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 incorporate the GALL-SLR guidance for evaluating sampling-based inspections and for conducting additional inspections if all impacted bolting material and environment combinations are not corrected when degradation is identified.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP XI.M18. 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 B2.1.9 summarizes operating experience related to the Bolting Integrity Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff conducted a search 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Bolting Integrity Program was evaluated.

UFSAR Supplement. SLRA Section A1.9 provides the UFSAR supplement for the Bolting Integrity Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that Dominion Energy 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 also noted that Dominion Energy committed to implementing the program enhancements, discussed above, 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 Dominion Energy's Bolting Integrity Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements, and finds that, when implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.6 Open-Cycle Cooling Water System

SLRA Section B2.1.11 states that the Open-Cycle Cooling Water System Program is an existing program that will be consistent with the program elements in the GALL-SLR Report AMP XI.M20, "Open-Cycle Cooling Water System," except for the exception identified in the SLRA. Dominion Energy amended this SLRA Section by letter dated February 4, 2021 (ADAMS Accession No. ML21035A303).

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.M20.

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

Exception 1. SLRA Section B2.1.11 includes an exception to the "detection of aging effects" program element related to the GALL-SLR requirement to perform heat transfer performance testing of the recirculation spray heat exchangers (RSHXs) at an interval not to exceed 5 years. The staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP XI.M20 and finds it acceptable because the RSHXs at NAPS are maintained in a dry layup condition (i.e., maintained in an air environment) and the open-cycle cooling water side of the RSHXs are flow tested every 18 months. Maintaining the RSHXs in dry layup eliminates the potential for biologic growth and biofouling of the RSHXs tubes, thus obviating the need for heat transfer performance testing.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP XI.M20. The staff also reviewed the exception between Dominion Energy's program and GALL-SLR Report XI.M20 associated with the "detection of aging effects" program element, and its justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects.

Operating Experience. As amended by letter dated February 4, 2021, SLRA Section B2.1.11 summarizes operating experience related to the Open-Cycle Cooling Water System Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the audit report (ADAMS Accession No. ML21036A060), 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 regarding 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 Dominion Energy should modify its proposed program beyond what was incorporated during the staff review of the SLRA. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Open-Cycle Cooling Water System Program was evaluated.

UFSAR Supplement. SLRA Section A1.11 provides the UFSAR supplement for the Open-Cycle Cooling Water System Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted Dominion Energy committed to ongoing implementation of the existing Open-Cycle Cooling Water System 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 Dominion Energy's Open-Cycle Cooling Water System Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the exception, and finds that, with the exception, the AMP will be adequate to manage the applicable aging effects. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.7 Closed Treated Water Systems

SLRA Section B2.1.12 states that the Closed Treated Water Systems Program is an existing program that, following enhancement, will be consistent with the program elements in the GALL-SLR Report AMP XI.M21A, "Closed Treated Water Systems."

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.M21A.

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 three enhancements is as follows:

Enhancement 1. SLRA Section B2.1.12 includes an enhancement to the "detection of aging effects," program element, which relates to developing a new procedure to specify the minimum number of inspections to be performed on each of the various sample populations in each 10-year period during the subsequent period of extended operation. The procedure will also specify the scope and focus area of the 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, it will be consistent with the GALL-SLR Report.

Enhancement 2. SLRA Section B2.1.12 includes an enhancement to the "monitoring and trending" program element, which relates to developing a new procedure 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, and that the sampling bases 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.M21A and finds it acceptable because, when it is implemented, it will be consistent with the GALL-SLR Report.

Enhancement 3. SLRA Section B2.1.12 includes an enhancement to the "corrective actions" program element, which relates to developing a new procedure 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. The procedure will also specify the scope and sample size of additional inspections that are to be performed. 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, it will be consistent with the GALL-SLR Report.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in 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 operating experience related to the Closed Treated Water Systems Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the audit report, the staff reviewed search results of the plant operating experience information to: (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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Closed Treated Water Systems Program was evaluated.

UFSAR Supplement. SLRA Section A1.12 provides the UFSAR supplement for the Closed Treated Water Systems 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 finds that the information in the UFSAR supplement is an adequate summary description of the program.

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

3.0.3.2.8 Fire Protection

SLRA Section B2.1.15 states that the Fire Protection Program 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-Mechanical-2020-XX, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance" (ADAMS Accession No. ML20156A330). The staff noted that subsequent to Dominion Energy's submittal of its SLRA, draft SLR-ISG-Mechanical-2020-XX was issued as final SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance" (ADAMS Accession No ML20181A434). Dominion Energy amended this SLRA section by letters dated February 4 and March 17, 2021 (ADAMS Accession Nos. ML21035A303 and ML21076B025, respectively).

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 "scope of program" program element, the staff needed additional information regarding the exclusion of the diesel-driven fire pump engine heat exchanger from an aging management review and issued RAI B2.1.15-1. The staff's request and Dominion Energy's response are documented in ADAMS Accession No. ML21091A187.

In lieu of providing testing and monitoring changes to address the previous functional failure of the heat exchanger, Dominion Energy changed its aging management approach and opted to periodically replace the diesel-driven fire pump engine coolant heat exchanger on a fixed frequency. Dominion Energy noted that inspection of the tube bundle was not practical due to the small diameter of the heat exchanger tubes. The change to a periodic replacement resulted in the heat exchanger being appropriately excluded from an aging management review. Dominion Energy revised SLRA Table A4.0-1 to add Commitment No. 49, which is not associated with a specific AMP, to develop procedures to replace the diesel-driven fire pump engine heat exchanger tube bundle on a 20-year frequency. Commitment No. 49 will be implemented by December 31, 2021, and the tube bundle replacement for the existing engine or the replacement of the existing engine with a spare will be completed by December 31, 2025.

Dominion Energy stated that the 20-year replacement frequency is based on plant-specific operating experience and provides reasonable assurance that the heat exchanger tube bundle will be replaced before loss of intended function of the diesel-driven fire pump. However, based on corrective action documentation, the staff questioned the basis for the 20-year replacement frequency and held public meetings with Dominion Energy on May 13, May 27, and June 17, 2021 (ADAMS Accession Nos. ML21145A211, ML21221A129, and ML21221A024, respectively). During the meetings, Dominion Energy presented additional information regarding the service life of the two skid-mounted diesel engine assemblies, which provided the basis for the 20-year replacement frequency. Dominion Energy also submitted additional information by letter dated July 29, 2021 (ADAMS Accession No. ML21210A396).

During its evaluation of Dominion Energy's response to RAI B2.1.15-1 and the supplemental information submitted in the letter dated July 29, 2021, the staff noted that one diesel-driven fire pump engine assembly has been in service for a total of 14 years with no adverse operating experience. The other diesel-driven fire pump engine assembly experienced a tube leak after being in service for 25 years. The staff finds Dominion Energy's response acceptable because, based on the operating experience of the two diesel-driven fire pump engine assemblies, the 20-year replacement frequency of the diesel-driven fire pump engine coolant heat exchanger tube bundle provides reasonable assurance that the periodic replacement will occur prior to loss of intended function.

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

Enhancement 1. SLRA Section B2.1.15 includes the following enhancement to the "monitoring and trending" program element that relates to revising procedures by including projected degradation until the next scheduled inspection and evaluating results of sampling-based inspections against acceptance criteria for fire barrier penetration seals, fire barriers, fire damper assemblies, and fire doors. 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 require projecting identified degradation of fire barrier penetration seals, fire barriers, fire damper assemblies, and fire doors until the next scheduled inspection; and evaluating results of sampling-based inspections against acceptance criteria to confirm the sampling basis will maintain the components' intended function during the subsequent period of extended operation; which is consistent with GALL-SLR Report AMP XI.M26.

Enhancement 2. SLRA Section B2.1.15 includes the following enhancement to the "corrective actions" program element that relates to revising procedures by including expansion of inspection scope and adjusting inspection frequencies for penetration seals. 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 the inspection scope for penetration seals to be expanded to include additional penetration seals when degradation is detected, and inspection frequencies to be adjusted if projected inspection results will not meet acceptance criteria prior to the next scheduled inspection; which is consistent with GALL-SLR Report AMP XI.M26.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, amendments, Dominion Energy's response to RAI B2.1.15-1, and the supplemental information submitted in the letter dated July 29, 2021, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy 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 "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 B2.1.15 summarizes operating experience related to the Fire Protection Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), 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 Dominion Energy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Fire Protection Program was evaluated.

UFSAR Supplement. SLRA Section A1.15, as amended by letters dated February 4 and March 17, 2021 (ADAMS Accession Nos. ML21035A303 and ML21076B025, respectively), provides the UFSAR supplement for the Fire Protection Program. The staff reviewed this UFSAR supplement description of the program, as amended, and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted in SLRA Table A4.0-1 that Dominion Energy committed to enhance the Fire Protection Program by implementing the enhancements discussed above 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 Dominion Energy's Fire Protection Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and concluded that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.9 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," except for the exceptions identified in the SLRA. Dominion Energy amended this SLRA section by letters dated February 4, 2021, March 17, 2021, and July 29, 2021 (ADAMS Accession Nos. ML21035A303, ML21076B025, and ML21210A396, respectively). Dominion Energy amended this SLRA section by letter dated March 17, 2021, by stating that changes to the Fire Water System Program related to Enhancement 8 had been completed.

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M27.

For the "scope of program" and "detection of aging effects" program elements, the staff needed additional information regarding the exception for the fire pump suction screen inspections (RAI B2.1.16-1), internal pipe blockage and external pipe corrosion (RAI B2.1.16-2), main drain testing (RAI B2.1.16-3), and cracking of copper alloy greater than 15 percent zinc (RAI B2.1.16-4). The staff's requests and Dominion Energy's responses to these RAIs are documented in ADAMS Accession No. ML21119A287.

In its response to RAI B2.1.16-1, regarding the exception for the fire pump suction screen inspections, Dominion Energy reiterated statements in Exception 1 of SLRA Section B2.1.16 about the monitoring, recording, and trending the differential pressure across the circulating water (CW) and service water (SW) traveling screens and about having an alarm in the main control room for high differential pressures with required operator corrective actions. Although Dominion Energy discussed activities to identify screen degradation or damage, the response added plant-specific note 13 to SLRA Table 3.3.2-42, stating that the intended function of the fire pump suction strainer elements (i.e., filtration) will be performed by the upstream CW or SW traveling screens, which are active components and not subject to aging management review.

In its review of the response, the staff noted that the filtration function is associated with two aging effects: flow blockage and loss of material. In addition, the staff noted (as discussed in the SRP-SLR) that passive functions generally do not have performance characteristics that are as readily observable as active functions. For this situation, the staff considered the flow blockage portion of the filtration function as being more readily observable than the loss of material portion. Because the justification for the exception in the SLRA only discussed differential pressure monitoring, the staff questioned how monitoring the differential pressure across the traveling screens will manage the loss of material portion of the filtration function for the CW and SW traveling screens and loss of material of the fire pump suction screens. The staff held a public meeting with Dominion Energy on June 24, 2021 (ADAMS Accession No. ML21221A300), to discuss this aspect. As a result of the meeting, Dominion Energy submitted SLRA Supplement 3, by letter dated July 29, 2021 (ADAMS Accession No. ML21210A396).

During its evaluation of the above supplemental information, the staff noted that Dominion Energy revised: (a) SLRA Sections 2.3.3.7 and 2.3.3.9 to state that the CW and SW traveling screen elements are subject to aging management, (b) SLRA Tables 3.3.2-7 and 3.3.2-9 by adding item 3.3.1-064 and item 3.3.1-066, respectively, to manage loss of material for the CW and SW traveling screen elements with the Fire Water System Program, (c) SLRA Table 3.3.2-42, plant-specific note 13, to state that flow blockage of the fire pump suction screens is precluded by the upstream SW and CW traveling screens and loss of material of these components will be managed by the Fire Water System Program, (d) SLRA Section B2.1.16 and SLRA Table A4.0-1 by adding Enhancement 9 to revise procedures to include the 12-year inspection of the fire pump suction screens, and (e) SLRA Section B2.1.16 Exception 1 to include the periodic visual inspections of the CW and SW traveling screens and the 12-year visual inspection of the fire pump suction screens, including the basis for the 12-year inspection frequency. The staff noted that the 12-year inspection frequency permits coordination with other periodic maintenance inspections in order to reduce out-of-service time.

The staff finds Dominion Energy's response acceptable because the program now includes periodic visual inspections to manage loss of material of the CW and SW traveling screens and the fire pump suction screens with a corresponding commitment to update procedures to require inspection of the fire pump suction screens for loss of material every 12 years. The staff finds the 12-year inspection frequency of the fire pump suction screens for loss of material acceptable because it permits coordination with other periodic maintenance inspections and the staff did not identify adverse operating experience that suggests a different inspection frequency is warranted. The staff notes that the first inspection will be performed prior to the subsequent period of extended operation, in accordance with Enhancement 9, which will provide insights to validate the inspection frequency. In addition, the staff finds the use of routine operator monitoring, recording, and trending, of differential pressure across the traveling screens, in conjunction with the automatic screen wash operation and main control room alarm for high differential pressure, as being sufficient to manage the flow blockage portion of the filtration intended function of the fire pump suction screens.

In its response to RAI B2.1.16-2, regarding internal pipe blockage and external pipe corrosion, Dominion Energy stated that even though sections of the fire water jockey pump discharge piping are clogged or thinned, the fire protection pressure maintenance subsystem continues to perform its intended function by maintaining the fire protection system at required operating pressure. If the pressure maintenance subsystem cannot maintain pressure, then the electric motor-driven fire pump automatically starts on low pressure and is alarmed in the main control room. An investigation of main control room alarms and the fire pump starts is required, and corrective actions are initiated as appropriate. The operating level of the hydro-pneumatic tank, part of the fire protection pressure maintenance subsystem, is confirmed by operators once per shift. In addition, a work order is in place to replace the remaining fire protection piping that has debris on the internal surfaces.

The staff finds Dominion Energy's response acceptable because, consistent with GALL-SLR Report AMP XI.M27, the fire protection system is maintained at required operating pressure and loss of system pressure is detected through the main control room alarm from fire pump starts, and, if appropriate, corrective actions will be initiated following the required investigation of the control room alarms and fire pump starts.

In its response to RAI B2.1.16-3, regarding main drain testing, Dominion Energy stated that the test results from 1996, which was the last test before the main drain tests were discontinued, will be used instead of the original acceptance test from 1977. Dominion Energy stated that test copies from 1977 and 1996 were compared to the test methodology in Section 13.2.5 and Annex 13.2.5 of National Fire Protection Association (NFPA) 25. Dominion Energy also stated that the new test procedure will be developed using the test methodology in NFPA 25 and that the 1996 test results will provide similar data for future test comparison. Dominion Energy discontinued main drain testing in 1997. Dominion Energy stated that, consistent with Enhancement 1 (see below), the main drain testing will be implemented and begin prior to the subsequent period of extended operation. The frequency of the main drain testing will be performed every 18 months (refueling outage interval), consistent with Exception 2 (see below).

The staff finds Dominion Energy's response acceptable because the main drain tests will be performed on a refueling outage interval and the main drain test results will be compared with the 1996 test results that provide similar data, and as a result, degradation of the fire water system supply over several years can be reasonably identified.

In its response to RAI B2.1.16-4, regarding cracking of copper alloy greater than 15 percent zinc, Dominion Energy revised: (a) SLRA Table 3.3.1, item 3.3.1-160, and SLRA Table 3.3.2-42 with plant-specific note 6 by deleting the Fire Water System Program and adding the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to manage cracking of copper alloy greater than 15 percent zinc components exposed internally to raw water, (b) SLRA Table 3.3.1, item 3.3.1-132, and SLRA Table 3.3.2-42 by deleting item 3.3.1-132 and plant-specific note 8 for cracking of copper alloy greater than 15 percent zinc components internally exposed to uncontrolled indoor air, and (c) SLRA Table 3.3.2-42 by adding item 3.3.1-131 for flow blockage in copper alloy valves, piping, and piping components exposed internally to uncontrolled indoor air.

During its evaluation of the response to RAI B2.1.16-4, the staff noted that Dominion Energy cited generic note E for item 3.3.1-160 in SLRA Table 3.3.2-42, indicating that a different program is credited than the program given in the GALL-SLR Report, even though managing the associated aging effects with the cited program is consistent with the GALL-SLR Report. The staff also noted that NUREG-2221 states the susceptibility of copper alloys to cracking depends on the presence of ammonia-based compounds. The staff finds Dominion Energy's response acceptable because, consistent with the GALL-SLR Report, cracking of copper alloy greater than 15 percent zinc sight glass bodies and valve bodies exposed internally to raw water will be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and flow blockage in copper alloy piping and piping components and copper alloy greater than 15 percent zinc valve bodies exposed internally to uncontrolled indoor air will be managed by the Fire Water System Program. In addition, the staff finds the deletion of item 3.3.1-132 for cracking of copper alloy greater than 15 percent zinc components from SLRA Table 3.3.2-42 acceptable because it is unlikely that the internal environment of the associated components would contain ammonia-based compounds.

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

Exception 1. SLRA Section B2.1.16 includes an exception to the “detection of aging effects” program element related to inspection and testing of fire pump suction screens. The staff needed additional information for this exception and issued RAI B2.1.16-1. The staff’s evaluation of the information provided for RAI B2.1.16-1 is discussed above.

The staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because the use of routine operator monitoring, recording, and trending of differential pressure across the CW and SW traveling screens, in conjunction with the automatic screen wash operation and main control room alarm for high differential pressure, is sufficient to manage the flow blockage portion of the filtration intended function of the fire pump suction screens. In addition, as discussed in the SLRA, the CW and SW traveling screens have a smaller opening size than the fire pump suction screen opening, which will limit debris from blocking the suction screen; visual inspections of the fire pump suction screens performed every 12 years and visual inspections of the upstream CW and SW traveling screens performed every 6 months and annually, respectively, by the Fire Water System Program are able to manage the loss of material portion of the filtration intended function of the fire pump suction screens and can reasonably ensure larger size debris does not pass through the traveling screens and buildup on the fire pump suction screens.

Exception 2. SLRA Section B2.1.16 includes an exception to the “detection of aging effects” program element related to the periodic main drain tests. The staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because the quantity of tests is consistent with the number of recommended tests or inspections in other sampling-based AMPs; the periodicity is consistent with footnote 10 of Table XI.M27-1 in GALL-SLR Report AMP XI.M27; and the number of main drain tests being conducted on a refueling outage interval in lieu of a 12-month interval is sufficient to establish a trend if potential flow blockage is occurring.

Enhancement 1. SLRA Section B2.1.16 includes an enhancement to the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements related to standpipe and hose station flow tests, acceptance criteria for main drain tests, criteria for the extent of condition testing when acceptance criteria are not met, and the scope of main drain testing. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M27 and finds it acceptable because when it is implemented the procedure changes will be consistent with the recommendations in GALL-SLR Report AMP XI.M27 and, as a result, the tests cited in the enhancement can be capable of detecting and, as necessary, determining the extent of degraded conditions.

Enhancement 2. SLRA Section B2.1.16 includes an enhancement to the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria," and "corrective actions" program elements related to internal visual inspections of wet pipe and pre-action sprinkler systems and deluge system piping, followup actions related to internal visual inspections, and criteria for conducting an obstruction investigation. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M27 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 and, as a result, these inspections can be capable of detecting internal corrosion, foreign material, and obstructions to flow.

Enhancement 3. SLRA Section B2.1.16 includes an enhancement to the "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements related to flow rates and monitoring a flow resistance factor during system flow testing. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M27 and finds it acceptable because when it is implemented it will be consistent with the recommended test procedures for underground and exposed piping flow tests cited in Table XI.M27-1 of GALL-SLR Report AMP XI.M27 and, as a result, the test results will provide consistent trend data.

Enhancement 4. SLRA Section B2.1.16 includes an enhancement to the "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements related to revising procedures to address recurring internal corrosion. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M27 and finds it acceptable because when it is implemented the extent of wall thickness screening (e.g., low frequency electromagnetic testing), followup 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 5. (Renumbered from Enhancement 7 by letter dated March 17, 2021.) This enhancement to the "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements related to monitoring the activity of the jockey pump consistent with the "detection of aging effects" program element of GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks," was deleted in the letter dated July 29, 2021, because monitoring the jockey pump activity is no longer being credited as an alternative to performing visual inspections of the buried fire protection system components.

Enhancement 6. (Renumbered from Enhancement 5 by letter dated March 17, 2021.) As amended by letter dated February 4, 2021, SLRA Section B2.1.16 includes an enhancement to the "detection of aging effects" program element related to portions of the water-based Fire Protection System that were wetted but are normally dry. To improve drainage, the NAPS Unit 2 lube oil purification piping will have the piping pitch adjusted; and to drain the line after system testing or initiation, a drain valve will be installed on the NAPS Unit 2 hydrogen seal oil fire protection piping. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M27 and finds it acceptable because when it is implemented the NAPS Unit 2 lube oil purification and hydrogen seal oil piping will be able to drain and, as a result, minimize the potential for loss of material and flow blockage. The visual inspections and wall thickness measurements that will be performed during the reconfiguration can ensure that potential past degradation due to drainage configuration issues will not impact the ability of the piping to perform its intended function. In addition, piping found to have unexpected degradation by the inspections performed during the reconfiguration will be replaced.

Enhancement 7. (Renumbered from Enhancement 6 and moved to Enhancement 5 by letter dated March 17, 2021.) See the staff's evaluation of Enhancement 5 above.

Enhancement 8. (Renumbered from Enhancement 7 by letter dated March 17, 2021.) As amended by letter dated February 4, 2021, SLRA Section B2.1.16 includes an enhancement to the "detection of aging effects" program element related to revising procedures to include a one-time test of sprinklers that have been exposed to water. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M27 and finds it acceptable because when it is implemented it will require 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 the procedures will include a sufficient sample size (3 percent or a maximum of 10 sprinklers at each unit), sample selection criteria, and minimum time in service (50 years).

Enhancement 9. As amended by letter dated July 29, 2021, SLRA Section B2.1.16 includes an enhancement to the "parameters monitored or inspected" and "detection of aging effects" program elements related to revising procedures to include visual inspection of the fire pump suction screen on a 12-year frequency. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M27 and finds it acceptable because when it is implemented the procedures will require the fire pump suction screen to be visually inspected for loss of material.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA; amendments; and Dominion Energy's response to RAIs B2.1.16-1, B2.1.16-2, B2.1.16-3, and B2.1.16-4; the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M27. The staff also reviewed the exceptions associated with the "detection of aging effects" program element, and their justifications, and finds that the AMP, with the exceptions, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the "parameters monitored or inspected," "detection of aging effects," "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 operating experience related to the Fire Water System Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), 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 Dominion Energy should modify its proposed program. Based on its audit and review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Fire Water System Program was evaluated.

UFSAR Supplement. SLRA Section A1.16, as amended by letter dated July 29, 2021 (ADAMS Accession No. ML21210A396), provides the UFSAR supplement for the Fire Water System

Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that Dominion Energy committed to enhance the Fire Water System Program by implementing Enhancements 1 through 9, as stated above, 5 years prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

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

3.0.3.2.10 Outdoor and Large Atmospheric Metallic Storage Tanks

SLRA Section B2.1.17 states that the Outdoor and Large Atmospheric Metallic Storage Tanks is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks," except for the exceptions identified in the SLRA. Dominion Energy amended this SLRA section in Supplement 1, dated February 4, 2021 (ADAMS Accession No. ML21035A303); in its response to RAI B2.1.17-1, dated April 29, 2021 (ADAMS Accession No. ML21119A287); in Supplement 3, dated July 29, 2021 (ADAMS Accession No. ML21210A396); and in Supplement 4, dated August 26, 2021 (ADAMS Accession No. ML21238A297).

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements of GALL-SLR Report AMP XI.M29.

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

Exception 1. As amended by Supplement 4, SLRA Section B2.1.17 includes an exception to the "preventive actions," "parameters monitored or inspected," "detection of aging effects," "acceptance criteria," and "corrective actions" program elements related to inspecting the sealant or caulking applied at the interface between the tank external surface and concrete for the emergency condensate storage tanks (ECSTs), the refueling water storage tanks (RWSTs), and casing cooling tanks (CCTs). The staff reviewed this exception against the corresponding program elements in GALL-SLR Report AMP XI.M29.

For the ECSTs, the SLRA initially stated that these tanks did not use caulking or sealant at the concrete-to-component interface and that inspections of the caulking or sealant were not required. However, the operating experience discussions in the SLRA noted that rainwater leakage between the concrete missile shield and the outer surface of the tanks had been a chronic problem. In addition, as clarified in SLRA Supplement 3, caulking is installed at the penetration-to-concrete interface of the ECSTs' vent and vacuum breaker penetrations to prevent ingress of moisture from affecting the tanks' external surfaces. The staff also notes that Dominion Energy revised Exception 2 in response to RAI B2.1.17-1 (discussed below) by stating the gasket on the ECST upper access concrete plug is replaced whenever the plug is removed. The staff considered this activity as also preventing ingress of moisture from affecting the tanks' external surfaces. Based on the above, in addition to Enhancement 2 provided in Supplement 4 (discussed below), the disposition of this portion of the exception is not needed because inspections of the caulking or sealant at the concrete-to-component interface will be performed consistent with the guidance in GALL-SLR Report AMP XI.M29.

For the refueling water storage tanks (RWSTs) and casing cooling tanks (CCTs), a mastic sealant is applied at the interface between the insulation jacketing and concrete foundation to ensure water-tightness and to prevent water from getting to the tank. Periodic inspections normally performed on the caulk at the tank and concrete foundation will be performed on the mastic sealant installed on the tank shell between the insulation and the tank concrete foundation, as discussed below in Enhancement 1. In addition, an inspection of the caulk at the tank and concrete foundation interface will be included when the RWSTs and CCTs external insulation is removed and sampled for external surface visual examinations. The staff finds this portion of the exception acceptable because corrosion caused by moisture penetrating the interface will be minimized through periodic inspections of the mastic, consistent with the intent of GALL-SLR Report AMP XI.M29.

<u>*Exception 2*</u>. As amended by Supplement 1 and the response to RAI B2.1.17-1, SLRA Section B2.1.17 includes an exception to the "detection of aging effects" program element related to visual and volumetric inspection techniques to identify degradation on the carbon steel tank external surfaces located outdoors on soil or concrete. As noted in SLRA Section B2.1.17, the ECSTs are encased in a 2-foot thick reinforced concrete missile shield that prevents visual and volumetric examinations of the external surface of the tank. During the audit, the staff also noted operating experience discussions regarding rainwater leakage between the concrete missile shield and the outer surface of the tanks were a chronic problem. Additionally, the staff identified ultrasonic testing inspection reports for the Unit 2 ECST that found three data points below the minimum wall thickness criteria. Based on this information, Dominion Energy amended this exception and Enhancement 4 of this program (as discussed below) to perform periodic inspections of the Unit 2 ECST, instead of the originally proposed one-time inspection, and to repair thinned tank wall areas prior to the subsequent period of extended operation.

The staff reviewed this exception against the corresponding program elements in GALL-SLR Report AMP XI.M29 and finds it acceptable because periodic wall thickness measurements, done at a 10-year frequency on Unit 2, will provide reasonable assurance that loss of material will be managed and the intended function of the tank walls will be maintained. Additionally, the staff finds the exception for the Unit 1 ECST acceptable because the Unit 1 ECST does not have a history of degradation, and the One-Time Inspection Program is capable of detecting loss of material when using the correct inspection technique. The staff notes that Dominion Energy revised this exception, in response to RAI B2.1.17-1, by stating that the gasket for the ECST upper access concrete plug is replaced whenever it is removed to allow access for internal tank wall thickness measurements. The staff included this as part of its evaluation of Exception 1.

Enhancement 1. SLRA Section B2.1.17 includes an enhancement to the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “acceptance criteria,” and “corrective actions” program elements, which will revise procedures to require periodic visual inspections of the RWSTs and CCTs each refueling outage to confirm that insulation mastic sealant at the RWST and CCT concrete foundation interface is intact. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M29 and finds it acceptable because when it is implemented it can provide reasonable assurance that caulking and sealant are intact to mitigate corrosion, which is consistent with GALL-SLR Report AMP XI.M29.

Enhancement 2. As amended by Supplement 4, SLRA Section B2.1.17 includes an enhancement to the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “acceptance criteria,” and “corrective actions” program elements, which will revise procedures to require caulking at the ECST vent and vacuum breaker penetration-concrete missile barrier interface that will be inspected on an 18-month frequency to confirm that the caulking is intact. Additionally, the visual inspection will be supplemented with physical manipulation to detect any degradation, and caulking will be replaced or repaired if any flaws are identified. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M29 and finds it acceptable because when it is implemented, it will ensure that the caulking is visually inspected along with physical manipulation at a frequency of every 18 months, which will prevent water/moisture intrusion onto the tank surface of the ECST.

Enhancement 3. SLRA Section B2.1.17 includes an enhancement to the “detection of aging effects” program element, which will revise procedures to require visual and surface examination of the exterior surfaces of the RWSTs, CCTs, and chemical addition tanks (CATs) to identify any loss of material or cracking. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M29 and finds it acceptable because when it is implemented it will require a sample of inspections of the exterior surfaces of the RWSTs, CCTs, and CATs and subsequent inspections that can identify evidence of moisture intrusion and insulation damage, which provides reasonable assurance that loss of material and cracking will be managed.

Enhancement 4. As amended by Supplement 1, SLRA Section B2.1.17 includes an enhancement to the “detection of aging effects” program element, which will revise procedures for the Unit 1 ECST to require a one-time thickness measurement of interior wall and tank bottom. Additionally, this enhancement also relates to revising procedures for the Unit 2 ESCT to require a periodic inspection to perform wall thickness readings that will be on a 10-year inspection frequency. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M29 and finds it acceptable because the inspections planned for the Unit 1 and Unit 2 ECSTs are capable of detecting loss of material and provide reasonable assurance that the intended function of the tank walls will be maintained.

Enhancement 5. SLRA Section B2.1.17 includes an enhancement to the “detection of aging effects” program element, which will revise procedures to require volumetric examination thickness measurements of the bottom of the RWSTs and CCTs to be performed each 10-year period. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M29 and finds it acceptable because when it is implemented it will require periodic bottom thickness measurements of the RWSTs and CCTs, which can provide reasonable assurance that the intended function of these tanks will be maintained.

Enhancement 6. SLRA Section B2.1.17 includes an enhancement to the “corrective actions” program element, which will develop a new procedure to specify additional inspections, described as follows. If any inspections do not meet acceptance criteria, additional inspections are conducted due to current or projected degradation. For inspections where only one tank of a material, environment, and aging effect was inspected, all tanks in that grouping are inspected. For other sampling-based inspections, 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, whichever is less. The enhancement also includes provisions for revising the timing of future inspections when projected results do not meet acceptance criteria. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M29 and finds it acceptable because when it is implemented it will require corrective actions to be taken that can provide reasonable assurance the inspections will identify degradation in the tanks within the scope of this AMP.

The staff conducted an audit to verify Dominion Energy’s claim of consistency with the GALL-SLR Report. Based on a review of the amended SLRA, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M29. The staff also reviewed the exceptions associated with the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “acceptance criteria,” and “corrective actions” program elements, with their justifications, and finds that the AMP, with the exceptions, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “acceptance criteria,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B2.1.17 summarizes operating experience related to the Outdoor and Large Atmospheric Metallic Storage Tanks Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), 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. Other than the information on the ECSTs that resulted in changes to Enhancement 2 and Enhancement 4, discussed above, the staff did not identify any operating experience indicating that Dominion Energy should modify its proposed program beyond that incorporated during the development of and staff review of the SLRA.

UFSAR Supplement. As modified by response to RAI B2.1.17-1 and Supplement 4, SLRA Section A1.17 provides the UFSAR supplement for the Outdoor and Large Atmospheric Metallic Storage Tanks Program. The staff reviewed this UFSAR supplement description of the program against the recommended description for this type of program as described in GALL-SLR Report Table XI-01 and noted that the applicant did not include the periodic inspections or preventive maintenance activities that will be performed on Unit 1 and Unit 2 ECSTs resulting from past chronic rainwater leakage and the inability to visually inspect the external surfaces of the tanks. The licensing basis for this program for the period of extended operation may not be adequate if the applicant does not incorporate this information in its UFSAR. This lack of information resulted in the issuance of RAI B2.1.17-1. The RAI and Dominion Energy's response are documented in ADAMS Accession Nos. ML21091A003 and ML21119A287, respectively.

During its evaluation of the applicant's response to RAI B2.1.17-1, the staff noted that the applicant has changed the UFSAR to include periodic inspections and preventive maintenance activities that will be performed in the Unit 1 and Unit 2 ECSTs. The staff finds the applicant's response and changes to the UFSAR supplement acceptable, because they address the periodic inspections and preventive maintenance activities that will be performed on Unit 1 and Unit 2 ECSTs resulting from past chronic rainwater leakage and the inability to visually inspect the external surfaces of the tanks. Therefore, the UFSAR supplement for the Outdoor and Large Atmospheric Metallic Storage Tanks Program is consistent with the corresponding program description in GALL-SLR Report Table XI-01.

The staff noted that in its response to RAI B2.1.17-1, the applicant also amended SLRA Section B2.1.17 to include replacement of the gasket on the ECST upper access concrete plugs whenever they are removed to allow access for internal tank wall thickness measurements. Additionally, the ECST vent and vacuum breaker caulking is periodically inspected on a 5-year interval during ECST missile shield inspections under the Structures Monitoring Program (B2.1.34). The staff reviewed the change to replace the gasket on the ECST upper access plugs and finds it acceptable because replacing the gasket that may be damaged each time the plug is open with a new gasket will prevent moisture/water intrusion into the surface of the ECST. The staff also reviewed the change to include inspection on a 5-year interval for the caulking on the vent and vacuum breaker, for which the staff determined the need for additional information regarding the inspection frequency on the vent and vacuum breaker, when there is evidence of rainwater leakage between the concrete missile shield and the outer surface of the Unit 1 and Unit 2 ECSTs. A draft RAI B2.1.17-2 was discussed during a public meeting on June 24, 2021 (see ADAMS Accession No. ML21174A195), and prior to the issuance of an RAI, Dominion Energy amended this section in Supplement 3 and in Supplement 4 to address the staff's concern. The staff noted that Dominion Energy revised the inspection frequency of the components in question from every 5 years to a frequency of every 18 months. The staff finds this acceptable because the inspection frequency of every 18 months for the caulking and sealant will ensure that the caulking and sealant are intact to prevent water/moisture intrusion onto the tank surface of the ECST. Additionally, the inspection technique and frequency of 18 months is consistent with the recommendations of the GALL-SLR Report.

The staff also noted that Dominion Energy committed to implement its proposed enhancements for the Outdoor and Large Atmospheric Metallic Storage Tanks Program, to implement the program and begin inspections or test 10 years prior to the subsequent period of extended operation, and to complete inspections or tests that are to be completed prior to the subsequent period of extended operation at least 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. On the basis of its review of Dominion Energy's Outdoor and Large Atmospheric Metallic Storage Tanks Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. In addition, the staff reviewed the exceptions and their justifications and concludes that the AMP, with the exceptions, is adequate to manage the applicable aging effects. Also, the staff reviewed the enhancements and concluded that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.11 Fuel Oil Chemistry

SLRA Section B2.1.18 states that the Fuel Oil Chemistry Program is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M30, “Fuel Oil Chemistry,” except for the exception identified in the SLRA. Dominion Energy amended this SLRA Section by letter dated February 4, 2021 (ADAMS Accession No. ML21035A303).

Staff Evaluation. During its audit (ADAMS Accession No ML21036A060), the staff reviewed Dominion Energy’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 in GALL-SLR Report AMP XI.M30.

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 exceptions and enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of these five exceptions and enhancements are as follows:

Exception 1. SLRA Section B2.1.18 includes an exception to the “parameters monitored or inspected,” and “detection of aging effects” program elements related to the newly installed fiberglass tank and polyvinylidene fluoride (PVDF) piping. These components will be inspected between 30 to 40 years of service life, in lieu of performing inspections every 10 years as recommended by the GALL-SLR Report AMP XI.M30, “Fuel Oil Chemistry.” The staff reviewed this exception against the corresponding program elements in GALL-SLR Report AMP XI.M30 and finds it acceptable because components have typically been in service between 30 to 40 years from the beginning of the original license to a renewed license for which the GALL Report is used. The fiberglass tank and PVDF piping were installed in 2014 and 2015, respectively. These components have not been in service long enough for significant degradation to occur. Additionally, the applicant will monitor the fuel oil quality to mitigate potential degradation such as hardening or loss of strength, loss of material, cracking or blistering of the fiberglass tank and PVDF pipe due to impurities such as water and microbiological organisms in fuel oil.

Enhancement 1. SLRA Section B2.1.18 includes an enhancement to the “scope of program” program element, which relates to including the security diesel generator fuel oil day tank in the scope of the program. 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 in the GALL-SLR Report.

Enhancement 2. SLRA Section B2.1.18 includes an enhancement to the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements. The enhancement relates to revising the procedures to include drain, clean internally to the extent practical, visually inspect internal surfaces (if physically possible), and perform tank bottom thickness measurements of in-scope tanks. 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 in the GALL-SLR Report.

Enhancement 3. SLRA Section B2.1.18 includes an enhancement to the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” and “acceptance criteria” program elements. This enhancement relates to revising or developing the procedures to include a one-time draining, cleaning, and internal visual inspection of the security diesel generator fuel oil supply tank between 30 and 40 years of service. 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 in the GALL-SLR Report.

Enhancement 4. SLRA Section B2.1.18 includes an enhancement to the “monitoring and trending” and “acceptance criteria,” program elements, which relates to revising the procedures to clarify the need to specifically monitor and trend water and biological activity in addition to particulates. 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 in the GALL-SLR Report.

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

<u>Operating Experience</u>. SLRA Section B2.1.18 summarizes operating experience related to the Fuel Oil Chemistry Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), 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 regarding 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 Dominion Energy should modify its proposed program beyond what was incorporated during the development of the SLRA. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Fuel Oil Chemistry Program was evaluated.

UFSAR Supplement. SLRA Section A1.18 provides the UFSAR supplement for the Fuel Oil Chemistry Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that Dominion Energy 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 UFSAR supplement, as amended by letter dated February 4, 2021, is an adequate summary description of the program.

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

3.0.3.2.12 External Surfaces Monitoring of Mechanical Components

SLRA Section B2.1.23 states that the External Surfaces Monitoring of Mechanical Components Program is an existing program that, following enhancements, 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 (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in 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 the enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of these four enhancements is as follows:

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 are performed at a frequency not to exceed one refueling cycle. In addition, the enhancement also specifies that visual inspections of elastomers and flexible polymers will cover 100 percent of accessible component surfaces, with a minimum surface area for tactile inspections of 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.

Enhancement 2. SLRA Section B2.1.23 includes enhancements to the "detection of aging effects" and "corrective actions" program elements, which relate to developing a new procedure to manage cracking of stainless steel, nickel-alloy, and copper-alloy (greater than 15 percent zinc) components and cracking and loss of material of insulated outdoor/indoor components exposed to condensation. The new inspection parameters cover inspection frequency and scope of initial and expansion sample size. 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.

Enhancement 3. SLRA Section B2.1.23 includes enhancements to the "monitoring and trending" and "corrective actions" program elements, which relate 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, and adjusting the inspection sampling bases (e.g., selection, size, frequency). 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.

Enhancement 4. 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), and that 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.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP XI.M36. 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 B2.1.23 summarizes operating experience related to the External Surfaces Monitoring of Mechanical Components Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the audit report, the staff reviewed search results of the plant operating experience information to: (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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the External Surfaces Monitoring of Mechanical Components Program was evaluated.

UFSAR Supplement. SLRA Section A1.23 provides the UFSAR supplement for the External Surfaces Monitoring of Mechanical Components 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. In Table A4.0-1, "Subsequent License Renewal Commitments," the staff noted that Dominion Energy committed to implementing the listed program enhancements 6 months prior to the subsequent period of extended operation, for the existing External Surfaces Monitoring of Mechanical Components Program. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

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

3.0.3.2.13 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 that, following enhancements, will be consistent with the program elements in the GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components."

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.M38.

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

Enhancements 1 and 2. SLRA Section B2.1.25 includes enhancements to the "parameters monitored or inspected" and "detection of aging effects" program elements, which relate to revising procedures to require inspection of elastomeric and flexible polymeric components for various forms of degradation, including supplemental tactile inspections with minimum scope provisions. The staff reviewed these enhancements against the corresponding program elements in GALL-SLR Report AMP XI.M38 and finds it acceptable because, when it is implemented, it will be consistent with the GALL-SLR Report.

Enhancement 3. SLRA Section B2.1.25 includes an enhancement to the "detection of aging effects," program element, which relates to revising procedures to specify that followup volumetric examinations are performed where irregularities are detected that could be indicative of an unexpected level of degradation for steel components exposed to raw water, raw water (potable), or waste water. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M38 and finds it acceptable because, when it is implemented, it will be consistent with the GALL-SLR Report.

Enhancement 4. SLRA Section B2.1.25 includes enhancements to the "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements, which relate to specifying the minimum size and scope of inspections specified in existing or new procedures. Evaluation of the degradation rate and subsequent adjustment to the sampling bases will also be addressed in the procedures. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M38 and finds it acceptable because, when it is implemented, it will be consistent with the GALL-SLR Report.

Enhancement 5. SLRA Section B2.1.25 includes enhancements to the "detection of aging effects" and "acceptance criteria" program elements, which relate to specifying a minimum of 10 piping wall thickness measurements in the bearing cooling system at each unit, with a frequency not to exceed two refueling outages. Locations with a wall thickness less than 50 percent will receive additional inspections based on prior inspection results, extent of degradation, rate of degradation, and timing of the next inspection. These augmented inspection requirements are being implemented based on operating experience that noted recurring internal corrosion within portions of the bearing cooling system. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M38 and finds it acceptable because, when it is implemented, it will be consistent with the GALL-SLR Report.

Enhancement 6. SLRA Section B2.1.25 includes an enhancement to the "acceptance criteria" program element, which relates to specifying that, where practical, acceptance criteria are quantitative and 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.M38 and finds it acceptable because, when it is implemented, it will be consistent with the GALL-SLR Report.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP XI.M38. 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 B2.1.25 summarizes operating experience related to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program was evaluated.

UFSAR Supplement. SLRA Section A1.25 provides the UFSAR supplement for the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that Dominion Energy committed to implementing the enhancements to the existing Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (as modified by editorial changes in a letter dated May 27, 2021, ADAMS Accession No. ML21147A293) 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 Dominion Energy's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, with the implemented enhancements, the AMP will be adequate to manage the applicable aging effects. The staff concludes that Dominion Energy 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 Buried and Underground Piping and Tanks

SLRA Section B2.1.27 states that the Buried and Underground Piping and Tanks Program is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks." Dominion Energy amended this SLRA section by letters dated February 4, 2021 (ADAMS Accession No. ML21035A303); April 1, 2021 (ADAMS Accession No. ML21091A187); July 29,2021 (ADAMS Accession No. ML21210A396), and August 26, 2021 (ADAMS Accession No. ML21238A297).

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 Dominion Energy's program to the corresponding program elements of GALL-SLR Report AMP XI.M41.

For the "parameters monitored or inspected," "detection of aging effects," "acceptance criteria," and "corrective actions" program elements, the staff determined the need for additional information regarding management of cracking due to cyclic loading for internally-lined gray cast iron piping and piping components exposed to soil, which resulted in the issuance of an RAI. RAI B2.1.27-1, draft followup RAI B2.1.27-1a, discussed during a public meeting on

June 24, 2021 (see ADAMS Accession No. ML21174A310 for public meeting announcement), and Dominion Energy's responses are documented in ADAMS Accession Nos. ML21063A540, ML21091A187, ML21174A195, ML21210A396, and ML21238A297. The staff noted that in its supplemental response, dated August 26, 2021 (which superseded the July 29, 2021, supplemental response), the applicant added Enhancement 6 to the Buried and Underground Piping and Tanks Program in response to draft followup RAI B2.1.27-1a. The staff evaluation of this enhancement is documented below.

For the "scope of program" program element, the staff determined the need for additional information regarding the presence of in-scope buried copper alloy piping. The staff's concern was documented as question No. 1 for the Buried and Underground Piping and Tanks Program in the audit report (ADAMS Accession No. ML21036A060). Prior to the issuance of an RAI, Dominion Energy added Enhancement 3 to address the staff's concern. The staff's evaluation of this enhancement is documented below.

For the "preventive actions" program element, the staff determined the need for additional information regarding why cathodic protection is not necessary for carbon steel fuel oil storage tanks (FOSTs) exposed to soil in the emergency diesel generator (EDG) system and carbon steel piping exposed to soil in the security system. Prior to the issuance of an RAI, Dominion Energy provided a supplemental response that added Enhancement 3 to address the staff's concern for the carbon steel piping exposed to soil in the security system (the staff's evaluation of this enhancement is documented below). However, the supplemental response did not address why cathodic protection is not necessary for the carbon steel FOSTs exposed to soil in the EDG system, which resulted in the issuance of RAIs. RAI B2.1.27-2, RAI B2.1.27-2a, and Dominion Energy's responses are documented in ADAMS Accession Nos. ML21063A540, ML21091A187, ML21123A298, and ML21147A293.

In its responses, Dominion Energy stated the following: (a) the buried carbon steel EDG FOSTs are internally coated with epoxy and externally coated with Koppers Bitumastic 300 M; (b) the EDG FOSTs are cleaned and inspected on a 10-year frequency; (c) during the 2011 baseline soil survey, the soil sample closest to the EDG FOSTs received a soil corrosivity index score of 2 in accordance with AWWA C105, "Polyethylene Encasement for Ductile Iron Pipe Systems," Table A.1, "Soil Test Evaluation"; (d) a comparison of the 2002 and 2013 minimum and maximum thickness measurements for the EDG FOSTs indicated a maximum corrosion rate of 5.64 mils per year (mpy); and (e) the difference between the minimum recorded thickness during the 2013 inspection and minimum allowable thickness is 179 mils (i.e., 503 mils minus 324 mils).

During its evaluation of Dominion Energy's responses to RAI B2.1.27-2 and RAI B2.1.27-2a, the staff noted the following: (a) GALL-SLR Report AMP XI.M41 includes a cathodic protection acceptance criterion of 1 mpy for steel components as an alternative to the -850 mV criterion; and (b) NACE SP0169-2013, "Control of External Corrosion on Underground or Submerged Metallic Piping Systems," states a commonly used benchmark for effective external corrosion control is 1 mpy. Although the EDG FOSTs thickness data show external surface corrosion rates potentially exceed 1 mpy, the staff finds Dominion Energy's justification for not providing cathodic protection for the EDG FOSTs acceptable for the following reasons: (a) the internal and external surfaces of the EDG FOSTs are coated in accordance with the "preventive actions" program element of GALL-SLR Report AMP XI.M41; (b) the 2011 soil sample closest to the EDG FOSTs indicated non-corrosive conditions per GALL-SLR Report AMP XI.M41 guidance; and (c) based on the maximum corrosion rate (i.e., 5.64 mils) and the difference between the minimum recorded thickness during the 2013 inspection and minimum allowable thickness (i.e., 179 mils), a 10-year inspection frequency provides the staff reasonable assurance that the intended function of the EDG FOSTs will be maintained during the subsequent period of extended operation.

For the “preventive actions” program element, the staff determined the need for additional information regarding whether buried and underground metallic piping and tanks are externally coated in accordance with GALL-SLR Report AMP XI.M41, which resulted in the issuance of an RAI and RCIs. RAI B2.1.27-3, RCI B2.1.27-B, RCI B2.1.27-C, RCI B2.1.27-D, and Dominion Energy’s responses are documented in ADAMS Accession Nos. ML21067A500, ML21084A182, ML21063A540, and ML21091A187.

In its response to RAI B2.1.27-3 (ADAMS Accession No. ML21091A187), Dominion Energy stated the following: (a) buried steel and stainless steel piping is specified to be coated with coal tar epoxy, coal tar enamel, or tape wrap; and (b) underground steel and copper alloy piping are specified to be coated with coal tar epoxy, moisture cure urethane tar, multifunctional epoxy, or tape wrap. In addition, Dominion Energy confirmed the following in its responses to RCIs B2.1.27-B, B2.1.27-C, and B2.1.27-D (ADAMS Accession No. ML21084A182): (a) in-scope buried gray cast iron piping is specified to be externally coated with a bituminous coating; (b) in-scope buried ductile iron piping is specified to be externally coated with an asphaltic coating; and (c) in-scope buried steel tanks exposed to soil are specified to be externally coated with “Koppers Bitumastic 300 M or equal.” The staff finds Dominion’s responses to the RAI and RCIs acceptable (in part) because buried and underground metallic piping and tanks are specified to be externally coated in accordance with the “preventive actions” program element of GALL-SLR Report AMP XI.M41. However, the staff noted that the responses did not address plant-specific operating experience indicating that external coatings were not always provided for buried steel and stainless steel piping, which resulted in the issuance of a followup RAI. RAI B2.1.27-3a and Dominion Energy’s response are documented in ADAMS Accession Nos. ML21123A298 and ML21147A293.

In its response, Dominion Energy stated the following with respect to buried stainless steel piping: (a) 31 inspections performed in 2011 and 2012 on the quench spray, recirculation spray, safety injection, chemical and volume control, residual heat removal, and condensate systems did not identify significant pitting, corrosion, or degradation of the piping; (b) a portion of missing coating was identified in one piping segment associated with the quench spray system; (c) coatings were found to have been installed during 17 other quench spray piping inspections and 13 other inspections associated with buried stainless steel piping. In addition, Dominion Energy stated with the exception of three operating experience examples involving weld repair or through wall leakage, a review and evaluation of 27 buried steel piping inspections conducted from 2011 to 2018 on the fire protection, condensate, fuel oil, and service water systems did not identify any significant pitting, corrosion, or degradation of the buried steel piping.

During its evaluation of Dominion Energy’s response to RAI B2.1.27-3a, the staff noted the following: (a) GALL-SLR Report AMP XI.M41 states additional inspections, beyond those in GALL-SLR Report Table XI.M41 2, “Inspection of Buried and Underground Piping and Tanks,” may be appropriate in response to plant-specific operating experience; (b) as documented in the “Safety Evaluation Report Related to the Subsequent License Renewal of Turkey Point Generating Units 3 and 4” (ADAMS Accession No. ML19191A057), the applicability of the extent of inspections recommended in GALL-SLR Report Table XI.M41-2 is limited to instances where plant-specific operating experience identifies a few (i.e., as opposed to several) instances of leaks; and (c) although there have been a few instances of coating degradation and leaks due to external corrosion, the majority of inspections associated with buried steel and stainless steel piping have identified no significant corrosion or other degradation of the piping. Based on the additional operating experience discussion provided in the response to RAI B2.1.27-3a, the staff finds that the operating experience associated with buried steel and stainless steel piping at NAPS is bounded by the operating experience for which GALL-SLR Report AMP XI.M41 was evaluated, and thus the staff finds that the extent of inspections in GALL-SLR Report Table XI.M41 2 is appropriate for buried steel and stainless steel piping.

For the “preventive actions” program element, the staff determined the need for additional information regarding how backfill quality for buried fire protection piping meets the intent of GALL-SLR Report AMP XI.M41, which resulted in the issuance of an RAI. RAI B2.1.27-4 and Dominion Energy’s response are documented in ADAMS Accession Nos. ML21063A540 and ML21091A187.

In its response, Dominion Energy stated the following: (a) with the exception of the unexpected backfill material identified during the 2012 piping excavation for the fire protection replacement project, there were no additional nonconforming backfill materials documented during Underground Piping and Tank Integrity (UPTI) Program inspections (2011 to current); (b) examination of the piping surface identified during the 2012 excavation for the fire protection replacement project did not identify any coating damage, pitting, or corrosion that would affect the intended function of the piping; and (c) existing backfill requirements are consistent with NFPA-24, Section 10.9.

The staff finds Dominion Energy’s response acceptable based on the following: (a) other than the 2012 operating experience example, there were no other instances of non-conforming backfill noted in the previous 10 years; (b) non-conforming backfill noted in the 2012 operating experience example did not result in coating damage or corrosion that would affect the intended function of the piping; and (c) existing backfill requirements are consistent with GALL-SLR Report AMP XI.M41 recommendations.

For the “preventive actions” program element, the staff reviewed procedure 0-EPM-2303-01, “Inspection of Service Water Cathodic Protection System,” during the audit and noted the acceptance range for instant off potentials included a limiting critical potential of -1,500 mV. The staff noted that GALL-SLR Report AMP XI.M41 recommends a limiting critical potential of -1,200 mV to prevent damage to external buried piping coatings. Subsequent to the audit, and as confirmed by the applicant through RCI B2.1.27-A (ADAMS Accession No. ML21084A182), the staff noted that the subject procedure was revised to include a limiting critical potential of -1,200 mV, consistent with GALL-SLR Report AMP XI.M41 recommendations.

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

<u>*Enhancement 1*</u>. SLRA Section B2.1.27 includes an enhancement to the “preventive actions” program element which relates to revising procedures to obtain pipe-to-soil potential measurements for piping in the scope of SLR during the next soil survey within 10 years prior to entering the subsequent period of operation. The staff reviewed this enhancement and finds it acceptable because these measurements will provide input into determining overall soil corrosivity.

Enhancement 2. SLRA Section B2.1.27 includes an enhancement to the “detection of aging effects” and “corrective actions” program elements which relates to refurbishing and reconnecting the service water ‘C’ cathodic protection subsystem associated with the buried carbon steel piping of the fuel oil system for the emergency electrical power system and the service water ‘D’ cathodic protection subsystem 5 years prior to entering the subsequent period of extended operation. During its review, the staff noted that in addition to the service water and emergency electrical power systems cited above, carbon steel piping is exposed to soil in the flood protection dike and security systems. In addition, the staff noted that the buried carbon steel piping of the flood protection dike drain system is protected by an active cathodic protection system and, as documented in the staff’s evaluation of Enhancement 3 below, the buried carbon steel piping of the security system will be replaced with a material that does not require cathodic protection per GALL-SLR Report AMP XI.M41 guidance. The staff reviewed this enhancement and finds it acceptable because providing cathodic protection for buried steel piping at least 5 years prior to entering the subsequent period of extended operation is consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 3. As amended by letter dated February 4, 2021, SLRA Section B2.1.27 includes an enhancement to the “scope of program,” “preventive actions,” and “detection of aging effects” program elements which relates to replacing the following buried piping materials before the last 5 years of the inspection period prior to entering the subsequent period of extended operation: (a) the buried copper piping between the fire protection jockey pump and the hydropneumatic tank will be replaced with carbon steel; and (b) the buried carbon steel fill line piping for the security diesel fuel oil tank will be replaced with corrosion resistant material that does not require inspection (e.g., titanium alloy, super austenitic, or nickel alloy materials).

The staff noted that the subject enhancement was provided by Dominion Energy in response to Buried and Underground Piping and Tanks Program audit questions No. 1 (i.e., clarification if there is in-scope buried copper alloy piping) and No. 3 (i.e., basis for not providing cathodic protection for steel piping exposed to soil in the security system) in the audit report. The staff reviewed this enhancement and finds it acceptable because, as confirmed by the applicant through RCI B2.1.27-E (ADAMS Accession No. ML21084A182), the following material replacements will occur before the last 5 years of the inspection period prior to entering the subsequent period of extended operation: (a) in-scope buried copper alloy piping will be replaced with carbon steel; and (b) in-scope buried steel piping in the security system will be replaced with a material that does not require cathodic protection per GALL-SLR Report AMP XI.M41 guidance. Therefore, the staff’s concerns described in Buried and Underground Piping and Tanks Program audit question Nos. 1 and 3 are moot.

Enhancement 4. As amended by letter dated February 4, 2021, SLRA Section B2.1.27 includes an enhancement to the “acceptance criteria” program element which relates to revising procedures to specify (a) cathodic protection surveys use the -850 mV instant off polarized potential criterion unless a suitable alternative polarization criteria (i.e., 100 mV polarization criteria, -750 mV criterion, -650 mV criterion, 1 mil per year (mpy) loss of material) can be demonstrated; and (b) additional requirements (e.g., verification of external loss of material rate through the use of electrical resistance corrosion rate probes, soil resistivity testing) when using the alternative polarization criteria. The staff reviewed this enhancement and finds it acceptable based on the following: (a) the use of the -850 mV instant off criterion for buried steel piping is consistent with GALL-SLR Table XI.M41 3, “Cathodic Protection Acceptance Criteria;” and (b) the conditions to use alternative polarization criteria are consistent with GALL-SLR Report AMP XI.M41 recommendations.

Enhancement 5. As amended by letters dated July 29, and August 26, 2021, SLRA Section B2.1.27 includes an enhancement to the "detection of aging effects" program element which relates to revising procedures to require additional inspections and destructive examinations of buried gray cast iron fire protection piping. The staff noted that the subject enhancement was added in response to draft followup RAIs B2.1.21-1a and B2.1.21-2a (both related to loss of material due to selective leaching as described in SER Section 3.0.3.1.10). With respect to loss of material due to selective leaching, the staff noted that the subject enhancement, in part, states the following:

> Procedures will be revised to require that a minimum of six excavations be conducted at each unit to inspect for loss of material due to selective leaching in buried gray cast iron fire protection piping and piping components. The inspections will be conducted in the 10-year period prior to the subsequent period of extended operation and in each 10-year period during the subsequent period of extended operation. A ten foot pipe length will be excavated for each buried gray cast iron fire protection piping sample and the external surfaces inspected for blistering, cracking, hardening or loss of strength, and loss of material. Additionally, NUREG-2191 Section XI.M33, Selective Leaching Program, destructive examinations will be conducted on a one-foot length of fire protection piping or a different component type from each discrete evacuation location (six/unit) to inspect for loss of material due to selective leaching. Five of the inspections will be conducted on a one-foot length of fire protection piping and the sixth inspection will be conducted on either a one-foot length of piping from the fire protection system or a different component type (e.g., hydrant) from the fire protection system.

The staff reviewed this enhancement and finds it acceptable based on the following: (a) the number and multiple locations of additional inspections and destructive examinations that will be conducted are adequate to provide reasonable assurance that loss of material due to selective leaching will be adequately managed for buried gray cast iron fire protection piping during the subsequent period of extended operation; and (b) the failures of buried gray cast iron fire protection piping noted by the staff during its review were not the result of loss of material due to selective leaching.

Enhancement 6. As amended by letter dated August 26, 2021, SLRA Section B2.1.27 includes an enhancement to the "parameters monitored or inspected," "detection of aging effects," "acceptance criteria," and "corrective actions" program elements which relates to revising procedures to require additional inspections and destructive examinations of buried gray cast iron fire protection piping. The staff noted that the subject enhancement was added in response to followup RAI B2.1.27-1a (related to failures of buried gray cast iron piping in the fire protection system caused by cracking due to cyclic loading). With respect to management of cracking due to cyclic loading, the staff noted that the subject enhancement, in part, states the following:

> Procedures will be revised to require five excavated piping samples at each unit be inspected (internally and externally) for cracking due to cyclic loading. The inspections will be conducted in the 10-year period prior to the subsequent period of extended operation (SPEO) and in each 10-year period during the SPEO as follows:
>
> a. A ten-foot pipe length of buried gray cast iron fire protection piping will be excavated for each inspection.

b. Visual (VT) and magnetic particle (MT) examinations will be conducted on the 10-foot buried gray cast iron fire protection piping samples. The radiographic (RT) nondestructive examination (NDE) method will be applied to areas that have potential surface cracking identified using the MT method.

c. Examination results will be evaluated by a Level II or III examiner qualified to ASME Code, Section XI and the following performed, as applicable:

- If there is no cracking identified using the NDE techniques, then a one-foot axial piece of the fire protection piping sample will still be removed and destructively examined to inspect for the loss of material due to selective leaching as required by NUREG-2191 Section XI.M33, Selective Leaching Program (see Enhancement 5).

- If cracking is identified, then a bounding one-foot axial section of the fire protection piping sample will be selected based on the crack size and characterization determined by a qualified NDE Level II or III examiner and further destructive examination conducted to identify cracking due to cyclic loading. The destructive examination of the one-foot axial section will also be inspected for the loss of material due to selective leaching (see Enhancement 5).

d. If results of the destructive examination inspections determine the cracking is due to cyclic loading, then Engineering will perform a crack growth evaluation and a flaw stability evaluation based on the predicted crack lengths at the end of the SPEO.

e. If results of the evaluations indicate the depth or extent of cracking of the base metal is projected to cause loss of intended function prior to the end of the SPEO, Engineering will perform an evaluation to determine the extent of condition, extent of cause, and the need for further follow-on actions through the Corrective Action Program (e.g., additional inspections).

The staff notes that cracking due to cyclic loading of buried gray cast iron piping is not explicitly identified within the scope of GALL-SLR Report AMP XI.M41, “Buried and Underground Piping and Tanks.” However, the material is included in the AMP and the scope of the program states that the program addresses the aging effect of cracking. Therefore, it is reasonable that cracking due to cyclic loading of buried gray cast iron fire protection system piping is addressed by the applicant’s enhanced program.

The staff notes that there have been no additional failures of buried gray cast iron fire protection system piping following the applicant’s corrective actions taken in 2003 to reduce the frequency and magnitude of the hydraulic transients. Thus, the staff finds it reasonable to infer that these actions have been successful in limiting the effects of cracking due to cyclic loading. Given the absence of failures since 2003, the staff finds that the destructive examinations described in this enhancement provide a reasonable approach and sample size to manage the effects of cracking due to cyclic loading of buried gray cast iron fire protection system piping at NAPS.

In addition, the staff finds that the NDE techniques to be employed (i.e., VT, MT and RT, as described in the enhancement) and the use of ASME-qualified examiners are capable of detecting the presence of cracking in this material, and, if cracks are detected, a crack growth evaluation will be conducted. This approach is consistent with the approach in GALL-SLR Report AMP XI.M41 to use capable examination methods and qualified examiners.

The staff notes that, if the results of any necessary crack growth evaluation indicate a potential loss of intended function prior to the end of the subsequent period of extended operation, the applicant will appropriately evaluate the extent of condition and extent of cause, and implement follow-on actions through the Corrective Action Program. This approach is consistent with the approach for corrective actions described in GALL-SLR Report AMP XI.M41.

The staff has reviewed this enhancement and finds it acceptable because the proposed inspections (i.e., sample size and examination technique) and destructive examinations that will be conducted, within the overall aging management approach described in Enhancement 6, are adequate to manage cracking due to cyclic loading of buried gray cast iron fire protection piping during the subsequent period of extended operation.

The staff notes that the subject enhancement also states the following:

> Dominion Energy is an active participant in industry working groups that are investigating new and improved NDE techniques. As NDE technology evolves, Dominion [Energy] will continue to monitor any relevant improvements, particularly those related to examination of cast iron, for potential incorporation into Dominion Fleet procedures.

While this activity is not a basis for the staff's finding that this enhancement is acceptable, it provides confirmation that the applicant will take a proactive approach to this program by remaining knowledgeable on the latest evolutions of NDE technology and considering implementation of them in its program.

Operating Experience: SLRA Section B2.1.27 summarizes operating experience related to the Buried and Underground Piping and Tanks Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed plant operating experience information provided by Dominion Energy 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 notes that, as documented in the NRC letter, dated October 13, 2020 (ADAMS Accession No. ML20258A284), the failures due to cyclic loading for gray cast iron piping exposed to soil discussed in the SLRA are not referenced in the GALL-SLR Report for this component, material, and environment combination. Consequently, the conditions and operating experience at the plant are not bounded by those for which GALL-SLR AMP XI.M41 was evaluated. However, as described above in its evaluation of Enhancement 6, the staff concluded that the enhancement would provide adequate aging management for the plant-specific conditions and operating experience at NAPS.

Based on its audit and its review of the application as amended, consistent with Dominion Energy's responses to RAIs (RAIs B2.1.27-1, B2.1.27-2, B2.1.27-2a, B2.1.27-3, B2.1.27-3a, and B2.1.27-4) and RCIs (RCIs B2.1.27-B, B2.1.27-C, B2.1.27-D), the staff finds that the plant-specific conditions and operating experience are adequately addressed in Enhancement 6 of the applicant's Buried and Underground Piping and Tanks Program. The staff's review of this enhancement is documented above.

UFSAR Supplement. As amended by letters dated July 29, 2021, and August 26, 2021, SLRA Section A1.27 provides the UFSAR supplement for the Buried and Underground Piping and

Tanks Program. The staff reviewed this UFSAR supplement description of the program and noted that, although it is consistent with the recommended description in GALL-SLR Report Table XI-01, the conditions and operating experience at the plant are not bounded by those for which GALL-SLR AMP XI.M41 was evaluated. The staff also noted Dominion Energy committed to implement the enhanced 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. For inspections that are to be completed prior to the subsequent period of extended operation, the staff also noted Dominion Energy 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 UFSAR supplement, as amended by letters dated July 29, 2021, and August 26, 2021, and as described in UFSAR supplement list of commitments in Table A4.0-1, is an adequate summary description of the program.

Conclusion. Based on its review of the applicant's Buried and Underground Piping and Tanks Program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the 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 functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

SLRA Section B2.1.28 states that the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," as modified by SLR-ISG-Mechanical-2021-02, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance," (ADAMS Accession No. ML20156A330) except for the exceptions identified in the SLRA. The staff noted that subsequent to Dominion Energy's submittal of its SLRA, draft SLR-ISG-Mechanical-2020-XX was issued as final SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance" (ADAMS Accession No. ML20181A434). Dominion Energy amended this SLRA Section by letter dated February 4, 2021 (ADAMS Accession No. ML21035A303).

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.M42, as modified by SLR-ISG-2021-02-MECHANICAL.

For the "scope of program" program element, the staff determined the need for additional information with respect to managing loss of material and loss of lining integrity for flow elements exposed to treated borated water greater than 140 degrees Fahrenheit (°F) in the chemical and volume control system (ADAMS Accession No. ML21036A060). However, prior to the issuance of an RAI, Dominion Energy provided a supplement to the SLRA (ADAMS Accession No. ML21035A303) which deleted the subject items and replaced them with polytetrafluoroethylene (PTFE) -lined steel and stainless steel flow elements exposed to treated borated water greater than 140 °F citing no aging effects with no AMP proposed. The staff's evaluation of PTFE-lined steel and stainless steel flow elements is documented in SER Section 3.3.2.3.1.

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

Exception 1. As amended by letter dated February 4, 2021, SLRA Section B2.1.28 includes an exception to the "detection of aging effects" and "corrective actions" program elements related to inspecting a minimum of 55 feet of internally-lined SW system piping annually at both units, in lieu of guidance provided in GALL-SLR Report Table XI.M42-1, "Inspection Intervals for Internal Coatings/Linings for Tanks, Piping, Piping Components, and Heat Exchangers." For two-unit sites such as NAPS, the staff noted that GALL-SLR Report Table XI.M42 1 recommends that 55 feet or 50 percent (whichever is less at each unit) of piping be inspected at a frequency of every 4 to 6 years. The staff reviewed this exception and finds it acceptable because the frequency of inspections proposed by the applicant exceeds the frequency provided in GALL-SLR Report Table XI.M42 1.

Exception 2. As amended by letter dated February 4, 2021, SLRA Section B2.1.28 includes an exception to the "detection of aging effects" program element related to the use of the redundant trains provision (i.e., criteria for extending the inspection frequency for components in redundant trains) in GALL-SLR Report Table XI.M42 1 for the turbine lube oil storage and transfer subsystem used oil tank and clean oil tank. The subject exception states the following in part:

- "[t]he turbine lube oil storage and transfer subsystem used oil tank and clean oil tank are not installed in redundant trains. The turbine lube oil storage and transfer subsystem used oil tank and clean oil tank are identical 16,000-gallon carbon steel tanks fabricated by the same manufacturer with the same interior polymer-based coating. The tanks are identical in configuration with the exception that the fill connection for the used oil tank is capped."
- "[e]ach tank is located in a lube oil storage tank room with an indoor air environment on the same elevation at opposite ends of the Turbine Building. The tank operating characteristics do not promote an environment that would result in damage to the coating due to erosion."

During its review of GALL-SLR Report Table XI.M42 1, the staff noted that the redundant trains provision applies when (a) an identical coating material is installed with the same installation requirements in redundant trains with the same operating conditions; and (b) the coatings are not in a location subject to erosion. Although the turbine lube oil storage and transfer subsystem used oil tank and clean oil tank are not installed in redundant trains, the staff finds the use of the redundant trains provision in GALL-SLR Report Table XI.M42 1 acceptable because both tanks (a) are coated with the same interior coating; (b) are exposed to the same internal and external environment; (c) are constructed of the same material; and (d) are not subject to erosion.

Enhancement 1. As amended by letter dated February 4, 2021, SLRA Section B2.1.28 includes an enhancement to the “scope of program” and “detection of aging effects” program elements. This enhancement relates to revising procedures to require baseline inspections of specific tanks, piping, and miscellaneous components within the scope of subsequent license renewal and inspection intervals that will not exceed those specified in GALL-SLR Report Table XI.M42 1. The staff reviewed this enhancement and finds it acceptable because performing baseline inspections prior to the subsequent period of extended operation and periodic inspections in accordance with GALL-SLR Report Table XI.M42 1 is consistent with GALL-SLR Report AMP XI.M42 recommendations.

Enhancement 2. SLRA Section B2.1.28 includes an enhancement to the “corrective actions” program element, which relates to revising procedures to include an alternative to repair or removal of internal coatings exhibiting indications of peeling and delamination. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancement 3 are implemented, the “corrective actions” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M42.

Enhancement 3. SLRA Section B2.1.28 includes an enhancement to the “corrective actions” program element, which relates to revising procedures to require additional inspections if one of the inspections does not meet acceptance criteria due to current or projected degradation. The staff reviewed this enhancement and finds it acceptable because, when the subject enhancement and Enhancement 2 are implemented, the “corrective actions” program element will be consistent with the corresponding program element in GALL-SLR Report AMP XI.M42.

Enhancement 4. As amended by letter dated February 4, 2021, SLRA Section B2.1.28 includes an enhancement to the “detection of aging effects” program element, which relates to revising procedures to require that inspection frequencies for internal coatings/linings of in-scope piping and piping components will be performed on a frequency consistent with GALL-SLR Report Table XI.M42 1. The staff reviewed this enhancement and finds it acceptable because performing periodic inspections in accordance with GALL-SLR Report Table XI.M42 1 is consistent with GALL-SLR Report AMP XI.M42 recommendations.

The staff conducted an audit to verify Dominion Energy’s claim of consistency with the GALL-SLR Report. Based on a review of the SLRA as amended by letter dated February 4, 2021, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP XI.M42, as modified by SLR-ISG-2021-02-MECHANICAL. The staff also reviewed the exceptions between Dominion Energy’s program and GALL-SLR Report Section XI.M42 associated with the “detection of aging effects” and “corrective actions” program elements, and their justifications, and finds that the AMP, with the exceptions, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the “scope of program,” “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 B2.1.28 summarizes operating experience related to the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff

reviewed plant operating experience information provided by Dominion Energy 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 regarding the ability of the applicant's proposed AMPs to manage the effects of aging in the subsequent period of extended operation.

The staff identified operating experience for which it determined the need for additional information regarding why the inspection frequencies in GALL-SLR Report Table XI.M42-1 are appropriate for the component cooling heat exchanger channel heads, in lieu of the triennial inspection frequency described in the SLRA, which resulted in the issuance of an RAI. RAI B2.1.28 1 and Dominion Energy's response are documented in ADAMS Accession Nos. ML21063A540 and ML21091A187, respectively.

In its response, Dominion Energy stated the following: (a) consistent with the Generic Letter (GL) 89-13 commitments, the Unit 1 component cooling heat exchangers are visually inspected on a triennial frequency based on engineering evaluation; and (b) if the GL 89-13 commitment for cleaning/inspection of the Unit 1 component cooling heat exchangers were to be extended to a 4-year frequency, current coating operating experience would support a 4-year GALL-SLR Report Table XI.M42-1 Category B inspection frequency. The staff finds Dominion Energy's response acceptable because: (a) the component cooling heat exchanger channel head coatings will continue to be inspected on a 3-year inspection interval, consistent with the frequency cited in the SLRA and in Dominion Energy's response to GL-89-13; and (b) extension of the inspection interval to the frequencies cited in GALL-SLR Report Table XI.M42 1 (i.e., every 4 to 6 years), based on the results of inspections, is consistent with GALL-SLR Report AMP XI.M42 recommendations.

Based on its audit, its review of the application, and its review of Dominion Energy's response to RAI B2.1.28 1, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program was evaluated.

UFSAR Supplement. As amended by letter dated February 4, 2021, SLRA Section A1.28 provides the UFSAR supplement for the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks 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, as modified by SLR-ISG-2021-02-MECHANICAL. The staff also noted Dominion Energy committed to implementing the enhanced Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program and to beginning inspections 10 years before the subsequent period of extended operation to manage 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 Dominion Energy committed to completing 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 UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of Dominion Energy's Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the exceptions and enhancements, and finds that, when implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.16 ASME Section XI, Subsection IWE

SLRA Section B2.1.29 states that the ASME Section XI, Subsection IWE AMP is an existing program with enhancements that will be consistent with the program elements in GALL-SLR Report AMP XI.S1, “ASME Section XI, Subsection IWE.” Dominion Energy amended this SLRA Section in SLRA Supplement 1 by letter dated February 4, 2021 (ADAMS Accession No. ML21035A303).

Staff Evaluation. During its audit (documented in ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy’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 in GALL-SLR Report AMP XI.S1.

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

Enhancement 1. SLRA Section B2.1.29, as amended by letter dated February 4, 2021, includes an enhancement to the “parameters monitored or inspected,” “detection of aging effects” and “acceptance criteria” program elements. This enhancement relates to conducting periodic supplemental surface examinations or other applicable alternate examination techniques, such as enhanced VT-1 (EVT-1) examinations of specific susceptible containment pressure-retaining boundary components, to manage cracking. The specific components subject to surface examination (or EVT-1 examination) are containment pressure-retaining portions of the fuel transfer tube, fuel transfer tube enclosure, fuel transfer tube blind flange, DM weld penetrations, and high-temperature steel piping penetrations. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S1 and finds it acceptable because, when it is implemented: (1) it will perform examinations using methods capable of detecting cracking due to fatigue and SCC (such as surface or EVT-1 examinations), in addition to visual examinations, once in a 10-year interval, of the above listed containment pressure-retaining boundary components to detect and manage cracking pursuant to the acceptance criteria in IWE-3122; (2) the inspection methods that will be used are consistent with the recommendations in the GALL-SLR Report to detect cracking in pressure-retaining components susceptible to SCC, or in components that are subject to cyclic loading but have no CLB fatigue or fatigue waiver analyses; and (3) the frequency of examination of once in a 10-year interval is reasonable because there has been no identified plant-specific operating experience of cracking in these components.

Enhancement 2. SLRA Section B2.1.29, as amended by letter dated February 4, 2021, includes an enhancement to the “detection of aging effects” program element, which relates to conducting a one-time supplemental volumetric examination of the containment liner surfaces, if triggered by plant-specific operating experience of containment liner corrosion initiating on the inaccessible side. From a review of plant-specific operating experience and a statement in the amended enhancement, the staff noted that the triggering operating experience has not occurred at NAPS since issuance of the first 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, the program will include actions, sampling criteria (random and focused), and statistical-based acceptance criteria consistent with GALL-SLR Report AMP XI.S1 recommendations. The proposed schedule for conducting the examination in both units within two refueling outages of identifying triggering operating experience is reasonable, considering the one-time supplemental examination is intended to confirm effectiveness of the AMP for managing potential liner corrosion from the inaccessible side and to verify that the triggering plant-specific operating experience is not representative of a larger issue.

Enhancement 3. SLRA Section B2.1.29 includes an enhancement to the “monitoring and trending” program element, which relates to specifying that successive inspections will be sequenced, evaluated, and re-examined in accordance with IWE-2420, and that examination results will be compared with recorded results of prior inservice examinations and evaluated for acceptance in accordance with 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, the program will formally trend periodic examination results by comparing them to previous recorded examination results. This enhancement will provide a projection of identified degradation to the next inspection or beyond to assure that timely corrective actions are taken, such that intended functions are not adversely affected prior to the next examination.

The staff conducted an audit to verify Dominion Energy’s claim of consistency with the GALL-SLR Report. Based on its audit and its review of the SLRA, as amended by letter dated February 4, 2021, the staff finds that the “scope of program,” “preventive actions,” and “corrective actions” program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP XI.S1. In addition, the staff reviewed the enhancements associated with the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B2.1.29, as amended by letter dated February 4, 2021, summarizes the operating experience related to the ASME Section XI, Subsection IWE AMP. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff searched the query results provided by Dominion Energy (on the ePortal) from its plant-specific operating experience database to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database; and (b) provide a basis for the staff’s conclusions regarding 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 Dominion Energy should modify its proposed program beyond what was incorporated during the development of and staff review of the SLRA.

Based on its audit and its review of the application, as amended by letter dated February 4, 2021, 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.

UFSAR Supplement. SLRA Section A1.29, as amended by letter dated February 4, 2021, provides the UFSAR supplement for the ASME Section XI, Subsection IWE AMP. 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 Dominion Energy committed to ongoing implementation of the existing ASME Section XI, Subsection IWE AMP for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that Dominion Energy committed to implementing the three SLRA AMP enhancements 6 months prior to the subsequent period of extended operation.

The staff finds that the information in the UFSAR supplement, including license renewal commitments, as amended by letter dated February 4, 2021, is an adequate summary description of the program.

Conclusion. Based on its review of Dominion Energy's ASME Section XI, Subsection IWE AMP, as amended by letter dated February 4, 2021, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements, and finds that, when the enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed, so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.17 ASME Section XI, Subsection IWF

SLRA Section B2.1.31 states that the ASME Section XI, Subsection IWF Program is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.S3, "ASME Section XI, Subsection IWF."

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.S3.

The staff also reviewed the portions of the "scope of program," "parameters monitored or inspected," "detection of aging effects," and "monitoring and trending" program elements 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 B2.1.31 includes an enhancement to the "scope of program" program element, which relates to revision of inservice inspection (ISI) procedures for 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. 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 for inspection of inaccessible areas in a manner that is consistent with the recommendations in GALL-SLR Report AMP XI.S3.

Enhancement 2. SLRA Section B2.1.31 includes an enhancement to the “parameters monitored or inspected,” and “detection of aging effects” program elements. The enhancement relates to the revision of procedures to specify that, for high-strength bolting greater than 1-inch nominal diameter within the scope of the ASME Section XI, Subsection IWF Program, volumetric examination comparable to that of ASME Code, Section XI, Table IWB-2500-1, Examination Category B-G-1 will be performed to detect cracking, in addition to the VT-3 examination. The enhancement proposes that, in each 10-year period during the subsequent period of extended operation, a representative sample of 20 percent of the population, or a maximum of 19 high-strength bolts per unit, will be inspected for IWF supports located in an “air” environment. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S3 and finds it acceptable because, when it is implemented, it will provide an equivalent level of inspection and detection as those recommended by GALL-SLR Report AMP XI.S3.

Enhancement 3. SLRA Section B2.1.31 includes an enhancement to the “detection of aging effects” program element, which relates to revision of inservice inspection (ISI) procedures by including 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. In compliance with the guidance provided in the GALL-SLR Report, 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. 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 include the corresponding GALL-SLR Report AMP XI.S3 program element guidance.

Enhancement 4. SLRA Section B2.1.31 includes an enhancement to the “monitoring and trending” program element, which relates to sampling of component supports that do not exceed the acceptance standards of IWF-3400 but that are repaired to as-new condition. The enhancement calls for the sample to be increased or modified to include other representative supports from 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, it will align the “monitoring and trending” program element to that of the GALL-SLR Report AMP XI.S3.

The staff conducted an audit to verify Dominion Energy’s claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the “preventive actions,” “acceptance criteria,” and “corrective actions” program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP XI.S3.

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 B2.1.31 summarizes operating experience related to the ASME Section XI, Subsection IWF Aging Management Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the audit report

(ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the ASME Section XI, Subsection IWF AMP was evaluated.

UFSAR Supplement. SLRA Section A1.31 provides the UFSAR supplement for the ASME Section XI, Subsection IWF Aging Management 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 Dominion Energy has committed (Commitment No. 31) to enhancing its procedures dealing with inspection of inaccessible areas, volumetric inspection of high-strength bolts for SCC, and sampling of high-strength bolts and Class 1, 2, and 3 piping supports, as outlined in the above reviewed and evaluated enhancements, no later than the last refueling outage or 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 Dominion Energy's ASME Section XI, Subsection IWF AMP, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when the enhancements are implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed, so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.18 Structures Monitoring

SLRA Section B2.1.34 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." Dominion Energy amended this SLRA Section by letter dated April 1, 2021 (ADAM Accession No. ML21091A186).

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.S6.

For the "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements, the staff determined the need for additional information, which resulted in the issuance of an RAI. RAI B2.1.34-1 and Dominion Energy's response are documented in ADAMS Accession No. ML21091A186.

In its response, Dominion Energy revised SLRA Section B2.1.34, Enhancement 3, and Table A4.0-1, item 34, to include the aging effects of loss of material, in addition to the aging effects of cracking, for aluminum and stainless steel structural components. The staff finds

Dominion Energy's response and changes to SLRA Section B2.1.34, Enhancement 3, and Table A4.0-1, item 34, acceptable because the revised enhancement will be consistent with the GALL-SLR Report recommendation to adequately manage the aging effects for aluminum and stainless steel structural components.

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

Enhancement 1. SLRA Section B2.1.34 includes an enhancement to the "scope of program," and "monitoring and trending" program elements, which relates to including the inspection of additional structures that are within the scope of subsequent license renewal. This enhancement also relates to performing the baseline inspections for these additional structures using quantitative inspection data prior to the subsequent period of extended operation (SLRA Commitment No. 34, item 1). The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when it is implemented, it will be consistent with the GALL-SLR Report recommendation to: (a) include all other structures (e.g., administration building, decontamination building, domestic water treatment building, heater boiler room) that are not covered by other structural AMPs within the scope of the Structures Monitoring Program, to ensure that they are periodically monitored for aging degradation; and (b) establish a quantitative baseline inspection prior to the subsequent period of extended operation.

Enhancement 2. SLRA Section B2.1.34 includes an enhancement to the "scope of program," and "parameters monitored or inspected" program elements, which relates to including the listed structural components as additional components that will be in the scope of the Structural Monitoring Program. The staff notes that this enhancement does reference several general components that will generally include other components that are similar in nature (e.g., spring hangers are considered under "components supports members," as also listed in that group per SLRA Table 2.4.1-38). The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when it is implemented, it will be consistent with the GALL-SLR Report recommendation to include all applicable structural components and commodities (e.g., structural bolting, anchor bolts and embedment, components support members including spring hangers, seismic joint fillers) that are not covered by other structural AMPs within the scope of the Structures Monitoring Program, to ensure that they are periodically monitored for aging degradation.

Enhancement 3. SLRA Section B2.1.34, as revised by Dominion Energy's response to RAI B2.1.34-1 in ADAMS Accession No. ML21091A186, includes an enhancement to the "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements. The enhancement relates to specifying that aluminum and stainless steel structural components (e.g., louvers, cable trays, conduits, and structural supports) be monitored for cracking and loss of material due to SCC. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when it is implemented, it will be consistent with the GALL-SLR Report recommendation to ensure that specific parameters monitored or inspected for these components are commensurate with industry codes, standards, and guidelines to ensure that aging degradation will be detected and quantified before there is a loss of intended function.

Enhancement 4. SLRA Section B2.1.34 includes an enhancement to "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements, which relates to specifying that elastomeric vibration isolators, structural sealant and seismic joint fillers be monitored for cracking, loss of material, and hardening. This enhancement also relates to specifying that visual inspection of elastomeric elements be supplemented by tactile inspection to detect hardening if the intended function is suspect. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when it is implemented, it will be consistent with the GALL-SLR Report recommendation to ensure that aging degradations are being detected and quantified before there is a loss of intended function by enhancing visual inspections when necessary and by specifying parameters monitored or inspected that are commensurate with industry codes, standards, and guidelines.

Enhancement 5. SLRA Section B2.1.34 includes an enhancement to the "parameters monitored or inspected," and "acceptance criteria" program elements, which relates to specifying that accessible sliding surfaces be monitored for indication of excessive loss of material that could restrict or prevent sliding of the surfaces. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when implemented, it will be consistent with the GALL-SLR Report recommendation to ensure that specific parameters monitored or inspected and acceptance criteria used for these components are commensurate with industry codes, standards, and guidelines, to ensure that aging degradation will be detected and quantified before there is a loss of intended function.

Enhancement 6. SLRA Section B2.1.34 includes an enhancement to the "corrective actions" program element, which relates to specifying that evaluations of neutron shield tanks findings will consider the structural support functions for the reactor pressure vessel. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S6 and finds it acceptable because, when it is implemented, it will ensure that structural degradations for the neutron shield tanks will be detected and quantified before there is a loss of intended function.

Enhancement 7. SLRA Section B2.1.34, as revised by Dominion Energy's response to RAI 3.5.2.3-1 in ADAMS Accession No. ML21091A186, includes an enhancement to the "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements. This enhancement relates to specifying that carbon fiber reinforced polymer (CFRP) wrap in concrete poles will be monitored for hardening or loss of strength, loss of material, cracking or blistering that could lead to the reduction or loss of intended function. Since this enhancement incorporates plant-specific actions, the staff reviewed the applicant's enhancement to the "detection of aging effects" and "acceptance criteria" program elements against the criteria in SRP-SLR Sections A.1.2.3.3, A.1.2.3.4, and A.1.2.3.6. The staff finds it acceptable because, when it is implemented, it will ensure that structural degradations associated with CFRP wrap in concrete poles will be detected and corrective actions taken before there is a loss of intended function.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, and Dominion Energy's responses to RAI B2.1.34-1 and RAI 3.5.2.3-1, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP XI.S6. In addition, the staff reviewed the enhancements associated with the “scope of program,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B2.1.34 summarizes operating experience related to the Structures Monitoring Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the audit report (ADAMS Accession No. ML21036A060), the staff conducted an independent search of the plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective action program database; and (b) 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 operation. The staff did not identify any operating experience indicating that Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Structures Monitoring Program was evaluated.

UFSAR Supplement. SLRA Section A1.34 provides the UFSAR supplement for the Structures Monitoring 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 Dominion Energy committed (Commitment No. 34) to implementing the program enhancements 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement, as amended by letter dated April 1, 2021, is an adequate summary description of the program.

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

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

Section B2.1.35 of the SLRA states that the Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.S7, “Inspection of Water-Control Structures Associated with Nuclear Power Plants.” Dominion Energy amended this SLRA section by letters dated February 4, 2021 (ADAMS Accession No. ML21035A303), and July 29, 2021 (ADAMS Accession No. ML21210A396).

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy’s claim of consistency with the GALL-SLR Report. The staff compared the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements of the

SLRA AMP, as amended, to the corresponding program elements of GALL-SLR Report AMP XI.S7.

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

Enhancement 1. SLRA Section B2.1.35 includes an enhancement to the “scope of program” program element which relates to including the CW Intake Tunnel Header and the Discharge Tunnel Seal Pit within the scope of the program. 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 the additional water-control structures determined to be in-scope of subsequent license renewal.

Enhancement 2. SLRA Section B2.1.35 includes an enhancement to the “detection of aging effects” program element which relates to including underwater inspections or dewatering to permit visual inspections for submerged structures, 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 include periodic visual inspections of submerged structures to ensure that aging degradation will be detected and quantified before there is a loss of intended function. This is consistent with GALL-SLR Report recommendations in the “detection of aging effects” program element in AMP XI.S7 for aging management of submerged structures.

The staff conducted an audit to verify Dominion Energy’s claim of consistency with the GALL-SLR Report. Based on a review of the SLRA and amendments, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements for which Dominion Energy 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” and “detection of aging effects” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B2.1.35 summarizes operating experience related to the Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff conducted an independent search of the plant operating experience information to: (a) identify examples of age-related degradation, as documented in the applicant’s corrective 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 noted that the inspection frequency for settlement was changed from 184 days to 12 months, and identified operating experience for which it determined the need for additional information, which resulted in the issuance of RAIs. RAI B2.1.35-1, RAI B2.1.35-1a, and Dominion Energy’s responses are documented in ADAMS Accession Nos. ML21119A287 and ML21210A396.

In its response to RAI B2.1.35-1, Dominion Energy stated that settlement monitoring of Class 1 Structures is governed by Technical Requirements Manual (TRM) Section 3.7.7. Dominion Energy also documented the technical justification for extension of the settlement surveillance frequency to 12 months. The staff finds Dominion Energy's extension of the settlement surveillance frequency to 12 months acceptable because review of trends of the settlement data indicate the monitored structures including the Service Water Valve House (SWVH) are not expected to challenge the 100 percent allowable settlement limit within the span of one settlement surveillance cycle of 12 months once the 75 percent settlement threshold for corrective actions has been exceeded; therefore, the reduction in monitoring frequency to every 12 months remains adequate to assure that proper corrective actions are taken prior to loss of function.

In its response to RAI B2.1.35-1a, Dominion Energy revised SLRA Section B2.1.35 to include recent operating experience related to the SWVH for which the 75 percent settlement threshold limit was exceeded. Dominion Energy also described its technical basis for determining allowable settlement limit, settlement trigger for initiating corrective actions, and the corrective action process for continuing management of the settlement during the subsequent period of extended operation for the SWVH by taking a similar approach to the one taken in 2009.

During its evaluation of Dominion Energy's response to RAI B2.1.35-1a, the staff noted the following:

(a) Dominion Energy clarified that the function of the SW expansion joint tie-rods and the monitoring of the allowable settlement specified in TRM Section 3.7.7 for the water-control structures is to maintain the pipe stress for the buried SW piping to within code allowable limits. The current allowable settlement limit established in 2009 is based on a calculation and a resultant design change that modified the SW piping and rubber expansion joints to accommodate for future potential settlement.

(b) For monitored locations where the structure exceeds 75 percent of the allowable settlement value in TRM Table 3.7.7-1, Dominion Energy will initiate a condition report and provide engineering evaluation within 60 days to review field condition and evaluate the consequences of additional settlement based on the requirement for settlement of Class I structures specified in TRM Section 3.7.7. Prior to exceeding the 100 percent allowable settlement, SW piping expansion joint tie-rods can be adjusted to accommodate future potential settlement.

(c) In order to continue management of the settlement for the SWVH, Dominion Energy will take a similar approach to the one taken in 2009, by adjusting the configuration of the SW piping expansion joint tie-rods prior to exceeding 100 percent allowable settlement. Following the tie-rods adjustments, the allowable settlement value for the SWVH settlement markers will be the same as the allowable settlement value determined in 2009 (i.e., 0.041 feet relative to the new baseline date). The configuration change, when implemented, restores margin and will accommodate potential additional settlement to ensure intended function of the associated SSCs in the SWVH.

The staff finds Dominion Energy's response and supplement of recent settlement operating experience description in SLRA Section B2.1.35 acceptable, because the corrective actions that have been initiated and will be taken related to the recent settlement operating experience of the SWVH for the settlement marker 28 exceeding 75 percent allowable settlement limit, provides objective evidence that the AMP assures adequate corrective actions will be taken prior to loss of function, and demonstrates that the settlement aging effect will be adequately managed during the subsequent period of extended operation.

Based on its audit and review of the application, as amended, and review of Dominion Energy's responses to RAIs B2.1.35-1 and B2.1.35-1a, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP was evaluated.

UFSAR Supplement. SLRA Section A1.35 provides the UFSAR supplement for the Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP. 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 Dominion Energy committed to ongoing implementation of the existing Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of Dominion Energy's Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP, as amended, the staff concludes that those program elements for which Dominion Energy 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 Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

SLRA Section B2.1.37 states 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 the GALL-SLR Report AMP XI.E1, "Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.E1.

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 seven enhancements are as follows:

Enhancement 1. SLRA Section B2.1.37 includes an enhancement to the "parameters monitored or inspected" program element to add the requirements 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). The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E1 and finds it acceptable because identifying adverse localized environments for each of the most limiting cable and connection electrical insulation plant environments is consistent with GALL-SLR Report AMP XI.E1.

Enhancement 2. SLRA Section B2.1.37 includes an enhancement to the "parameters monitored/inspected" program element to add a list of structures/areas to perform/conduct the visual inspection of cables and connections. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report XI.E1 and finds it acceptable because visual inspection of accessible in-scope cable and connection electrical insulation subject to an adverse localized environment is consistent with GALL-SLR Report AMP XI.E1.

Enhancement 3. SLRA Section B2.1.37 includes an enhancement to the "parameters monitored/inspected" and "detection of aging effects" program elements to add the requirements to perform a review of previously identified and mitigated adverse localized environment cumulative aging effects applicable to in-scope cable and connection electrical insulation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E1 and finds it acceptable because reviewing plant-specific operating experience for previously identified and mitigated adverse localized environments cumulative aging effects applicable to in-scope cable and connection electrical insulation is consistent with GALL-SLR Report AMP XI.E1.

Enhancement 4. SLRA Section B2.1.37 includes an enhancement to the "detection of aging effects" program element to add a description of testing methodology, should testing be deemed necessary based on unacceptable visual indication of surface anomalies. The enhancement calls for the testing of a sample size of 20 percent of each cable and connection insulation material type found within an adverse localized environment, with a maximum sample size of 25. The following factors will be considered in the development of the cable and connection insulation test sample: environment, including identified adverse localized environments (e.g., high-temperature, high humidity, vibration), voltage level, circuit loading, connection types, location (e.g., high-temperature, high humidity, vibration) 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 enhancement provides the technical basis for selecting the sample. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E1 and finds it acceptable because testing sample size, factors, and testing methods of cable and connection insulation material found in an adverse localized environment are consistent with GALL-SLR Report AMP XI.E1.

Enhancement 5. SLRA Section B2.1.37 includes an enhancement to the "monitoring and trending" program element to add the requirement that, if anomalies are found during the visual inspection process, they will be addressed through a corrective action program. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E1 and finds it acceptable because addressing anomalies found during the visual inspection process through the corrective action program is consistent with GALL-SLR Report AMP XI.E1.

Enhancement 6. SLRA Section B2.1.37 includes an enhancement to the "acceptance criteria" program element to add the requirement to verify that the test results for electrical cable and connection insulation material are to be within the acceptance criteria, as identified in the procedures. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.E1 and finds it acceptable because verifying that the test results are within the acceptable criteria, as defined in the plant's procedures, is consistent with GALL-SLR Report AMP XI.E1.

Enhancement 7. SLRA Section B2.1.37 includes an enhancement to the "corrective action" program element 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 could include, but will not be 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 will be made as to whether the same condition or situation is applicable to additional in-scope accessible and inaccessible cables and connections (extent of condition). The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E1 and finds it acceptable because performance of an engineering evaluation of unacceptable test results and visual inspections of cable and connection electrical insulation abnormalities are consistent with GALL-SLR Report AMP XI.E1.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP XI.E1. 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 B2.1.37 summarizes operating experience related to the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. The staff reviewed operating experience information in the application and during the audit. As discussed in the audit report (ADAMS Accession No. ML21036A060), the staff reviewed operating experience corrective action program examples provided by Dominion Energy 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements was evaluated.

UFSAR Supplement. SLRA Section A1.37 provides the UFSAR supplement for the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements. 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 Dominion Energy committed to implementing the program enhancements 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 Dominion Energy'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 Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

SLRA Section B2.1.38 states that 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 program that will be consistent with the program elements in the 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 Instrument Circuits," except for the enhancements identified in the SLRA.

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.E2.

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

Enhancement 1. SLRA Section B2.1.38 includes an enhancement to the "scope of program" program element to add testing of the post-accident neutron monitoring system cables and connections external to containment to the program. The procedure will evaluate reduced electrical insulation resistance by measuring cable resistance and capacitance. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E2 and finds it acceptable because scoping of electrical insulation for cables and connections used in circuits with sensitive, high-voltage, low level signals is consistent with GALL-SLR Report AMP XI.E2.

Enhancement 2. SLRA Section B2.1.38 includes an enhancement to the "acceptance criteria" program element to specify the acceptance criteria in the plant's procedures. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E2 and finds it acceptable because calibration results or findings of surveillance and cable testing to be within the acceptance criteria, as specified in the plant's procedures, is consistent with GALL-SLR Report AMP XI.E2.

Enhancement 3. SLRA Section B2.1.38 includes an enhancement to the "corrective actions" program element to include corrective actions and a requirement for performance of an engineering evaluation when cable system test results do not meet the acceptance criteria. Results of the Engineering evaluation will determine if the test frequency needs to be increased. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E2 and finds it acceptable because performing an engineering evaluation when cable testing results do not meet the acceptance criteria is consistent with GALL-SLR Report AMP XI.E2.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP XI.E2. In addition, the staff reviewed the enhancements associated with the "scope of program," "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 operating experience related to the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits was evaluated.

UFSAR Supplement. SLRA Section A1.38 provides the UFSAR supplement for the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits. 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 Dominion Energy committed to implementing the program enhancements 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 Dominion Energy's Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed, so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

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

SLRA Section B2.1.39 states that the Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is an existing program with enhancements that will be consistent with the program elements in the GALL-SLR Report AMP XI.E3A, "Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements," as modified by SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance."

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored/inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements of the SLRA to the corresponding program elements in GALL-SLR Report AMP XI.E3A, as modified by SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance."

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 seven enhancements are as follows:

Enhancement 1. SLRA Section B2.1.39 includes an enhancement to the "preventive actions" program element 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 and finds it acceptable because inspecting and dewatering of in-scope manholes after event-driven occurrences are consistent with GALL-SLR Report AMP XI.E3A.

Enhancement 2. SLRA Section B2.1.39 includes an enhancement to the "preventive actions" program element to add a step stating that automatic or passive drainage features of manholes are operating properly. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E3A and finds it acceptable because verifying and inspecting automatic or passive drainage features of manholes after event-driven occurrences is consistent with GALL-SLR Report AMP XI.E3A.

Enhancement 3. SLRA Section B2.1.39 includes an enhancement to the "preventive actions" program element to add a step that includes a requirement for testing medium-voltage cables that are exposed to significant moisture to determine the condition of the electrical insulation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E3A and finds it acceptable because testing of medium-voltage power cables that are exposed to significant moisture to determine the condition of the electrical insulation is consistent with GALL-SLR AMP XI.E3A.

Enhancement 4. SLRA Section B2.1.39 includes an enhancement to the "preventive actions," "parameters monitored/inspected," "detection of aging effects," and "acceptance criteria" program elements to add cables from RSST "B" and "C" to Bus 1G and Bus 2G, and associated manholes, to the scope of the program and perform inspections, dewatering, and testing with the first inspection scheduled prior to the subsequent period of extended operation. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.E3A and finds it acceptable because inspecting, dewatering, and testing of the in-scope inaccessible medium-voltage power cables exposed to significant moisture is consistent with GALL-SLR Report XI.E3A.

Enhancement 5. SLRA Section B2.1.39 includes an enhancement to the "parameters monitored/inspected" program element to add a step to evaluate adjusting the inspection frequency of manholes based on plant-specific operating experience over time with water collection. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E3A and finds it acceptable because inspection for water accumulation based on plant-specific operating experience with water accumulation over time is consistent with GALL-SLR Report AMP XI.E3A.

Enhancement 6. SLRA Section B2.1.39 includes an enhancement to the "detection of aging effects" and "acceptance criteria" program elements to create a plant-specific inaccessible medium-voltage cable test matrix that will document inspection methods, test methods, and acceptance criteria for the in-scope inaccessible medium-voltage power cables based on operating experience. Testing will be conducted at least once every 6 years. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.E3A and finds it acceptable because developing a plant-specific inaccessible medium-voltage cables testing matrix that documents inspection methods, test methods, acceptance criteria, and testing frequency of every 6 years is consistent with GALL-SLR Report AMP XI.E3A

Enhancement 7. SLRA Section B2.1.39 includes an enhancement to the "monitoring and trending" program element that will include a requirement to review visual inspection and physical test results that are trendable and repeatable, 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 and finds it acceptable because condition monitoring, cable testing, and inspection results, using the same visual inspection and test methods that are trendable and repeatable, provide additional information on the rate of cable or connection insulation degradation and are consistent with GALL-SLR Report AMP XI.E3A.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP XI.E3A, as modified by SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance." 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 B2.1.39 summarizes operating experience related to the Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed operating experience corrective actions program examples provided by Dominion Energy 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements was evaluated.

UFSAR Supplement. SLRA Section A1.39 provides the UFSAR supplement for the Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements 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 Dominion Energy committed to implementing the program enhancements 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 Dominion Energy's Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program, as modified by SLR-ISG-2021-04-ELECTRICAL, "Updated Aging Management Criteria for Electrical Portions of the Subsequent License Renewal Guidance," the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that Dominion Energy 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).

3.0.3.2.23 Metal-Enclosed Bus

SLRA Section B2.1.42 states that the Metal-Enclosed Bus Program is an existing program that will be consistent with the program elements in GALL-SLR Report AMP XI.E4, "Metal-Enclosed Bus," except for the enhancements identified in the SLRA.

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP XI.E4.

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

Enhancement 1. SLRA Section B2.1.42 includes an enhancement to the "scope of program" program element that will add the Metal-Enclosed Bus (MEB) connecting "A" Reserve Station Service Transformer to Bus 1G and Bus 2G to the scope of the program and perform inspections and testing on a 10-year frequency with the first inspection scheduled prior to the subsequent period of extended operation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E4 and finds it acceptable because the scope of the MEB Program is consistent with GALL-SLR Report AMP XI.4.

Enhancement 2. SLRA Section B2.1.42 includes an enhancement to the "parameters monitored/inspected" program element that will add a step for inspecting inaccessible sections of bus duct that require engineering to provide guidance for performance of electrical testing of connections using an ohmmeter, and for performance of visual inspection of the bus duct using a borescope. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E4 and finds it acceptable because demonstrating (e.g., through alternate analysis, inspection, or test) that the inaccessible MEB sections together with the accessible MEB inspection and test program will continue to maintain MEB AMP in a manner that is consistent with the CLB during the subsequent period of extended operation, and that is consistent with GALL-SLR Report AMP XI.E4.

Enhancement 3. SLRA Section B2.1.42 includes an enhancement to the "parameters monitored/inspected" program element. The enhancement will add a note stating that 20 parameters of the accessible bolted connection population, with the maximum of 25, is a representative sample for increased resistance of connection inspections. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E4 and finds it acceptable because the inspection sample criteria are consistent with GALL-SLR Report AMP XI.E4.

Enhancement 4. SLRA Section B2.1.42 includes an enhancement to the "monitoring and trending" program element that will require the transmittal of bus connection resistance values to engineering for trending, to provide information on the rate of connection degradation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.E4 and finds it acceptable because results that are trendable can provide additional information on the rate of degradation and are consistent with GALL-SLR Report AMP XI.E4.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP XI.E4. In addition, the staff reviewed the enhancements associated with the "scope of program," "parameters monitored/inspected," and "monitoring and trending" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B2.1.42 summarizes operating experience related to the MEB Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed operating experience corrective actions program examples provided by Dominion Energy 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the MEB Program was evaluated.

UFSAR Supplement. SLRA Section A1.42 provides the UFSAR supplement to the MEB. 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 Dominion Energy committed to implementing the program enhancements 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 Dominion Energy's MEB Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. The staff also reviewed the enhancements and finds that, when implemented, the AMP will be adequate to manage the applicable aging effects. The staff concludes that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.24 Fatigue Monitoring

SLRA Section B3.1 states that the Fatigue Monitoring Program is an existing program that will be consistent with the program elements in the GALL-SLR Report AMP X.M1, "Fatigue Monitoring," except for the enhancements identified in the SLRA.

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy'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 in GALL-SLR Report AMP X.M1.

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

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 procedural revisions that will require monitoring and tracking of transient cycles associated with the ASME Code, Section XI, Appendix L, regarding fatigue sensitive locations to be performed each inspection interval. Furthermore, consistent with the existing cycle counting program, a surveillance limit will be established to initiate corrective actions prior to exceeding transient cycle assumptions in the ASME Code, Section XI, Appendix L analyses.

The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP X.M1 and finds it acceptable because, when it is implemented, Dominion Energy's Fatigue Monitoring Program will be consistent with the GALL-SLR Report AMP X.M1 and it will ensure that the validity of ASME Code, Section XI, Appendix L, regarding evaluations of fatigue sensitive locations, will be verified. Otherwise, corrective actions will be initiated prior to exceeding cycle counting limits.

Enhancement 2. SLRA Section B3.1 includes an enhancement to the "corrective actions" program element. The enhancement relates to procedural revisions that will expand existing corrective action guidance associated with exceeding a cycle counting surveillance limit, to recommend consideration of component repair, component replacement, performance of a more rigorous analysis, performance of an ASME Code, Section XI, Appendix L flaw tolerance analysis, or scope expansion to consider other locations with the highest expected environmentally-adjusted cumulative usage factor (CUF_{en}) values.

The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP X.M1and finds it acceptable because, when it is implemented, Dominion Energy's Fatigue Monitoring Program will be consistent with the GALL-SLR Report AMP X.M1 for initiating appropriate corrective actions if a cycle counting limit is reached.

Enhancement 3. SLRA Section B3.1 includes an enhancement which relates to procedural revisions that will require that, when a cycle counting action limit is reached, action will be taken to ensure that the analytical bases of the High-Energy Line Break (HELB) locations are maintained.

The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP X.M1 and finds it acceptable because, when it is implemented, Dominion Energy's Fatigue Monitoring Program will be consistent with GALL-SLR Report AMP X.M1 and it will ensure that the supporting basis for determining HELB locations is verified, if cycle counting action limits are reached.

The staff conducted an audit to verify Dominion Energy's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements in GALL-SLR Report AMP X.M1. 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 B3.1 summarizes operating experience related to the Fatigue Monitoring Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Fatigue Monitoring Program was evaluated.

UFSAR Supplement. SLRA Section A2.1 provides the UFSAR supplement for the Fatigue Monitoring. 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 X-01.

The staff also noted that Dominion Energy committed to ongoing implementation of the existing Fatigue Monitoring Program for managing the effects of aging for applicable components during the subsequent period of extended operation.

The staff also noted that Dominion Energy committed (Commitment No 46) to enhance its existing program for SLR in the following manner and will be implemented 6 months prior to the subsequent period of extended operation:

- Procedures will be revised to require monitoring and tracking of transient cycles associated with the ASME Code, Section XI, Appendix L fatigue sensitive locations to be performed each inspection interval. Consistent with the existing cycle counting program, a surveillance limit will be established to initiate corrective actions prior to exceeding transient cycle assumptions in the ASME Code, Section XI, Appendix L analyses.
- Procedures will be revised to expand existing corrective action guidance associated with exceeding a cycle counting surveillance limit to recommend consideration of component repair, component replacement, performance of a more rigorous analysis, performance of an ASME Code, Section XI, Appendix L flaw tolerance analysis, or scope expansion to consider other locations with the highest expected CUF_{en} values.
- Procedures will be revised to require that when a cycle counting action limit is reached, action will be taken to ensure that the analytical bases of the HELB locations are maintained.

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

Conclusion. Based on its review of Dominion Energy's Fatigue Monitoring Program, the staff concludes that those program elements for which Dominion Energy 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 Dominion Energy 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).

3.0.3.2.25 Neutron Fluence Monitoring

SLRA Section B3.2 describes the existing Neutron Fluence Monitoring Program as consistent with GALL-SLR Report AMP X.M2, “Neutron Fluence Monitoring Program,” as modified by SLR-ISG- Mechanical-2021-02, “Updated Aging Management Criteria for Mechanical Portions of the Subsequent License Renewal Guidance.”

Staff Evaluation. During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy’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 Dominion Energy’s program to the corresponding program elements in GALL-SLR Report AMP X.M2, as modified by SLR-ISG- Mechanical-2021-02, Updated Aging Management Criteria for Mechanical Portions of the Subsequent License Renewal Guidance.

During its review of SLRA Section B3.2, the staff identified a difference in the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” and “monitoring and trending” program elements. The staff noted a staff identified exception that Dominion Energy will not monitor for changes in the neutron fluence values of the reactor vessel internal (RVI) components during the subsequent period of extended operation.

The staff noted the RVI components were evaluated by Dominion Energy for their susceptibility to such neutron radiation damage mechanisms (including gas irradiation embrittlement, irradiation-assisted stress corrosion cracking, irradiation-enhanced stress relaxation or creep and void swelling or neutron induced component distortion). Furthermore, this evaluation explicitly considered plant-specific 80-year neutron fluence values for RVI components, which were calculated using NRC-approved methodologies, a plant-specific RVI component model, and a plant-specific core neutron source conforming to RG 1.190.

The staff reviewed this difference against the corresponding program elements in GALL-SLR Report AMP X.M2 and finds it acceptable because during the subsequent period of extended operation, RVI components will be inspected for neutron radiation damage mechanisms in accordance with Dominion Energy’s PWR Vessel Internals Program. As such, neutron fluence monitoring of the RVIs is not necessary since these RVI components will be periodically inspected to ensure that the effects of aging will be adequately managed. The staff’s evaluation of the PWR Vessel Internals Program is documented in SER Section 3.0.3.2.3.

The staff conducted an audit to verify Dominion Energy’s claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, the staff finds that the “acceptance criteria” and “corrective actions” program elements are consistent with the corresponding program elements in GALL-SLR Report AMP X.M2.

The staff also finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” and “monitoring and trending” program elements associated with this staff-identified difference are adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B3.2 summarizes operating experience related to the Neutron Fluence Monitoring Program. The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML21036A060), the staff reviewed the plant operating experience information provided in the basis documents 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 regarding 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 Dominion Energy should modify its proposed program. Based on its audit and its review of the application, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Neutron Fluence Monitoring Program was evaluated.

UFSAR Supplement. SLRA Section A2.2 provides the UFSAR supplement for the Neutron Fluence Monitoring 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 X-01. The staff also noted that Dominion Energy committed (Commitment No. 47) to ongoing implementation of the existing Neutron Fluence 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 UFSAR supplement is an adequate summary description of the program.

Conclusion. Based on its review of Dominion Energy's Neutron Fluence Monitoring Program, the staff concludes that those program elements for which Dominion Energy claimed consistency with the GALL-SLR Report are consistent. In addition, the staff reviewed a staff-identified difference between Dominion Energy's program and GALL-SLR Report X.M2, as modified by SLR-ISG-Mechanical-2021-02, "Updated Aging Management Criteria for Mechanical Portions of the Subsequent License Renewal Guidance," and concludes that the AMP, with the exception, is adequate to manage the applicable aging effects. The staff concludes that Dominion Energy 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).

3.0.3.3 AMPs Not Consistent with or Not Addressed in the GALL-SLR Report

3.0.3.3.1 Monitoring of Neutron-Absorbing Materials Other Than Boraflex

SLRA Tables 3.3.1, "Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of the GALL-SLR Report," and B1.1, "Correlation: NUREG-2191 Program with NAPS Program," state that NAPS does not have in-scope Boral®; boron steel, and other materials (excluding Boraflex) in spent fuel storage racks or neutron-absorbing sheets in spent fuel storage racks exposed to treated borated water or treated water in the Auxiliary Systems. Based on these statements, Dominion Energy did not use the associated NUREG-2191 AMP, "XI.M40, Monitoring of Neutron-Absorbing Materials other than Boraflex," and in addition AMR item 3.3.1-102 was not used.

The staff reviewed NAPS's SLRA and UFSAR to verify Dominion Energy's claim that NAPS does not have in-scope Boral®; boron steel, and other materials (excluding Boraflex) in spent fuel storage racks or neutron-absorbing sheets in spent fuel storage racks exposed to treated borated water or treated water in the Auxiliary Systems. Based on a review of the SLRA and

UFSAR, the staff confirms that NAPS does not have in-scope Boral®; boron steel, and other materials in spent fuel storage racks or neutron-absorbing sheets in spent fuel storage racks exposed to treated borated or treated water.

3.0.4 QA Program Attributes Integral to Aging Management Programs

The regulations at 10 CFR 54.21(a)(3) require license renewal applicants to demonstrate that for SCs subject to 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. NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" (SRP-SLR), Appendix A.1, Branch Technical Position (BTP) RLSB-1, "Aging Management Review—Generic," describes 10 elements of an acceptable AMP. Program elements 7, 8, and 9 are associated with the QA activities of corrective actions, confirmation process, and administrative controls, respectively. BTP RLSB-1 Table A.1-1, "Elements of an Aging Management Program for Subsequent License Renewal," provides the following description of these program elements:

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

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

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

NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" (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. Additionally, 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 [aging management program], consistent with the CLB of the facility, for the subsequent period of extended operation.
- For nonsafety-related structures and components that are subject to an AMR, an applicant has the option to expand the scope of its 10 CFR Part 50 Appendix B Program to include these SCs to address the corrective actions [program element 7], confirmation process [program element 8], and administrative controls [program element 9] for aging management during the subsequent period of extended operation. The reviewer verifies that the applicant has documented such a commitment in the Final Safety Analysis Report supplement in accordance with 10 CFR 54.21(d).
- If an applicant chooses an alternative means to address corrective actions, the confirmation process, and administrative controls for managing aging of nonsafety-related SCs that are subject to an AMR for SLR, the applicant's

proposal is reviewed on a case-by-case basis following the guidance in BTP RLSB-1 (Appendix A.1 of this SRP-SLR).

3.0.4.1 Summary of Technical Information in Application

SLRA Appendix A, "UFSAR 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 action, confirmation process, and administrative controls that are applied to the AMPs for both safety-related and nonsafety-related components.

SLRA Appendix A, Section A1, states:

> 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 (SCs) subject to AMPs.

SLRA Appendix B, Section B.1.3, states:

> 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)."

3.0.4.2 Staff Evaluation

The staff reviewed SLRA Appendix A, Section A1, and Appendix B, Section B1.3, which describe how the applicant's existing QA Program includes the quality assurance-related elements (corrective actions, confirmation process, and administrative controls) for AMPs, which are consistent with the staff's guidance described in Branch Technical Position IQMB-1. During the staff's in-office audit (ADAMS Accession No. ML21036A060), the staff also reviewed a sample of the applicant's AMP basis documents and confirmed that the AMPs will implement the corrective action program, confirmation processes, and administrative controls, as described in the SLRA. Based on its review, the staff determined that the quality assurance attributes presented in the AMP basis documents and the associated AMPs are consistent with the staff's position regarding QA for aging management.

3.0.4.3 Conclusion

Based on 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, Branch Technical Position 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 CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.0.5 Operating Experience for Aging Management Programs

3.0.5.1 Summary of Technical Information in the Application

SLRA Appendix A, "UFSAR Supplement," Section A1, "Summary Descriptions of Aging Management Programs," and SLRA Appendix B, "Aging Management Programs," Section B1.4, "Operating Experience," describe the consideration of operating experience for AMPs. SLRA Sections A1 and B1.4 state that the applicant will conduct a systematic review of plant-specific and industry operating experience concerning aging management and age-related degradation to ensure that the subsequent license renewal AMPs will be effective in managing the aging effects for which they are credited. The SLRA states that operating experience for the programs credited with managing the effects of aging will be reviewed to identify corrective actions that may result in program enhancements.

3.0.5.2 Staff Evaluation

3.0.5.2.1 Overview

In accordance with 10 CFR 54.21(a)(3), an applicant is required to demonstrate that the effects of aging on SCs subject to an AMR will be adequately managed so that their intended functions will be maintained in a way that is consistent with the CLB for the subsequent period of extended operation. NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants – Final Report (SRP-SLR)," Appendix A.4, "Operating Experience for Aging Management Programs," states that the systematic review of plant-specific and industry operating experience, including relevant research and development concerning aging management and age-related degradation ensures that the SLR AMPs are, and will continue to be, effective in managing the aging effects for which they are credited. In addition, the SRP-SLR states that the AMPs should either be enhanced, or new AMPs developed, as appropriate, when it is determined through the evaluation of operating experience that the effects of aging may not be adequately managed. AMPs should be informed by the review of operating experience on an ongoing basis, regardless of the AMP's implementation schedule.

3.0.5.2.2 Consideration of Future Operating Experience

The staff reviewed SLRA Sections A1 and B1.4 to determine how the applicant will use future operating experience to ensure that the AMPs are effective. The staff evaluated the applicant's operating experience review activities, as described in the SLRA. The staff's evaluations with respect to these SRP-SLR sections follow in SER Sections 3.0.5.2.3 and 3.0.5.2.4, respectively.

3.0.5.2.3 Acceptability of Existing Programs

SRP-SLR Section A.4.2, “Position,” describes existing programs generally acceptable to the staff for the capture, processing, and evaluation of operating experience concerning age-related degradation and aging management during the term of a renewed operating license. The acceptable programs are those relied on to meet the requirements of Appendix B to 10 CFR Part 50 and item I.C.5, “Procedures for Feedback of Operating Experience to Plant Staff,” in NUREG-0737, “Clarification of TMI [Three Mile Island] Action Plan Requirements,” dated November 1980 (ADAMS Accession No. ML051400209), as incorporated into the licensee’s technical specifications. SRP-SLR Section A.4.2 also states that, as part of meeting the requirements of NUREG-0737, item I.C.5, the applicant’s Operating Experience Program should rely on active participation in the Institute of Nuclear Power Operations (INPO) Operating Experience Program (formerly the INPO Significant Event Evaluation and Information Network (SEE IN)) endorsed in GL 82-04, “Use of INPO SEE IN Program,” dated March 9, 1982).

SLRA Sections A1 and B1.4 state that the applicant uses its Operating Experience Program to capture and systematically review operating experience from plant-specific and industry sources. The applicant stated that the Operating Experience Program meets the requirements of 10 CFR 50, Appendix B and NUREG-0737. The applicant further stated that the Operating Experience Program interfaces with and relies on active participation in the INPO Operating Experience Program. Based on this information, the staff determined that the applicant’s Operating Experience Program is consistent with the programs described in SRP-SLR Section A.4.2.

3.0.5.2.4 Areas of Further Review

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

SLRA Sections A1 and B1.4 state that operating experience from plant-specific and industry sources are captured and systematically reviewed on an ongoing basis in accordance with the QA Program, which is consistent with Appendix B to 10 CFR Part 50, and the Operating Experience Program, which is consistent with NUREG-0737, item I.C.5. Sections A1 and B1.4 state that the ongoing evaluation of operating experience included a review of corrective actions, which may result in program enhancements. The SLRA states that trending reports, program health reports, assessments, and corrective action 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 QA Program, the corrective action program, and the Operating Experience Program would not preclude consideration of age-related operating experience, which is consistent with the guidance in SRP-SLR Section A.4.2.

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

SLRA Appendix A, “UFSAR 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,” 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. SER Section 3.0.4 documents the staff’s evaluation of SLRA Sections A1 and 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 operating experience and evaluated accordingly.

SLRA Sections A1 and B1.4 state that the sources of external operating experience include the INPO Operating Experience Program, GALL-SLR Report revisions, and other NRC review and guidance documentation.

The staff finds that the applicant will consider an appropriate breadth of industry operating experience for impacts to its aging management activities, which includes sources that the staff considers to be the primary sources of external operating experience information. Based on the completion of the staff’s review and the consistency of consideration of guidance documents as industry operating experience with the guidance in SRP-SLR, Section A.4.2, the staff finds it acceptable.

Screening of Incoming Operating Experience. SRP-SLR Section A.4.2 states that all incoming plant-specific and industry operating experience should be screened to determine whether it involves age-related degradation or impacts to aging management activities.

SLRA Sections A1 and B1.4 state that internal and external operating experience is captured and systematically reviewed on an ongoing basis. Site-specific and industry operating experience items are screened to determine whether they involve lessons learned that may impact AMPs. Items are evaluated, and affected AMPs are either enhanced or new AMPs are developed, as appropriate, when it is determined that the effects of aging are not adequately managed. The staff finds that the applicant’s operating experience review processes will include screening of all new operating experience to identify and evaluate items that have the potential to impact the aging management activities. Based on the completion of the staff’s review and the consistency of screening of incoming operating experience with the guidance in SRP-SLR, Section A.4.2, the staff finds Dominion Energy’s screening of incoming operating experience process acceptable.

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

SLRA Sections A1 and B1.4 state that the corrective action program identifies either plant-specific operating experience related to aging or industry operating experience related to aging, allowing the tracking and trending of this information. Based on the completion of the staff’s review and the consistency of the identification of operating experience related to aging with the guidance in SRP-SLR, Section A.4.2, the staff finds it acceptable.

Information Considered in Operating Experience Evaluations. SRP-SLR Section A.4.2 states that operating experience identified as involving aging should receive further evaluation based on consideration of 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 action program to either enhance the AMPs or develop and implement new AMPs if an operating experience evaluation finds that the effects of aging may not be adequately managed.

SLRA Sections A1 and 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 will either be enhanced or new AMPs will be developed, as appropriate.

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

Evaluation of AMP Implementation Results. SRP-SLR Section A.4.2 states that the results of implementing the AMPs, such as data from inspections, tests, and analyses, should be evaluated regardless of whether the acceptance criteria of the particular AMP have been met. SRP-SLR Section A.4.2 states that this information should be used to determine whether it is necessary to adjust the inspection activities for aging management. In addition, SRP-SLR Section A.4.2 states that actions should be initiated within the plant corrective action program to either enhance the AMPs or develop and implement new AMPs, if these evaluations indicate that the effects of aging may not be adequately managed.

SLRA Section B1.4 states internal operating experience includes event investigations, trending reports, and lessons learned from in-house events as captured in program health reports, program assessments, and in the 10 CFR Part 50, Appendix B corrective action program. In addition, SLRA Section B1.4 states that AMPs will either be enhanced or new AMPs will be developed, as appropriate, when it is determined, through the evaluation of operating experience, that the effects of aging may not be adequately managed. SLRA Section B1.4 states that the Operating Experience Program also meets the requirements of NEI 14-12, "Aging Management Program Effectiveness," for periodic program assessments. In addition, SLRA Section B1.4 states that AMP and operating experience assessments will be performed on a periodic basis, at intervals not to exceed 5 years.

Based on the completion of the staff's review and the consistency of the applicant's treatment of AMP implementation results as operating experience with the guidance in SRP-SLR, Section A.4.2, the staff finds it acceptable.

Training. SRP-SLR Section A.4.2 states that training on age-related degradation and aging management should be provided to those personnel responsible for implementing the AMPs and those personnel who may submit, screen, assign, evaluate, or otherwise process plant-specific and industry operating experience. SRP-SLR Section A.4.2 also states that the training should be periodic and include provisions to accommodate the turnover of plant personnel.

SLRA Sections A1 and B1.4 state that the Operating Experience Program provides for training of plant personnel responsible for activities including screening, evaluating, and communicating operating experience items related to aging management and aging-related degradation.

Based on the completion of the staff's review and the consistency of the scope of personnel included in the applicant's training program with the guidance in SRP-SLR, Section A.4.2, the staff finds it acceptable.

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

Based on the completion of the staff's review and the consistency of the applicant's reporting of its operating experience to the industry with the guidance in SRP-SLR, Section A.4.2, the staff finds it acceptable.

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

Sections A1 and B1.4 state that the applicant's self-assessment process provides for periodic evaluation of the effectiveness of the Operating Experience Program described in the UFSAR supplement. SLRA Sections A1 and B1.4 state that the Operating Experience Program will be implemented on an ongoing basis throughout the terms of the renewed licenses. SLRA Section A1 provides the UFSAR supplement summary description of the applicant's enhanced programmatic activities for ongoing review of the operating experience. Upon issuance of the renewed licenses in accordance with 10 CFR 54.31(c), this summary description will be incorporated into the CLB, and, at that time, the applicant will be obligated to conduct its operating experience review activities accordingly.

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

Based on its review of the SLRA, the staff determined that the applicant's programmatic activities for the ongoing review of operating experience are acceptable for (a) the systematic review of plant-specific and industry operating experience to ensure that the license renewal AMPs are, and will continue to be, effective in managing the aging effects for which they are credited; and (b) the enhancement of AMPs or development of new AMPs when it is determined through the evaluation of operating experience that the effects of aging may not be adequately managed. Based on the completion of the staff's review and the consistency of the applicant's operating experience review activities with the guidance in SRP-SLR, Section A.4.2, the staff finds the applicant's programmatic activities for the ongoing review of operating experience acceptable.

3.0.5.2.5 Conclusion

Based on its review of the SLRA, the staff determined that the applicant's programmatic activities for the ongoing review of operating experience are acceptable for (a) the systematic review of plant-specific and industry operating experience to ensure that the license renewal AMPs are, and will continue to be, effective in managing the aging effects for which they are credited and (b) the enhancement of AMPs or development of new AMPs when it is determined through the evaluation of operating experience that the effects of aging may not be adequately managed. Based on the staff's review and the consistency of the applicant's operating experience review activities with the guidance in SRP-SLR, Section 4.2, the staff finds the applicant's programmatic activities for the ongoing review of operating experience acceptable.

3.0.5.2.6 UFSAR Supplement

In accordance with 10 CFR 54.21(d), the UFSAR supplement must contain a summary description of the programs and activities for managing the effects of aging. SLRA Section A1 provides the UFSAR supplement summary description of the applicant's programmatic activities for the ongoing review of operating experience that will ensure that plant-specific and industry operating experience related to aging management will be used effectively.

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

3.0.5.3 Conclusion

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

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

3.1.1 Summary of Technical Information in the Application

SLRA Section 3.1 provides AMR results for those components the applicant identified in SLRA Section 2.3.1, "Reactor Vessel, Internals, and Reactor Coolant System," 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 AMR results with those provided in the GALL-SLR Report for the reactor coolant system (RCS) components and component groups.

3.1.2 Staff Evaluation

Table 3.1-1, below, summarizes the 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 Evaluated in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1.1-001	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.1)
3.1.1-002	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.1)
3.1.1-003	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.1)
3.1.1-004	Not applicable to NAPS (see SER Section 3.1.2.2.1)
3.1.1-005	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.1)
3.1.1-006	Not applicable to PWRs (see SER Section 3.1.2.2.1)
3.1.1-007	Not applicable to PWRs (see SER Section 3.1.2.2.1)
3.1.1-008	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.1)
3.1.1-009	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.1)
3.1.1-010	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.1)
3.1.1-011	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.1)
3.1.1-012	Consistent with the GALL-SLR Report (See SER Section 3.1.2.2.2)
3.1.1-013	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.3, item 1)
3.1.1-014	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.3, item 2)
3.1.1-015	Not applicable to NAPS (see SER Sections 3.1.2.1.1)
3.1.1-016	Not applicable to PWRs (see SER Section 3.1.2.2.4)
3.1.1-017	Not applicable to PWRs (see SER Section 3.1.2.1.1)
3.1.1-018	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.5)
3.1.1-019	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.6, item 1)
3.1.1-020	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.6, item 2)
3.1.1-021	Not applicable to PWRs (see SER Section 3.1.2.1.1)
3.1.1-022	Not applicable to NAPS (see SER Sections 3.1.2.1.1 and 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 SER Section 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 SER Section 3.1.2.2.9)
3.1.1-029	Not applicable to PWRs (see SER Section 3.1.2.2.12)
3.1.1-030	Not applicable to PWRs
3.1.1-031	Not applicable to PWRs
3.1.1-032	Not applicable to NAPS (See SER Section 3.1.2.2.5)
3.1.1-033	Consistent with the GALL-SLR Report. (See SER Section 3.1.2.1.2, item 1)
3.1.1-034	Not applicable to NAPS
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

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1.1-038	Consistent with the GALL-SLR Report
3.1.1-039	Consistent with the GALL-SLR Report
3.1.1-040	Consistent with the GALL-SLR Report
3.1.1-040a	Consistent with the GALL-SLR Report
3.1.1-041	Not applicable to PWRs (see SER 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 (See Section 3.1.2.2.13, item 1)
3.1.1-051a	Not applicable to NAPS (see SER Sections 3.1.2.1.1)
3.1.1-051b	Not applicable to NAPS (see SER Sections 3.1.2.1.1)
3.1.1-052a	Not applicable to NAPS (see SER Sections 3.1.2.1.1)
3.1.1-052b	Not applicable to NAPS (see SER Sections 3.1.2.1.1)
3.1.1-052c	Not applicable to NAPS (see SER Sections 3.1.2.1.1)
3.1.1-053a	Consistent with the GALL-SLR Report as updated per SLR-ISG-2021-01-PWRVI (see SER Section 3.1.2.2.9)
3.1.1-053b	Consistent with the GALL-SLR Report as updated per SLR-ISG-2021-01-PWRVI (see SER Section 3.1.2.2.9)
3.1.1-053c	Consistent with the GALL-SLR Report as updated per SLR-ISG-2021-01-PWRVI (see SER Section 3.1.2.2.9)
3.1.1-054	Consistent with the GALL-SLR Report
3.1.1-055a	Not applicable to NAPS (see SER Section 3.1.2.1.1)
3.1.1-055b	Not applicable to NAPS (see SER Section 3.1.2.1.1)
3.1.1-055c	Consistent with the GALL-SLR Report as updated per SLR-ISG-2021-01-PWRVI (see SER Section 3.1.2.2.9)
3.1.1-056a	Not applicable to NAPS (see SER Section 3.1.2.1.1)
3.1.1-056b	Not applicable to NAPS (see SER Section 3.1.2.1.1)
3.1.1-056c	Not applicable to NAPS (see SER Section 3.1.2.1.1)
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 NAPS (see SER Section 3.1.2.1.1)
3.1.1-058b	Not applicable to NAPS (see SER Section 3.1.2.1.1)
3.1.1-059a	Consistent with the GALL-SLR Report as updated per SLR-ISG-2021-01-PWRVI (see SER Section 3.1.2.2.9)
3.1.1-059b	Consistent with the GALL-SLR Report as updated per SLR-ISG-2021-01-PWRVI (see SER Section 3.1.2.2.9)
3.1.1-059c	Consistent with the GALL-SLR Report as updated per SLR-ISG-2021-01-PWRVI (see SER Section 3.1.2.2.9)
3.1.1-060	Not applicable to PWRs
3.1.1-061	Consistent with the GALL-SLR Report
3.1.1-062	Not Used. Addressed by 3.1.1-092
3.1.1-063	Not applicable to PWRs

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1.1-064	Consistent with the GALL-SLR Report
3.1.1-065	Not applicable to NAPS
3.1.1-066	Not Used. Addressed by 3.1.1-067
3.1.1-067	Consistent with the GALL-SLR Report
3.1.1-068	Not applicable to NAPS (See SER Section 3.1.2.1.1)
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 SER Section 3.1.2.1.2 item 2 and SER Section 3.1.2.2.3 item 3)
3.1.1-072	Consistent with the GALL-SLR Report
3.1.1-073	Not applicable to NAPS
3.1.1-074	Consistent with the GALL-SLR Report
3.1.1-075	Not applicable to NAPS
3.1.1-076	Consistent with the GALL-SLR Report (see SER Section 3.1.2.1.3, item 1)
3.1.1-077	Consistent with the GALL-SLR Report (see SER Section 3.1.2.1.3, item 2)
3.1.1-078	Not applicable to NAPS
3.1.1-079	Not applicable to PWRs
3.1.1-080	Not applicable to NAPS
3.1.1-081	Not applicable to NAPS
3.1.1-082	Not applicable to NAPS
3.1.1-083	Not Used. Addressed by 3.3.1-012
3.1.1-084	Not applicable to PWRs
3.1.1-085	Not applicable to PWRs
3.1.1-086	Not applicable to NAPS
3.1.1-087	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.5)
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	Consistent with the GALL-SLR Report
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 SER Section 3.1.2.1.1)
3.1.1-100	Not applicable to PWRs
3.1.1-101	Not applicable to PWRs
3.1.1-102	Not applicable to PWRs
3.1.1-103	Not applicable to PWRs (see SER Section 3.1.2.1.1)
3.1.1-104	Not applicable to PWRs
3.1.1-105	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.15)
3.1.1-106	Not applicable to NAPS
3.1.1-107	Consistent with the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
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 NAPS (see SER Section 3.1.2.2.15)
3.1.1-116	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.10)
3.1.1-117	Not used. Addressed by 3.1.1-119 (see SER Section 3.1.2.2.6, item 2)
3.1.1-118	Not used. Addressed by 3.1.1-053a, 3.1.1-053b, and 3.1.1-053c. (see SER Section 3.1.2.2.5)
3.1.1-119	Consistent with the GALL-SLR Report as updated per SLR-ISG-2021-01-PWRVI (see SER Sections 3.1.2.2.9 and 3.1.2.2.10)
3.1.1-120	Not applicable to PWRs (see SER 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 SER 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	Consistent with the GALL-SLR Report
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 SER Section 3.1.2.2.16)
3.1.1-137	Consistent with the GALL-SLR Report
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 SER Section 3.1.2.2.6, item 3)

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

(1) SER Section 3.1.2.1 discusses AMR results for components that the applicant states are either not applicable to NAPS 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 requests for additional information (RAIs) issued and the staff's conclusions. The remaining subsections in SER Section 3.1.2.1 document the review of components that required additional information or otherwise require explanation.

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

(3) SER Section 3.1.2.3 discusses AMR results for components that the applicant states are not consistent with, or not addressed in, the GALL-SLR Report. These AMR results 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 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. 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 RAI applies, the GALL-SLR Report provides a basis for acceptability of the AMR item. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SER Table 3.1-1, and no separate writeup is required or provided. For AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in Sections 3.1.2.1.2 through 3.1.2.1.4 below.

Section 3.1.2.1.1 documents the staff's review of AMR items for which the GALL-SLR Report does not recommend further evaluation that the applicant determined to either not be applicable or not used.

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

For SLRA Table 3.1.1, items 3.1.1-004, 3.1.1-022, 3.1.1-032, 3.1.1-034, 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, 3.1.1-082, 3.1.1-086, 3.1.1-106, and 3.1.1-115, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to NAPS. The staff reviewed the SLRA and UFSAR and confirmed that the applicant's SLRA does not have any AMR results that are applicable for these items, no in-scope components in corresponding environments.

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 (BWRs). The staff reviewed the SRP-SLR, confirmed that these items only apply to BWRs, and finds that these items are not applicable to NAPS because it is a PWR.

For SLRA Table 3.1.1, items 3.1.1-015, 3.1.1-051a, 3.1.1-051b, 3.1.1-052a, 3.1.1-052b, 3.1.1-052c, 3.1.1-055a, 3.1.1-055b, 3.1.1-056a, 3.1.1-056b, 3.1.1-056c, 3.1.1-058a, and 3.1.1-058b, Dominion Energy claimed that they were not applicable because NAPS has Westinghouse RVI components. The associated NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," aging items are not used. The staff confirmed that these items are associated only with Babcock & Wilcox and Combustion Engineering and, therefore, finds the applicant's claim acceptable.

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), 3.1.1-062 (addressed by 3.1.1-092), 3.1.1-066 (addressed by 3.1.1-067), 3.1.1-083 (addressed by 3.1.1-012), 3.1.1-114 (addressed 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), 3.1.1-117 (addressed by 3.1.1-119; see SER Section 3.1.2.2.6), and 3.1.1-118 (addressed by 3.1.1-053a, 3.1.1-053b, and 3.1.1-053c). The staff reviewed the SLRA and confirmed that the aging effects will be addressed by other SLRA Table 1 items. Therefore, the staff finds Dominion Energy's proposal to use alternate items acceptable.

3.1.2.1.2 Cracking Due to Stress Corrosion Cracking

Item 1. SLRA Table 3.1.1, AMR item 3.1.1-033, addresses cracking due to SCC for Class 1 reactor coolant pressure boundary components made of stainless steel or steel with stainless steel cladding and 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 exposed to reactor coolant. The AMR item cites plant-specific note 2, which states, "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."

Based on its review of components associated with AMR item 3.1.1-033 for which Dominion Energy cited generic note E, the staff finds Dominion Energy's proposal to manage the effects of aging using the Steam Generators and Water Chemistry Programs acceptable because the Steam Generators Program monitors the condition of the steel with stainless steel cladding channel heads and the use of the Water Chemistry Program to manage cracking due to SCC is consistent with the GALL-SLR Report.

Item 2. 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, nickel-alloy steam generator (SG) U-bend supports including antivibration bars exposed to secondary feedwater or steam. For the SLRA Table 2 AMR item that cites 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 stainless steel feedwater nozzle thermal sleeves exposed to treated water greater than 60 C (greater than 140 F). The AMR item cites plant-specific note 5, which states, in part, "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…for the feedwater nozzle thermal sleeve."

Based on its review of components associated with AMR item 3.1.1-071 for which Dominion Energy cited generic note E, the staff finds Dominion Energy's proposal to manage cracking due to SCC for the stainless steel feedwater nozzle thermal sleeves using the ASME Section XI Program and the Water Chemistry Program acceptable because the use of the Water Chemistry Program to manage cracking due to SCC is consistent with the GALL-SLR and because the ASME Section XI Program will provide visual inspections that are capable of detecting cracking.

3.1.2.1.3 Loss of Material Due to Wear and Fretting

Item 1. 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 antivibration bars exposed to secondary feedwater or steam. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the ASME Section XI program to manage loss of material due to wear and fretting for the stainless steel feedwater nozzle thermal sleeves exposed to treated water greater than 60 C (greater than 140 F). The AMR item cites plant-specific note 5, which states, in part, "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 for the feedwater nozzle thermal sleeve."

Based on its review of components associated with AMR item 3.1.1-076 for which Dominion Energy cited generic note E, the staff finds Dominion Energy's proposal to manage loss of material due to wear and fretting for the stainless steel feedwater nozzle thermal sleeves using the ASME Section XI Program acceptable because the ASME Section XI Program will provide visual inspections that are capable of detecting loss of material.

Item 2. SLRA Table 3.1.1, AMR item 3.1.1-077, and time-limited aging analysis (TLAA) 4.7.8, "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 greater than 60 C (greater than 140 F). The AMR item cites plant-specific note 3, which states, "Wear of steam generator tubes at the tube support plates is a plant-specific TLAA, evaluated in Steam Generator Tube Wear Evaluation (4.7.8)."

Based on its review of components associated with AMR item 3.1.1-077 for which Dominion Energy cited generic note E, the staff finds Dominion Energy'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 uses the Steam Generators Program, which is consistent with the GALL-SLR, to manage loss of material.

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 and tubesheets exposed 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 and the stainless steel primary inlet and outlet nozzle safe ends exposed to reactor coolant. The AMR items cite 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 loss of material due to boric acid corrosion for the primary inlet and outlet nozzle and safe-end."

Based on its review of components associated with AMR item 3.1.1-127 for which Dominion Energy cited generic note E, the staff finds Dominion Energy'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 because the use of the Water Chemistry Program to manage loss of material is consistent with the GALL-SLR and because the ASME Section XI Program will provide visual inspections that are capable of detecting boric acid corrosion.

3.1.2.1.5 Aging Management of Pressurized Water Reactor Vessel Internals

SLRA Table 3.1.1, AMR item 3.1.1-032 addresses cracking and loss of material due to wear for stainless steel and nickel alloy reactor vessel internal core support structure components exposed to reactor coolant and neutron flux. Dominion Energy stated that this item is not applicable. The staff evaluated Dominion Energy's claim and finds it acceptable because the staff verified Dominion Energy's statement that it has no in-scope reactor vessel internal core support structure components that are not already referenced as ASME Code, Section XI, Examination Category B-N-3 core support structure components in the Existing Programs Components inspection category in MRP-227, Revision 1-A. The staff noted that aging management of Westinghouse Existing Programs Components is adequately addressed by AMR items 3.1.1-053c and 3.1.1-059c in SLRA Table 3.1.1. The staff also noted that this generic SRP-SLR Table 3.1-1 item (item ID 032) has been deleted per the SRP-SLR updates provided in SLR-ISG-2021-01-PWRVI because MRP-227, Revision 1-A Existing Programs component categorizations adequately cover aging management of ASME Code, Section XI, Examination Category B-N-3 core support structure components.

SLRA Table 3.1.1, AMR item 3.1.1-087 addresses loss of material due to pitting and crevice corrosion for stainless steel and nickel alloy reactor vessel internal components exposed to reactor coolant and neutron flux. In AMR item 3.1.1-087, Dominion Energy stated that this item is not applicable based on the assertion that loss of material due to wear for reactor vessel internal components exposed to reactor coolant and neutron flux is addressed by AMR items 3.1.1-054, 3.1.1-059a, 3.1.1-059b, and 3.1.1-059c in SLRA Table 3.1.1. The staff evaluated Dominion Energy's claim of non-applicability for AMR item 3.1.1-087 and determined the need for additional information, which resulted in the issuance of an RAI. RAI B2.1.7-1 and Dominion Energy's response are documented at ADAMS Accession No. ML21119A287.

In its response to RAI B2.1.7-1, Dominion Energy asserted that loss of material due to pitting and crevice corrosion is not an aging effect requiring management for the reactor vessel internal components. As a basis for this assertion, Dominion Energy discussed the generic screenings and evaluations of active aging degradation mechanisms that supported the development of MRP-227, Rev. 1-A (Reference 2) and the applicant's PWR Vessel Internals AMP. Dominion Energy stated that the development of the PWR Vessel Internals AMP for SLR determined that neither pitting nor crevice corrosion are identified as screened-in aging degradation mechanisms for any of the in-scope reactor vessel internal components at NAPS. Dominion Energy also stated that loss of material due to pitting and crevice corrosion is not expected in the nearly oxygen-free environment of the PWR reactor coolant system (RCS). Based on these arguments, Dominion Energy claimed that AMR item 3.1.1-087 in SLRA Table 3.1.1 is not applicable and no addition to the SLRA Table 3.1.2-2 AMR results for reactor vessel internal components is required.

During its evaluation of Dominion Energy's response to RAI B2.1.7-1, the staff noted that the applicant's claim that loss of material due to pitting and crevice corrosion is not an aging effect requiring management is not consistent with Element 2 (Preventive Actions) of the PWR Vessel Internals AMP or the NRC staff guidance in SRP-SLR Report, Appendix A, Branch Technical Position (BTP) RLSB-1. Specifically, the PWR Vessel Internals AMP is identified as being consistent with GALL-SLR Report AMP XI.M16, which includes Element 2, Preventive Actions. Element 2 of GALL-SLR Report AMP XI.M16A relies on PWR water chemistry control to prevent or mitigate aging effects that can be induced by corrosive aging mechanisms, including loss of material due to pitting and crevice corrosion. For this purpose, Element 2 specifies that reactor coolant water chemistry is monitored and maintained in accordance with the Water Chemistry

Program, as described in GALL-SLR Report AMP XI.M2, “Water Chemistry.” Further, BTP RLSB-1 states that an aging effect should be identified as applicable for SLR even if there is a prevention or mitigation program associated with that aging effect. As an example, the BTP cites water chemistry for preventing or mitigating corrosion; the BTP states that corrosion should be identified as applicable for SLR; and the AMR should consider the adequacy of the AMP referencing water chemistry.

The staff also noted that the generic screenings and evaluations of active aging degradation mechanisms cited by Dominion Energy are for determining component inspection criteria. As such, the generic screenings and evaluations support those AMP elements (e.g., Elements 3, 4, and 5 of the GALL-SLR Report AMP XI.M16A) that involve the detection and monitoring of aging effects based on performing component inspections (e.g., visual inspections, ultrasonic tests). The generic screenings and evaluations do not address the management of water chemistry, per GALL-SLR AMP Element 2 and Row 087 of SRP-SLR Table 3.1-1, as a means to prevent pitting and crevice corrosion. Therefore, the RAI response discussion of generic screenings and evaluations of aging degradation is not germane to the issues raised by the staff in RAI B2.1.7-1. The staff also noted that the reason that pitting and crevice corrosion were not considered in the generic screenings and evaluations is because these generic analyses are based on a presumption that pitting & crevice corrosion are prevented from occurring due to the maintenance of acceptable PWR primary water chemistry. It is for these reasons that both Element 2 of GALL-SLR AMP XI.M16A and SRP-SLR Row 087 recommend the use of the Water Chemistry AMP to manage loss of material due to pitting and crevice corrosion.

The staff discussed these issues with Dominion Energy during public meetings held on May 13 and May 27, 2021. The public meeting summaries are available at ADAMS Accession Nos. ML21145A211 and ML21221A129. As a result of these discussions, Dominion Energy issued a followup response to RAI B2.1.7-1. RAI B2.1.7-1 and Dominion Energy’s followup response are documented at ADAMS Accession No. ML21210A396. In its followup response to RAI B2.1.7-1, Dominion Energy stated that the existing NAPS Water Chemistry AMP is consistent with GALL-SLR Report AMP XI.M2 for preventive actions and is a mitigation program that does not provide for detection of any aging effects for in-scope components. Dominion Energy stated that the objective of the program is to mitigate loss of material due to corrosion and cracking due to SCC for stainless steel and nickel alloy components exposed to reactor coolant. The applicant revised SLRA Table 3.1.1, AMR item 3.1.1-087, to state that this item is consistent with the GALL-SLR Report. The applicant also revised SLRA Table 3.1.2-2 AMR results for the internals to include two new generic line items that cite AMR item 3.1.1-087.

During its evaluation of Dominion Energy’s followup response to RAI B2.1.7-1, the staff verified that Dominion Energy’s revisions to SLRA Table 3.1.1, AMR item 3.1.1-087, and SLRA Table 3.1.2-2 are consistent with the recommendations of SRP-SLR Report Table 3.1-1, Row 087, and GALL-SLR Report Item IV.B2.RP-24. The staff finds Dominion Energy’s followup RAI response and SLRA revisions acceptable because they show that loss of material due to pitting and crevice corrosion are applicable for the reactor vessel internal components. Further, the aging effect and degradation mechanisms are managed by the Water Chemistry AMP as a preventive action, consistent with Element 2 of the NAPS PWR Vessel Internals AMP.

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 certain RCS components as recommended by the GALL-SLR Report and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria contained in SRP-SLR Section 3.1.2.2. The following subsections document the staff's review.

3.1.2.2.1 Cumulative Fatigue Damage

SLRA Section 3.1.2.2.1, associated with SLRA Table 3.1.1 items 3.1.1-001, 3.1.1-002, 3.1.1-003, 3.1.1-005, 3.1.1-008, 3.1.1-009, 3.1.1-010, and 3.1.1-011, states that cumulative fatigue damage is an aging effect assessed by a fatigue TLAA. Specifically, the applicant indicated that the evaluation of the TLAAs for fatigue of RV, internals, and RCS components, are addressed in SLRA Sections 4.3 and 4.7. This is consistent with SRP-SLR Section 3.1.2.2.1 and is, therefore, acceptable. The staff's evaluations of the TLAAs for fatigue of RV, internals, and RCS components, are documented in SER Section 4.3.

SLRA Table 3.1.1, item 3.1.1-004, addresses cumulative fatigue damage, cracking due to fatigue, and cyclic loading for steel pressure vessel support skirt and attachment welds. Dominion Energy stated that this item is not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.1.2.2.1, found it acceptable because the staff independently reviewed the applicant's UFSAR, and confirmed that there are no steel pressure vessel support skirt and attachment welds within the scope of license renewal.

For AMR items 3.1.1-006 and 3.1.1-007, Dominion Energy stated that they were not applicable because they are only applicable to BWRs. The staff confirmed this item is associated only with BWRs and, therefore, the staff finds the applicant's claim acceptable.

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

The staff reviewed SLRA Section 3.1.2.2.2 against the criteria in SRP-SLR Section 3.1.2.2.2, which divided this degradation in items 1 and 2:

Item 1. SRP-SLR Section 3.1.2.2.2 states that loss of material due to general, pitting, and crevice corrosion could occur in the steel PWR steam generator upper and lower shell and transition cones exposed to secondary feedwater and steam. SRP-SLR states that the existing program relies on control of water chemistry to mitigate corrosion and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program to detect loss of material. SRP-SLR indicates that the extent and schedule of the existing steam generator inspections are designed to ensure that flaws cannot attain a depth sufficient to threaten the integrity of the welds. As referenced in the SRP-SLR, NRC Information Notice (IN) 90-04, "Cracking of the Upper Shell-to-Transition Cone Girth Welds in Steam Generators," indicates that the program may not be sufficient to detect pitting and crevice corrosion while industry operating experience shows general and pitting corrosion of the shell is known to exist. Therefore, SRP-SLR recommends performing augmented inspection to manage this aging effect. SRP-SLR notes that this issue is limited to Westinghouse Model 44 and 51 steam generators, where a high-stress region exists at the shell-to-transition cone weld. Acceptance criteria are described in Branch Technical Position (BTP) RLSB-1 (SRP-SLR Appendix A.1).

SLRA Section 3.1.2.2.2, item 1, associated with SLRA Table 3.1-1, item 3.1.1-012, addresses loss of material due to general, pitting, and crevice corrosion that could occur in the PWR steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam. Dominion Energy stated that IN 90-04 stated that volumetric examinations of the shell-to-transition cone girth welds, required by Section XI of the ASME Code, may not be sufficient to differentiate isolated cracks from inherent geometric conditions. Dominion Energy further stated that following this IN, in addition to inspections required by the ASME Code, Section XI, it inspected a steam generator transition cone girth weld 100 percent using magnetic particle testing (MPT). Dominion Energy did not observe any degradation during these inspections. Dominion Energy stated that the continued implementation of the Water Chemistry Program, AMP B2.1.2, and the steam generator periodic inspections required by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program, AMP B2.1.1, will effectively manage loss of material for the steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam prior to loss of intended function.

The staff evaluated Dominion Energy's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program and Water Chemistry Program as documented in SER Sections 3.0.3.2.1 and 3.0.3.1.1, respectively. In its review of components associated with SLR Table 3.1-1, item 3.1.1-012, the staff finds that Dominion Energy has met the further evaluation criteria and Dominion Energy's proposal to manage the effects of aging using these programs is acceptable because: (1) the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program includes enhanced examination techniques to confirm that the integrity of the steam generator shell is adequately maintained by detecting and monitoring potential flaws, (2) the Water Chemistry Program monitors and controls the secondary water chemistry conditions to minimize environmental effects on aging degradation in these components, and (3) the use of these programs is consistent with the guidance in the GALL-SLR Report.

Based on the AMPs identified, the staff determines that Dominion Energy's AMPs meet the criteria in SRP-SLR Section 3.1.2.2.2, item 1. For the items associated with SLRA Section 3.1.2.2.2, item 1, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions 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. SRP-SLR Section 3.1.2.2.2 states that loss of material due to general, pitting, and crevice corrosion could occur in the steel PWR steam generator shell assembly exposed to secondary feedwater and steam. SRP-SLR further stated that the existing program relies on control of secondary water chemistry to mitigate corrosion. Based on guidance in the SRP-SLR, some applicants have replaced only the bottom part of their recirculating steam generators, generating a cut in the middle of the transition cone, and, consequently, a new transition cone closure weld. SRP-SLR recommends that volumetric examinations be performed in accordance with the requirements of the ASME Code, Section XI for upper shell and lower shell-to-transition cones with gross structural discontinuities for managing loss of material due to general, pitting, and crevice corrosion in the welds for Westinghouse Model 44 and 51 steam generators, where a high-stress region exists at the shell-to-transition cone weld.

SRP-SLR Section 3.1.2.2.2 states that the new continuous circumferential weld, resulting from cutting the transition cone as discussed above, is a different situation from the steam generator transition cone welds containing geometric discontinuities. SRP-SLR states that control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations of stagnant flow conditions. SRP-SLR notes that the new transition area weld is a field weld as opposed to having been made in a controlled manufacturing facility and the surface conditions of the transition weld may result in flow conditions more conducive to initiation of general, pitting, and crevice corrosion than those of the upper and lower transition cone welds.

SRP-SLR indicates that crediting of the In-Service Inspection (ISI) Program for the new steam generator transition cone weld may not be an effective basis for managing loss of material in this weld, as the ISI criteria would only perform a VT-2 visual leakage examination of the weld as part of the system leakage test performed pursuant to ASME Code, Section XI requirements. In addition, ASME Code, Section XI does not require licensees to remove insulation when performing visual examination on nonborated treated water systems. SRP-SLR states that the effectiveness of the Water Chemistry Program should be verified to ensure that loss of material due to general, pitting and crevice corrosion does not occur. For the new continuous circumferential weld, SRP-SLR recommends further evaluation to verify the effectiveness of the Water Chemistry Program. SRP-SLR Section 3.1.2.2.2 states that a one-time inspection at susceptible locations is an acceptable method to determine whether an aging effect does not occur, or an aging effect is progressing very slowly, such that the component's intended function will be maintained during the subsequent period of extended operation. Furthermore, this issue is limited to replacement of recirculating steam generators with a new transition cone closure weld.

SLRA Section 3.1.2.2.2, item 2, associated with SLRA Table 3.1-1, item 3.1.1-012, addresses loss of material due to general, pitting, and crevice corrosion affecting the PWR steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam. Dominion Energy replaced the steam generators at NAPS in 1993 for Unit 1 and in 1995 for Unit 2. Dominion Energy stated that only the lower shell assembly of each steam generator (Westinghouse Model 51F) was replaced, generating a cut in the middle of the transition cone, and consequently creating a new transition cone closure weld. Dominion Energy indicated that for this new transition cone closure weld, a one-time inspection at susceptible locations is an acceptable method to determine whether an aging effect does not occur, or an aging effect is progressing very slowly, such that the component’s intended function will be maintained during the subsequent period of extended operation. Dominion Energy stated that the One-Time Inspection Program, AMP B2.1.20, will use MPT to inspect the continuous circumferential transition cone closure weld on each steam generator. The MPT examination will provide essentially 100 percent of examination coverage of each weld prior to the subsequent period of extended operation. Dominion Energy explained that this one-time inspection along with the continued implementation of the Water Chemistry Program, AMP B2.1.2, and the steam generator periodic inspections required by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program, AMP B2.1.1, will effectively manage loss of material for the steel steam generator components prior to loss of intended function.

The staff’s evaluations of Dominion Energy’s One-Time Inspection Program and Water Chemistry Program are documented in SER Sections 3.0.3.1.9 and 3.0.3.1.1, respectively. In its review of components associated with SLR Table 3.1-1, item 3.1.1-012, the staff finds that Dominion Energy has met the further evaluation criteria and Dominion Energy’s proposal to manage the effects of aging using these programs is acceptable because: (1) the One-Time Inspection Program includes surface examinations to confirm the integrity of the steam generator transition cone weld and verify the effectiveness of the Water Chemistry Program, (2) the steam generator periodic inspections required by the ISI Program will effectively manage loss of material for the steel steam generator components prior to loss of intended function, (3) the Water Chemistry Program monitors and controls the secondary water-chemistry conditions to minimize environmental effects on aging degradation in these components, and (4) the use of these programs is consistent with the guidance in the GALL-SLR Report.

Based on the AMPs identified, the staff determines that Dominion Energy's AMPs meet the criteria in SRP-SLR Section 3.1.2.2.2, item 2. For the items associated with SLRA Section 3.1.2.2.2, item 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

Item 3. 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 antivibration bars exposed to secondary feedwater or steam. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the ASME Section XI Program and the Water Chemistry Program to manage loss of material for the stainless steel feedwater nozzle thermal sleeves exposed to treated water greater than 60 C (greater than 140 F). The AMR item cites plant-specific note 5, which states, in part, "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 for the feedwater nozzle thermal sleeve."

Based on its review of components associated with AMR item 3.1.1-071 for which Dominion Energy cited generic note E, the staff finds Dominion Energy's proposal to manage loss of material for the stainless steel feedwater nozzle thermal sleeves using the ASME Section XI Program and the Water Chemistry Program acceptable because the use of the Water Chemistry Program to manage loss of material is consistent with the GALL-SLR, and because the ASME Section XI Program will provide visual inspections that are capable of detecting loss of material.

3.1.2.2.3 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement

Item 1. SLRA Section 3.1.2.2.3, associated with SLRA Table 3.3.1 item 3.1.1-013, addresses loss of fracture toughness due to neutron irradiation embrittlement. Specifically, the applicant addressed the three items requiring further staff evaluation in SLR-SRP Section 3.1.2.2.3.

The first item states that neutron irradiation embrittlement is a TLAA to be evaluated for the subsequent period of extended operation. The applicant stated that neutron irradiation embrittlement is a TLAA as defined in 10 CFR 54.3 and is evaluated in SLRA Section 4.2. The applicable TLAAs include those in the following LRA sections: (a) Section 4.2.1, Neutron Fluence Projections, (b) Section 4.2.2, Upper-Shelf Energy, (c) Section 4.2.3, Pressurized Thermal Shock, (d) Section 4.2.4, Adjusted Reference Temperature, (e) Section 4.2.5, Pressure-Temperature Limits, and (f) Section 4.2.6, Low Temperature Overpressure Protection. The applicant dispositioned the TLAAs in accordance with 10 CFR 54.21(c)(1). This is consistent with SRP-SLR Section 3.1.2.2.3, item 1, and is, therefore, acceptable.

The applicant included the applicable AMR items for reactor pressure vessel (RPV) components subject to these TLAAs in SLRA Table 3.1.1, item 3.1.1-13 and in an AMR item that is included in SLRA Table 3.1.2-1 on page 3-87. The staff noted that the AMR items appropriately includes those ferritic RPV base metal and weld components that are located in the beltline region of the RPV, including those in the upper, intermediate, and lower RPV shells. The staff also verified that the applicant's AMR items are consistent with criteria in AMR item 13 of SRP-SLR Table 3.1-1 and GALL-SLR AMR item IV.A2.R-84. GALL-SLR item IV.A2.R-84 includes the RV inlet and outlet nozzle materials. Appendix H of 10 CFR establishes a fluence threshold of 1×10^{17} n/cm^2 (E > 1 MeV), at which licensees must evaluate embrittlement of ferritic steels exposed to neutron fluence. The licensee stated in SLRA Section 4.2.4 that some nozzle materials were projected to exceed the threshold value during the subsequent period of extended operation. Accordingly, the licensee included nozzle materials in vessel embrittlement TLAAs. The staff finds the AMR items to be acceptable because they are in compliance with the RPV component scoping requirements specified in 10 CFR Part 50, Appendix G, and 10 CFR 50.61 rules and consistent with the corresponding AMR items for these components in the GALL-SLR and SRP-SLR reports.

The staff reviews the applicant's basis for dispositioning the TLAAs in accordance with 10 CFR 54.21(c)(1)(i), (ii), or (iii) in the applicable subsections of SER Section 4.2.

Item 2. SLRA Section 3.1.2.2.3, item 2, associated with SLRA Table 3.1.1, item 3.1.1-014, addresses loss of fracture toughness due to neutron irradiation of the reactor pressure vessel beltline and extended beltline exposed to reactor coolant and neutron flux, which will be managed by the Reactor Vessel Material Surveillance and Neutron Fluence Monitoring AMPs. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.1.2.2.3, item 2.

In its review of components associated with AMR item 3.1.1-014, the staff finds that Dominion Energy has met the further evaluation criteria and Dominion Energy's proposal to manage the effects of aging for the RV shell, primary nozzle, and support pad using the Reactor Vessel Material Surveillance and Neutron Fluence Monitoring AMPs is acceptable because it is consistent with AMR item IV.A2.RP-229 in the GALL-SLR Report.

Based on the AMPs identified, the staff concludes that Dominion Energy's AMP meets SRP-SLR Section 3.1.2.2.3, item 2, criteria. For SLRA Table 3.1.1, item 3.1.1-014, associated with SLRA Section 3.1.2.2.3, item 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. SLRA Section 3.1.2.2.3, item 3, states that reduction in fracture toughness is a plant-specific TLAA for Babcock & Wilcox reactor internals. The applicant stated this item is not applicable to Units 1 and 2. Since Units 1 and 2 are Westinghouse design pressurized water reactors, the staff finds that the applicant's response to the third item is acceptable.

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

Item 1. SLRA Section 3.1.2.2.4, item 1, associated with SLRA Table 3.1.1, item 3.1.1-016, addresses cracking due to SCC and irradiation-assisted stress corrosion cracking (IASCC) of the stainless steel or nickel-alloy RV top head enclosure flange leakage detection line exposed to air-indoor uncontrolled and reactor coolant leakage. Dominion Energy stated that this item is not applicable. The staff evaluated Dominion Energy'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 associated with a BWR plant.

Item 2. The staff reviewed SLRA Section 3.1.2.2.4, item 2, against the criteria in SRP-SLR Section 3.1.2.2.4. The applicant stated that this item is not applicable to North Anna, Units 1 and 2, which are PWR units. The staff noted that the associated item in the SLRA is applicable to BWRs only. The staff confirmed that this item is associated only with BWRs and, therefore, finds the applicant's claim acceptable.

3.1.2.2.5 Crack Growth Due to Cyclic Loading

SLRA Section 3.1.2.2.5 states that TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1) and that the evaluation of this TLAA, cracking associated with weld-deposited cladding, is addressed in SLRA Section 4.7.7. This is consistent with SRP-SLR Section 3.1.2.2.5 and is, therefore, acceptable. The staff's evaluation regarding the TLAA for cracking associated with weld-deposited cladding is documented in SER Section 4.7.7. Therefore, the staff finds AMR item 3.1.1-018 to be consistent with the GALL-SLR Report, which recommends further evaluation.

3.1.2.2.6 Cracking Due to Stress Corrosion Cracking

Item 1. SLRA Section 3.1.2.2.6, item 1, associated with SLRA Table 3.1-1, item 3.1.1-019, addresses the management of SCC in PWR RV bottom-mounted instrumentation (BMI) guide tubes exposed to a reactor coolant environment. The SLRA states that the NAPS BMI guide tubes are being managed by the Water Chemistry Program and the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program.

The criteria in SRP-SLR Section 3.1.2.2.6.1 state that cracking due to an SCC mechanism could occur in PWR RV BMI guide tubes that are exposed to a reactor coolant environment. SRP-SLR Section 3.1.2.2.6.1 also states that the GALL-SLR Report recommends further evaluation to ensure that this aging effect is adequately managed during the subsequent period of extended operation.

In its review of the applicant's RV BMI guide tubes, which is associated with SLRA Table 3.1-1, item 3.1.1-019, the staff noted that the RV BMI guide tubes are made of stainless steel with a normal operating environment of reactor coolant. In addition, the applicant stated that SCC of the RV BMI guide tubes will be managed by the Water Chemistry Program and the inspection will be implemented by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program. During normal operation, the environment for the applicant's RV BMI guide tubes will be borated water. In addition, the applicant's RV BMI guide tubes are fabricated from stainless steel. The staff noted that the GALL-SLR Report includes entries for stainless steels exposed to a borated water environment. These entries indicate that an aging effect requiring management is not present for this material and environment combination. In an unlikely scenario when there is cracking, visual examinations would identify any indication of borated water leakage, if present. Therefore, the staff finds that the applicant's proposal to use its Water Chemistry Program and the ASME Section XI ISI, Subsections IWB, IWC, and IWD Program acceptable.

Based on the programs identified, the staff determines that the applicant's programs meet the criteria in SRP-SLR Section 3.1.2.2.6, item 1. For the items associated with SLRA Section 3.1.2.2.6, item 1, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

Item 2. SLRA Section 3.1.2.2.6 associated with SLRA Table 3.1.1, AMR item 3.1.1-020, addresses cracking due to SCC for the CASS Class 1 reactor coolant piping and piping components exposed to the reactor coolant, which will be managed by the Water Chemistry Program and the ASME Code, Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program. Most of NAPS's CASS Class 1 reactor coolant piping and fittings meet NRC

NUREG-0313, "Technical Report on Material Selection and Process Guidelines for BWR Coolant Pressure Boundary Piping," guidance and recommendations regarding ferrite and carbon contents.

Item 3. SLRA Section 3.1.2.2.6, item 3, associated with SLRA Table 3.1.1, item 3.1.1-139, addresses cracking due to SCC and IASCC of the stainless steel or nickel-alloy RV top head enclosure flange leakage detection line exposed to air-indoor uncontrolled and reactor coolant leakage, which will be managed by the External Surfaces Monitoring of Mechanical Components Program. The staff evaluated Dominion Energy's proposal against the criteria in SRP-SLR Section 3.1.2.2.6 item 3. In its review of components associated with AMR item 3.1.1-139, the staff finds that Dominion Energy has met the further evaluation criteria and Dominion Energy's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components Program is acceptable because this is the program recommended by the SRP-SLR.

3.1.2.2.7 Cracking Due to Cyclic Loading

The staff reviewed SLRA Section 3.1.2.2.7 against the criteria in SRP-SLR Section 3.1.2.2.7. The applicant stated that this item is not applicable to Units 1 and 2, which are PWR units, because the associated item in SLRA Table 3.1-1 is applicable to BWRs only. The staff confirmed that this item is associated only with BWRs and, therefore, finds the applicant's claim acceptable.

3.1.2.2.8 Loss of Material Due to Erosion

SLRA Section 3.1.2.2.8, associated with SLRA Table 3.1.1, AMR item 3.1.1-022, addresses loss of material due to erosion for steel SG feedwater impingement plates and supports exposed to secondary feedwater. Dominion Energy stated that this AMR item is not applicable. The staff evaluated Dominion Energy'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

SLRA Section 3.1.2.2.9, associated with SLRA Table 3.1.1 AMR items 3 3.1.1-053a, 3.1.1-053b, 3.1.1-053c, 3.1.1-055c, 3.1.1-059a, 3.1.1-059b, 3.1.1-059c, and 3.1.1-119, addresses cracking due to SCC, IASCC, and fatigue; loss of fracture toughness due to irradiation embrittlement and/or thermal embrittlement; changes in dimensions or distortion due to void swelling; loss of preload due to thermal and irradiation-enhanced stress relaxation; and loss of material due to wear for stainless steel and nickel-alloy PWRVI components exposed to reactor coolant and neutron flux. These aging effects will be managed by the PWR Vessel Internals Program and the Water Chemistry Program. Dominion Energy revised this SLRA Section by letter dated March 17, 2021 (ADAMS Accession No. ML21076B025), to address the NRC's SLR interim staff guidance for aging management of PWR vessel internal components in SLR-ISG-2021-01-PWRVI. The staff reviewed Dominion Energy's proposal, as described in revised SLRA Section 3.1.2.2.9, against the criteria in SRP-SLR Section 3.1.2.2.9, as updated per SLR-ISG-2021-01-PWRVI.

The staff noted that SLRA Section 3.1.2.2.9 (as revised) cites EPRI Topical Report (TR) 3002017168, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227, Revision 1-A)" June 2020 (ADAMS Accession

No. ML20175A112, Reference 2) as the 60-year basis for the PWR Vessel Internals Program. The staff also noted that SLRA Section 3.1.2.2.9 (as revised) specifies that the 60-year inspection and evaluation (I&E) guidelines in MRP-227, Revision 1-A, are supplemented with a gap analysis that identifies enhancements to the PWR Vessel Internals Program needed to address an 80-year operating period. The staff verified that Dominion Energy's MRP-227, Revision 1-A gap analysis provides the technical basis for determining enhancements to the existing 60-year AMP needed to provide reasonable assurance that the effects of aging will be adequately managed during the subsequent period of extended operation.

In its review of components associated with AMR 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, 3.1.1-059c, and 3.1.1-119, the staff finds that Dominion Energy has met the further evaluation criteria. The staff also finds that Dominion Energy's proposal to manage the effects of aging using the PWR Vessel Internals Program and Water Chemistry Program is acceptable because the PWR Vessel Internals Program includes I&E guidelines that are consistent with those recommended in SRP-SLR Section 3.1.2.2.9, as updated per SLR-ISG-2021-PWRVI.

Based on the programs identified, the staff concludes that Dominion Energy's further evaluation meets the criteria in SRP-SLR Section 3.1.2.2.9, as updated per SLR-ISG-2021-01-PWRVI. For those AMR items associated with SLRA Section 3.1.2.2.9, the staff also concludes that the SLRA is consistent with the GALL-SLR report, as updated per SLR-ISG-2021-01-PWRVI. Therefore, the staff concludes that Dominion Energy 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 Table 3.1.1, AMR item 3.1.1-028, associated with SRP-SLR Section 3.1.2.2.9, addresses loss of material due to wear and cracking due to SCC, IASCC, and/or fatigue for stainless steel or nickel alloy control rod guide tube (CRGT) support pins exposed to reactor coolant and neutron flux. In its revisions to SLRA Section 3.1.2.2.9 and AMR item 3.1.1-28, provided by letter dated March 17, 2021 (ADAMS Accession No. ML21076B025), Dominion Energy stated that this item is not used because the CRGT support pins are "No Additional Measures" components addressed by AMR item 3.1.1-055c. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.1.2.2.9 and SRP-SLR Table 3.1-1, item 028, as updated per the NRC's interim staff guidance in SLR-ISG-2021-01-PWRVI. The staff finds Dominion Energy's claim acceptable because the revised SLRA sections are consistent with the recommendation in SLR-ISG-2021-01-PWRVI. Specifically, the staff noted that revised AMR item 3.1.1-028 identifies that the replacement CRGT stainless steel support pins are stainless steel. Since stainless steel CRGT support pins are not as susceptible to degradation, they may be placed in the No Additional Measures inspection category, which is addressed by AMR item 3.1.1-055c, consistent with SLR-ISG-2021-01-PWRVI.

3.1.2.2.10 Loss of Material Due to Wear

<u>Item 1</u>. The staff reviewed SLRA Section 3.1.2.2.10 against the criteria in SRP-SLR Section 3.1.2.2.10, which divided this degradation into items 1 and 2. The staff notes that item 1 is related to AMP B2.1.1, the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program, and will be discussed as follows. Item 2 is related to AMP B2.1.7, PWR Vessel Internals Program, and will be discussed in the section of the SE related to AMP B2.1.7.

For item 1, SRP-SLR Section 3.1.2.2.10 states that industry operating experience indicates that loss of material due to wear can occur in PWR control rod drive (CRD) head penetration nozzles made of nickel-alloy due to the interactions between the nozzle and the thermal sleeve-centering pads of the nozzle. The CRD head penetration nozzles are also called control rod drive mechanism (CRDM) nozzles or CRDM head adapter tubes. SRP-SLR further states that the applicant should perform a further evaluation to confirm the adequacy of a plant-specific AMP or analysis (with any necessary inspections) for management of the aging effect. SRP-SLR indicates that the applicant may use the acceptance criteria, which are described in BTP RLSB-1 (Appendix A.1 of this SRP-SLR), to demonstrate the adequacy of a plant-specific AMP. Alternatively, the applicant may perform an analysis with any necessary inspections to confirm that loss of material due to wear does not affect the intended function(s) of these CRD head penetration nozzles, consistent with the CLB.

SLRA Section 3.1.2.2.10, item 1, associated with SLRA Table 3.1-1, item 3.1.1-116, addresses that loss of material due to wear can occur in PWR CRD head penetration nozzles made of nickel-alloy due to the interaction between the nozzle and the thermal sleeve-centering pads of the nozzle. Dominion Energy stated that the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) Program includes inspection of the CRD head penetration nozzles for loss of material due to wear.

The staff notes that recent PWR operating experience has shown that the thermal sleeve flanges have degraded caused by wear because of interaction between the thermal sleeve and the CRDM. SLRA Table A4.0-1, item 10, states that procedures will be revised to perform inspections of control rod guide tube (CRGT) thermal sleeves as indicated in MRP 2018-027. MRP 2018-027 refers to the Westinghouse Nuclear Safety Advisory Letter (NSAL) 18-1 recommendation. Westinghouse NSAL recommends that, based on operating experience from international PWR plants related to wear of thermal sleeve flanges associated with the RV closure head CRDM that resulted in stuck control rods during plant restart operations, a visual inspection should be performed during the next refueling outage after issuance of the NSAL and during each subsequent refueling outage. The visual inspection of the top of the CRGT is to determine whether any thermal sleeves have lowered significantly or are in a failed state. Dominion Energy stated that for the Units 1 and 2 the guidance is to look for shiny marks on the top edge of the upper guide tube enclosure. Dominion Energy further stated that, during the next inspection for the under-RV head, it will visually inspect the bottom of the thermal sleeve guide funnels to look for any shiny surfaces on the bottom surface of the guide funnel that would indicate that the thermal sleeve guide funnels have dropped to a point where they are in contact with the top of the guide tube. Dominion Energy stated that a visual inspection of thermal sleeve guide funnel elevations is recommended to identify whether any sleeves are noticeably lower than others. The staff notes that this degradation is not monitored via the ISI Program. However, Dominion Energy will visually inspect the control rod guide tubes to monitor structural integrity of the thermal sleeves and CRD guide tube.

The staff's evaluations of Dominion Energy's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program are documented in SER Section 3.0.3.2.1. In its review of components associated with SLR Table 3.1-1, item 3.1.1-116, the staff finds that Dominion Energy has met the further evaluation criteria and Dominion Energy's proposal to manage the effects of aging using the program is acceptable because: (1) the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program provides for periodic testing and inspections to detect wear, (2) Dominion Energy will perform a visual examination of the thermal sleeve, and (3) the use of the program is consistent with the guidance in the GALL-SLR Report.

Based on the program identified, the staff concludes that Dominion Energy's program meets SRP-SLR Section 3.1.2.2.10, item 1. For those AMR items associated with SLRA Section 3.1.2.2.10, item 1, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21 (a)(3).

Item 2. SLRA Section 3.1.2.2.10, item 2, associated with SLRA Table 3.1.1 AMR item 3.1.1-119, addresses loss of material due to wear for stainless steel thermal sleeves in CRD head penetration nozzles exposed to reactor coolant and neutron flux. The loss of material due to wear for the CRD nozzle thermal sleeves will be managed by the PWR Vessel Internals Program. In its March 17, 2021 letter (ADAMS Accession No. ML21076B025), Dominion Energy revised AMR item 3.1.1-119 and the associated SLRA Table 3.1.2-2 AMR result for the CRD nozzle thermal sleeves to include component-specific changes that are based on the SLR interim staff guidance for aging management of PWR vessel internal components in SLR-ISG-2021-01-PWRVI. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.1.2.2.10, item 2.

The staff noted that SLRA Section 3.1.2.2.10, item 2 cites the further evaluation in SLRA Section 3.1.2.2.9. The staff verified that Dominion Energy revised SLRA Section 3.1.2.2.9 in its March 17, 2021, letter to include AMR item 3.1.1-119. The staff also noted that AMR item 3.1.1-119 and the PWR Vessel Internals Program are now cited for the CRD nozzle thermal sleeves in the March 17, 2021, revision to SLRA Table 3.1.2-2. The staff verified that these revised AMR results ensure that the PWR Vessel Internals Program is appropriately credited to manage loss of material due to wear for the CRD nozzle thermal sleeves. In its review of the component associated with AMR item 3.1.1-119, the staff finds that Dominion Energy has met the further evaluation criteria. The staff also finds that Dominion Energy's proposal to manage the effects of aging using the PWR Vessel Internals Program is acceptable because this program includes the recommended I&E guidelines for managing loss of material due to wear for CRD nozzle thermal sleeves.

Based on the program identified, the staff concludes that Dominion Energy's further evaluation meets the SRP-SLR Section 3.1.2.2.10, item 2 criterion. For the AMR item associated with SLRA Section 3.1.2.2.10, item 2, the staff also concludes that the SLRA is consistent with the GALL-SLR report, as updated per SLR-ISG-2021-01-PWRVI. Therefore, the staff concludes that Dominion Energy 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).

3.1.2.2.11 Cracking Due to Primary Water Stress Corrosion Cracking

SLRA Table 3.1.1, AMR item 3.1.1-025 addresses cracking due to PWSCC for steel (with nickel-alloy cladding) or nickel-alloy SG primary side components: divider plate and tube-to-tube sheet welds exposed to reactor coolant. SLRA Section 3.1.2.2.11, associated with SLRA Table 3.1.1, AMR item 3.1.1-025, addresses cracking for Alloy 600 material exposed to reactor coolant, which will be managed by the Steam Generators and Water Chemistry Programs. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.1.2.2.11.

Item 1. The SGs are Westinghouse Model 54F, and the divider plates and the associated welds are fabricated from Alloy 600 for Unit 1 and Alloy 690 for Unit 2. Dominion Energy stated that they completed the checklist provided by EPRI to determine whether the industry analyses in EPRI Report 3002002850 bound the Unit 1 SGs and determined that the industry analyses do bound the Unit 1 SGs. Therefore, a plant-specific AMP is not necessary for the Unit 1 SGs. In addition, Dominion Energy stated that a plant-specific AMP is not necessary for the Unit 2 SGs.

The SRP-SLR states that a plant-specific AMP is not necessary for plants with divider plate assemblies fabricated of Alloy 690 and Alloy 690 weld materials. In addition, the SRP-SLR states that a plant-specific AMP is not necessary for plants with divider plate assemblies fabricated of Alloy 600 or Alloy 600 type weld materials if the industry analyses in EPRI Report 3002002850 are bounding.

The staff finds that Dominion Energy has met the further evaluation criteria because the divider plates and associated welds for Unit 2 are fabricated of Alloy 690 and therefore a plant-specific AMP is not required, and the divider plates and associated welds fabricated of Alloy 600 in Unit 1 are bounded by EPRI Report 3002002850 and therefore a plant-specific AMP is not necessary. In addition, the staff reviewed information related to this further evaluation during its audit (ADAMS Accession No. ML21036A060).

Based on the programs identified, the staff concludes that Dominion Energy'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 Dominion Energy 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. Units 1 and 2 SGs are Westinghouse Model 54F, and the SG tubes are thermally treated Alloy 690 and the tubesheets are clad with Alloy 600 type material. Dominion Energy stated that they completed the checklist provided by EPRI to determine whether the industry analyses in EPRI Report 3002002850 bound the Units 1 and 2 SGs and determined that the industry analyses do bound the Units 1 and 2 SGs. In addition, Dominion Energy stated that as part of the Steam Generators Program, the tubesheet region will be visually inspected for evidence of cracking. Therefore, a plant-specific AMP is not necessary.

The SRP-SLR states that a plant-specific AMP is not necessary for plants with thermally treated Alloy 690 SG tubes and tubesheets clad with Alloy 600 type material if the industry analyses in EPRI Report 3002002850 are bounding and the Steam Generators Program includes visual inspections of the tubesheet region for evidence of cracking.

The staff finds that Dominion Energy has met the further evaluation criteria because the Unit 1 and Unit 2 SGs are bounded by EPRI Report 3002002850 and the Steam Generators Program includes visual inspection of the tubesheet 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 (ADAMS Accession No. ML21036A060).

Based on the programs identified, the staff concludes that Dominion Energy'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 Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.1.2.2.12 Cracking Due to Irradiation-Assisted Stress Corrosion Cracking

SLRA Section 3.1.2.2.12, associated with SLRA Table 3.1.1, items 3.1.1-029, 3.1.1-041, and 3.1.1-103, addresses cracking due to SCC, intergranular SCC, or IASCC in mechanical core plate access hole cover, welded core plate access hole cover made from nickel-alloy materials and that are exposed to a BWR reactor coolant with neutron flux environment, or other BWR RVI components that are made from nickel-alloy or stainless steels materials and are exposed to a BWR reactor coolant with neutron flux environment. Dominion Energy stated that these items are not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.1.2.2.12 and finds it acceptable because: (a) the applicable AMR items and the corresponding AMR further evaluation criteria in SRP-SLR Section 3.1.2.2.12 are only applicable to BWR-designed reactor units, and (b) the UFSAR confirms that the reactor units at Surry are PWR-designed light water reactors.

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

Item 1. SLRA Table 3.1.1, AMR item 3.1.1-050, addresses the loss of fracture toughness due to thermal aging embrittlement for the CASS Class 1 piping and piping components (including pump casings and CRD pressure housings) exposed to reactor coolant greater than 250 C (greater than 482 F). The AMR item cites generic note E, and the plant-specific note 3 which states that the thermal embrittlement of CASS reactor coolant pump casings is a TLAA, evaluated in SLRA Section 4.7.6, Reactor Coolant Pump Code Case N-481. The staff finds Dominion Energy's plant-specific AMR basis acceptable because: (a) the guidance in SRP-SLR Section 1.2 allows TLAAs to be used as a basis for demonstrating adequate aging management in accordance with the requirement in 10 CFR 54.21(a)(3), and (b) the applicant has included its plant-specific TLAA for the CASS reactor coolant pump casings in SLRA Section 4.7.6 and projected the TLAA to the end of the subsequent period of extended operation in accordance with 10 CFR 54.21(c)(1)(i). The staff's evaluations of the TLAA for the CASS reactor coolant pump casings and the basis for dispositioning the TLAA in accordance with 10 CFR 54.21(c)(1)(i) are documented in SER Section 4.7.6.

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

SLRA Section 3.1.2.2.14, associated with SLRA Table 3.1.1, item 3.1.1-120, addresses loss of preload due to thermally induced or irradiation-enhanced stress relaxation in BWR core plate rim hold down bolts that are exposed to a BWR reactor coolant with neutron flux environment. Dominion Energy stated that this item is not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.1.2.2.14 and finds it acceptable because: (a) the applicable AMR item and AMR further evaluation criteria in SRP-SLR Section 3.1.2.2.14 are only applicable to BWR design reactor units (and specifically for those BWRs whose core plate assemblies are secured through the use of bolted connections), and (b) the UFSAR confirms that the NAPS units are PWR-designed light water reactors.

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

SLRA Section 3.1.2.2.15, associated with SLRA Table 3.1.1 item 3.1.1-105, addresses loss of material due to general, crevice or pitting corrosion for steel piping and piping components exposed to concrete. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.1.2.2.15.

SLRA Section 3.1.2.2.15 states that: (a) a portion of the outside diameter of each steel neutron shield tank is encased in concrete that conforms to American Concrete Institute (ACI) 318, "Building Code Requirements for Structural Concrete;" (b) review of operating experience did not identify degradation of concrete around embedded components that could lead to penetration of water; and (c) the tanks are not potentially exposed to groundwater.

In its review of components associated with item 3.1.1-105, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal that there are no aging effects requiring management is acceptable for the following reasons, consistent with the further evaluation criteria: (a) the steel neutron shield tanks are encased in concrete that conforms to ACI 318; (b) plant-specific operating experience did not reveal any instances of degradation of concrete around embedded components that could lead to penetration of water; and (c) tanks are not potentially exposed to groundwater.

SLRA Section 3.1.2.2.15, associated with SLRA Table 3.1.1, item 3.1.1-115, addresses loss of material due to crevice or pitting corrosion and cracking due to SCC for stainless steel piping and piping components exposed to concrete. Dominion Energy stated that this item is not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.1.2.2.15 and finds it acceptable because, based on a review of the UFSAR, there are no stainless steel components exposed to concrete in the RCS.

For those AMR items associated with SLRA Section 3.1.2.2.15, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy 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

SLRA Section 3.1.2.2.16, associated with SLRA Table 3.1.1, item 3.1.1-136, addresses stainless steel and nickel-alloy piping and piping components (except for the RV flange leakage detection line piping) exposed to air-indoor uncontrolled that are susceptible to loss of material due to pitting or crevice corrosion and will be managed by the One-Time Inspection Program. The RV flange leakage detection line piping will be managed by the External Surfaces Monitoring of Mechanical Components Program, which is discussed in SER Section 3.1.2.2.6 "Cracking Due to Stress Corrosion Cracking," item 3. The staff evaluated Dominion Energy'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 Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the One-Time Inspection Program (with the exception of the RV flange leakage detection line piping that uses the External Surfaces Program) is acceptable because these are the programs recommended by the SRP-SLR.

3.1.2.2.17 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA Program.

3.1.2.2.18 Ongoing Review of Operating Experience

SER Section 3.0.5 documents the 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

NAPS did not identify any AMR results listed in SLRA Tables 3.1.2-1 through 3.1.2-4 that are either not consistent with or not addressed in the GALL-SLR Report and are usually denoted with generic notes F through J.

3.2 Aging Management of Engineered Safety Features

3.2.1 Summary of Technical Information in the Application

SLRA Section 3.2 provides AMR results for those components the applicant identified in SLRA Section 2.3.2, "Engineered Safety Features," as being subject to an AMR. SLRA Table 3.2.1, "Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of the GALL-SLR Report," is a summary comparison of the applicant's AMR results with those provided in the GALL-SLR Report for the engineered safety features (ESF) components.

3.2.2 Staff Evaluation

Table 3.2-1, below, summarizes the 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 Evaluated in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2.1-001	Consistent with the GALL-SLR Report (see SER 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 SER 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 SER Section 3.2.2.2.3)
3.2.1-007	Consistent with the GALL-SLR Report (see SER Section 3.2.2.2.4)
3.2.1-008	Consistent with the GALL-SLR Report
3.2.1-009	Consistent with the GALL-SLR Report
3.2.1-010	Not applicable to NAPS (see SER Section 3.2.2.1.1)
3.2.1-011	Not applicable to NAPS
3.2.1-012	Not applicable to NAPS
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 NAPS
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

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2.1-022	Consistent with the GALL-SLR Report
3.2.1-023	Not applicable to NAPS
3.2.1-024	Not applicable to NAPS
3.2.1-025	Not applicable to NAPS
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 NAPS
3.2.1-028	Not applicable to NAPS
3.2.1-029	Not applicable to NAPS
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 NAPS
3.2.1-033	Consistent with the GALL-SLR Report
3.2.1-034	Not applicable to NAPS
3.2.1-035	Not applicable to NAPS
3.2.1-036	Not applicable to NAPS
3.2.1-037	Not applicable to NAPS
3.2.1-038	Not applicable to NAPS
3.2.1-039	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-040	Consistent with the GALL-SLR Report
3.2.1-041	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-042	Not applicable to NAPS (see SER Section 3.2.2.2.10)
3.2.1-043	Not applicable to NAPS
3.2.1-044	Consistent with the GALL-SLR Report
3.2.1-045	Not applicable to NAPS
3.2.1-046	Not applicable to NAPS
3.2.1-047	Not applicable to NAPS
3.2.1-048	Consistent with the GALL-SLR Report (see SER Section 3.2.2.2.2)
3.2.1-049	Not applicable to NAPS
3.2.1-050	Consistent with the GALL-SLR Report
3.2.1-051	Not applicable to NAPS
3.2.1-052	Not applicable to NAPS
3.2.1-053	Consistent with the GALL-SLR Report
3.2.1-053a	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-054	Not applicable to PWRs
3.2.1-055	Not applicable to NAPS (see SER Section 3.2.2.2.9)
3.2.1-056	Not applicable to NAPS (see SER Section 3.2.2.2.10)
3.2.1-057	Consistent with the GALL-SLR Report (see SER Section 3.2.2.1.2)
3.2.1-058	Not applicable to NAPS
3.2.1-059	Not applicable to NAPS
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 NAPS
3.2.1-063	Consistent with the GALL-SLR Report
3.2.1-064	Consistent with the GALL-SLR Report
3.2.1-065	Not applicable to NAPS

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2.1-066	Not applicable to NAPS (see SER Section 3.2.2.2.7)
3.2.1-067	Consistent with the GALL-SLR Report
3.2.1-068	Not applicable to NAPS
3.2.1-069	Not applicable to NAPS
3.2.1-070	Consistent with the GALL-SLR Report
3.2.1-071	Consistent with the GALL-SLR Report
3.2.1-072	Consistent with the GALL-SLR Report
3.2.1-073	Consistent with the GALL-SLR Report
3.2.1-074	Not applicable to NAPS
3.2.1-075	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-076	Consistent with the GALL-SLR Report
3.2.1-077	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-078	Consistent with the GALL-SLR Report
3.2.1-079	Consistent with the GALL-SLR Report
3.2.1-080	Consistent with the GALL-SLR Report (see SER Section 3.2.2.2.4)
3.2.1-081	Consistent with the GALL-SLR Report
3.2.1-082	This item number is not used in 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	Not applicable to NAPS
3.2.1-091	Not used. (See SER Section 3.2.2.2.9. Addressed by 3.2.1-053 and 3.2.1-078.)
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 NAPS
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 NAPS
3.2.1-099	Consistent with the GALL-SLR Report (see SER Section 3.2.2.2.2)
3.2.1-100	Not applicable to NAPS (see SER Section 3.2.2.2.8)
3.2.1-101	Not applicable to NAPS (see SER Section 3.2.2.2.8)
3.2.1-102	Not applicable to NAPS (see SER Section 3.2.2.2.8)
3.2.1-103	Consistent with the GALL-SLR Report (see SER Section 3.2.2.2.4)
3.2.1-104	Not applicable to NAPS
3.2.1-105	Not applicable to NAPS (see SER Section 3.2.2.2.10)
3.2.1-106	Consistent with the GALL-SLR Report (see SER Section 3.2.2.2.2)
3.2.1-107	Consistent with the GALL-SLR Report (see SER Section 3.2.2.2.2)
3.2.1-108	Consistent with the GALL-SLR Report (see SER Section 3.2.2.2.4)
3.2.1-109	Not applicable to NAPS (see SER Section 3.2.2.2.8)
3.2.1-110	Not applicable to NAPS (see SER Section 3.2.2.2.8)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2.1-111	Not applicable to NAPS (see SER Section 3.2.2.2.10)
3.2.1-112	Not applicable to NAPS (see SER Section 3.2.2.2.2)
3.2.1-113	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2.1-114	Not applicable to NAPS
3.2.1-115	Not applicable to NAPS
3.2.1-116	Not applicable to NAPS
3.2.1-117	Not applicable to NAPS
3.2.1-118	Not applicable to NAPS
3.2.1-119	Not applicable to NAPS (see SER Section 3.2.2.2.10)
3.2.1-120	Not applicable to NAPS
3.2.1-121	Not applicable to NAPS (see SER Section 3.2.2.2.10)
3.2.1-122	Not applicable to NAPS
3.2.1-123	Not applicable to NAPS
3.2.1-124	Not applicable to NAPS
3.2.1-125	Consistent with the GALL-SLR Report
3.2.1-126	Not applicable to NAPS
3.2.1-127	Not applicable to NAPS
3.2.1-128	Not applicable to NAPS
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 NAPS
3.2.1-132	Not applicable to NAPS
3.2.1-133	Not applicable to NAPS
3.2.1-134	Not applicable to NAPS

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

(1) SER Section 3.2.2.1 discusses AMR results for components that the applicant states are either not applicable to NAPS or are consistent with the GALL-SLR Report. Section 3.2.2.1.1 summarizes the staff's review of items that are not applicable or not used and documents any RAIs issued and the staff's conclusions. The remaining subsections in SER Section 3.2.2.1 document the review of components that required additional information or otherwise require explanation.

(2) SER Section 3.2.2.2 discusses AMR results for which the GALL-SLR Report and SRP-SLR recommend further evaluation.

(3) SER Section 3.2.2.3 discusses AMR results for components that the applicant states are not consistent with, or not addressed in, the GALL-SLR Report. These AMR results 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 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. 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 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 item. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SER Table 3.2-1, and no separate writeup is required or provided. For the AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in Section 3.2.2.1.2 below.

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

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

For SLRA Table 3.2-1, items 3.2.1-010, 3.2.1-011, 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, 3.2.1-042, 3.2.1-043, 3.2.1-045, 3.2.1-046, 3.2.1-047, 3.2.1-049, 3.2.1-051, 3.2.1-052, 3.2.1-055, 3.2.1-056, 3.2.1-058, 3.2.1-059, 3.2.1-062, 3.2.1-065, 3.2.1-066, 3.2.1-068, 3.2.1-069, 3.2.1-074, 3.2.1-090, 3.2.1-096, 3.2.1-098, 3.2.1-100, 3.2.1-101, 3.2.1-102, 3.2.1-104, 3.2.1-105, 3.2.1-109, 3.2.1-110, 3.2.1-111, 3.2.1-114, 3.2.1-115, 3.2.1-116, 3.2.1-117, 3.2.1-118, 3.2.1-119, 3.2.1-120, 3.2.1-121, 3.2.1-122, 3.2.1-123, 3.2.1-124, 3.2.1-126, 3.2.1-127, 3.2.1-128, 3.2.1-131, 3.2.1-132, 3.2.1-133, and 3.2.1-134, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to NAPS. The staff reviewed the SLRA and UFSAR and confirmed that the applicant's SLRA does not have any AMR results that are applicable for these items, no in-scope components in corresponding environments.

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 BWRs. The staff reviewed the SRP-SLR, confirmed that these items only apply to BWRs, and finds that these items are not applicable to NAPS because it is a PWR.

For the following SLRA Table 3.1.1 items, the applicant claims that the corresponding item in the GALL-SLR Report is not used because it is addressed by other SLRA Table 1 items: 3.2.1-091 (addressed by 3.2.1-053 and 3.2.1-078)

SLRA Table 3.2.1, item 3.2.1-010, addresses loss of fracture toughness due to thermal aging embrittlement for cast austenitic stainless steel (CASS) piping, and piping components exposed to treated borated water greater than 250 degrees Celsius (°C) (greater than 482 °F) or treated water greater than 250 °C (greater than 482 °F) in the ESF systems. Dominion Energy stated that this item is not applicable. The staff evaluated Dominion Energy's claim and finds it acceptable because the staff verified from its review of NAPS's UFSAR that there are no CASS piping and piping components exposed to treated borated water greater than 250 °C (greater than 482 °F) or treated water greater than 250 °C (greater than 482 °F) in the ESF systems.

3.2.2.1.2 No Aging Effect Requiring Management

SLRA Table 3.2.1, item 3.2.1-057, and SLRA Table 3.3.1, item 3.3.1-114 addresses no aging effects for copper-alloy piping and piping components exposed to air, condensation, and gas. During its review of components constructed from copper alloy greater than 15 percent zinc associated with items 3.2.1-057 and 3.3.1-114, for which Dominion Energy cited generic note A, the staff noted that the SLRA states that there are no aging effects when exposed to air-indoor uncontrolled or condensation. The AMR items associated with item 3.2.1-057 cite a plant-specific note which states "[s]pray nozzles are not wetted and are near the top of Containment, not exposed to potential leakage through insulation that could carry contaminants such as ammonia compounds that support cracking." In addition, the AMR items associated with item 3.3.1-114 cite a plant-specific note which states the following:

> Cracking of copper alloy (>15% Zn) in air and condensation environments requires the presence of ammonia-based compounds. In indoor air, such compounds could be conveyed to external surfaces of components via leakage through the insulation from bolted connections. However, internal surfaces of components are not exposed to contamination from external leakage sources. Therefore, internal cracking of these components is not expected.

The staff noted that GALL-SLR Report item S-454 cites cracking as an applicable aging effect for copper alloy greater than 15 percent zinc piping and piping components exposed to air or condensation. The technical basis for item S-454 in NUREG-2221, "Technical Bases for Changes in the Subsequent License Renewal Guidance Documents NUREG-2191 and NUREG-2192," states the following:

> Based on a review of ASM Handbook, Volume 13B, "Corrosion: Materials, Corrosion of Copper and Copper Alloys," ASM International, 2006, pages 129–133, the staff concluded that copper alloy (>15% Zn or >8% Al) is susceptible to cracking due to SCC in air or condensation environments depending on the presence of ammonia-based compounds. In addition to being present in the outdoor air environment, they could be conveyed to the surface of a copper alloy (>15% Zn or >8% Al) component via leakage through the insulation from bolted connections (e.g., flange joints, valve packing).

Based on its review of copper alloy greater than 15 percent zinc components exposed to air-indoor uncontrolled or condensation associated with AMR items 3.2.1-057 and 3.3.1-114 for which Dominion Energy cited generic note A, the staff finds Dominion Energy's proposal to cite no aging effects acceptable for the following reasons: (a) based on the location of the spray nozzles, there is reasonable assurance that they will not be exposed to ammonia or ammonia compounds; and (b) internal surfaces are not exposed to leaks in piping systems located above; therefore, there is reasonable assurance that the internal surfaces of copper alloy greater than 15 percent zinc components will not be exposed to ammonia or ammonia compounds.

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 evaluates aging management for certain ESF components as recommended by the GALL-SLR Report, and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria contained in SRP-SLR Section 3.2.2.2. 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 Table 3.2.1, AMR item 3.2.1-001, states that fatigue of ESF components is a TLAA, and that the evaluation of this TLAA, is addressed in

SLRA Section 4.3.3. This is consistent with SRP-SLR Section 3.2.2.2.1 and is, therefore, acceptable. The staff's evaluation regarding the TLAA for fatigue of ESF components is documented in SER 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, 3.2.1-099, 3.2.1-106, 3.2.1-107, and 3.2.1-112, addresses loss of material due to pitting and crevice corrosion for stainless steel and nickel-alloy piping, piping components, and tanks exposed to air, condensation, or underground environment, which will be managed by the One-Time Inspection, Buried and Underground Piping and Tanks, or Outdoor and Large Atmospheric Metallic Storage Tanks Programs. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.2.2.2.2.

In its review of components associated with AMR items 3.2.1-004, 3.2.1-048, 3.2.1-099, 3.2.1-106, 3.2.1-107, and 3.2.1-112, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the Outdoor Large Atmospheric Metallic Storage Tanks Program for AMR item 3.2.1-106, and the Buried and Underground Piping and Tanks Program for AMR item 3.2.1-112, is acceptable because the periodic inspections conducted as part of these programs are capable of detecting loss of material. The staff finds Dominion Energy's proposal to manage the effects of aging for AMR items 3.2.1-048, 3.2.1-099, and 3.2.1-107 using the One-Time Inspection Program acceptable because the plant-specific operating experience does not reveal a history of loss of material due to crevice corrosion or pitting for these components, and the proposed one-time inspections are capable of detecting whether loss of material is occurring.

Based on the programs identified, the staff concludes that Dominion Energy's programs meet SRP-SLR Section 3.2.2.2.2 criteria. For those AMR items associated with SLRA Section 3.2.2.2.2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy 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).

3.2.2.2.3 Loss of Material Due to General Corrosion and Flow Blockage Due to Fouling

In SLRA Section 3.2.2.2.3, associated with SLRA Table 3.2.1, item 3.2.1-006 addresses loss of material and flow blockage in metallic flow orifice and spray nozzles exposed to uncontrolled air indoor and condensation. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.3 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, tanks, tanks within the scope of GALL-SLR AMP XI.M29, and insulated piping, piping components, and tanks exposed to air, condensation, or underground environment, which will be managed by the One-Time Inspection, Buried and Underground Piping and Tanks, or Outdoor and Large Atmospheric Metallic Storage Tanks Programs. The staff reviewed Dominion Energy'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 staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the Buried and Underground Piping and Tanks Program for AMR item 3.2.1-080, and Outdoor and Large Atmospheric Metallic Storage Tanks Program for AMR item 3.2.1-103, is acceptable because the periodic inspections conducted as part of these programs are capable of detecting cracking. The staff finds Dominion Energy's proposal to manage the effects of aging for AMR items 3.2.1-007 and 3.2.1-108 using the One-Time Inspection Program acceptable because the plant-specific operating experience does not reveal a history of cracking for these components, and the proposed one-time inspections are capable of detecting whether cracking is occurring.

Based on the programs identified, the staff concludes that Dominion Energy'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

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA Program.

3.2.2.2.6 Ongoing Review of Operating Experience

SER Section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of operating experience.

3.2.2.2.7 Loss of Material Due to Recurring Internal Corrosion

SLRA Section 3.2.2.2.7, associated with SLRA Table 3.2.1, item 3.2.1-066, addresses loss of material due to recurring internal corrosion in metallic piping components exposed to raw water and wastewater. Dominion Energy stated that its review of operating experience for ESF systems at NAPS confirmed that loss of material due to recurring internal corrosion was not an AERM and that item 3.2.1-066 was not applicable. The 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 did not identify any examples of recurring internal corrosion in ESF systems during its review of NAPS's operating experience information.

3.2.2.2.8 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

SLRA Section 3.2.2.2.8, associated with SLRA Table 3.2.1, AMR items 3.2.1-100, 3.2.1-101, 3.2.1-102, 3.2.1-109, and 3.2.1-110, addresses cracking due to SCC for aluminum components. Dominion Energy stated that these items are not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.2.2.2.8 and finds it acceptable because based on a review of the UFSAR and SLRA there are no in-scope aluminum components in the ESF systems.

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

SLRA Section 3.2.2.2.9, associated with SLRA Table 3.2.1, item 3.2.1-055, addresses loss of material due to general, crevice or pitting corrosion for steel piping and piping components exposed to concrete. Dominion Energy stated that this item is not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.2.2.2.9 and finds it acceptable because based on a review of the UFSAR, there are no steel components exposed to concrete in the ESF systems.

SLRA Section 3.2.2.2.9, associated with SLRA Table 3.2.1 item 3.2.1-091, addresses loss of material due to crevice or pitting corrosion and cracking due to SCC for stainless steel piping and piping components exposed to concrete, which will be managed by the Buried and Underground Piping and Tanks Program. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.2.2.2.9.

In its review of components associated with item 3.2.1-091, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the Buried and Underground Piping and Tanks Program is acceptable because periodic visual inspections can be capable of detecting loss of material and cracking in stainless steel piping. Therefore, the staff finds that AMR item 3.2.1-091 will be adequately addressed by AMR items 3.2.1-053 and 3.2.1-078.

Based on the program identified, the staff concludes that Dominion Energy's program meets SRP-SLR Section 3.2.2.2.9 criteria. For those AMR items associated with SLRA Section 3.2.2.2.9, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.2.2.2.10 Loss of Material Due to Pitting and Crevice Corrosion in Aluminum Alloys

SLRA Section 3.2.2.2.10, associated with SLRA Table 3.2.1, AMR items 3.2.1-042, 3.2.1-056, 3.2.1-105, 3.2.1-111, 3.2.1-119, and 3.2.1-121, addresses loss of material for aluminum components. Dominion Energy stated that these items are not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.2.2.2.10 and finds it acceptable because based on a review of the UFSAR and SLRA there are no in-scope aluminum components in the ESF systems.

3.2.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL-SLR Report

The SLRA did not identify any AMR results in SLRA Tables 3.2.2-1 through 3.2.2-4 that are not consistent with, or not addressed in, the GALL-SLR Report.

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

3.3.1 Summary of Technical Information in the Application

SLRA Section 3.3 provides AMR results for those components the applicant identified in SLRA Section 2.3.3, "Auxiliary Systems," as being subject to an AMR. SLRA Table 3.3.1, "Summary of Aging Management Programs for Auxiliary Systems," is a summary comparison of the applicant's AMR results with those provided in the GALL-SLR Report for the auxiliary systems components.

3.3.2 Staff Evaluation

Table 3.3-1, below, summarizes the 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 Evaluated in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-001	Consistent with the GALL-SLR Report (see SER Section 3.3.2.2.1)
3.3.1-002	Consistent with the GALL-SLR Report (see SER Section 3.3.2.2.1)
3.3.1-003	Consistent with the GALL-SLR Report (see SER Section 3.3.2.2.2)
3.3.1-003a	Not used. Addressed by 3.3.1-003
3.3.1-004	Consistent with the GALL-SLR Report (see SER 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 SER 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 NAPS
3.3.1-011	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-012	Consistent with the GALL-SLR Report
3.3.1-013	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-014	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-015	Consistent with the GALL-SLR Report
3.3.1-016	Not applicable to PWRs
3.3.1-017	Consistent with the GALL-SLR Report
3.3.1-018	Not used. Addressed by 3.3.1-028 and 3.3.1-124
3.3.1-019	Not applicable to PWRs
3.3.1-020	Consistent with the GALL-SLR Report
3.3.1-021	Not applicable to PWRs
3.3.1-022	Not applicable to PWRs
3.3.1-023	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-024	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-025	Not Applicable to NAPS
3.3.1-026	Not applicable to PWRs
3.3.1-027	Not applicable to PWRs
3.3.1-028	Consistent with the GALL-SLR Report
3.3.1-029	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-030	Not applicable to NAPS
3.3.1-030a	Not used. Addressed by 3.3.1-175
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

Component Group (SRP-SLR Item No.)	Staff Evaluation
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 NAPS
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 NAPS
3.3.1-048	Consistent with the GALL-SLR Report
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 NAPS
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
3.3.1-061	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-062	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-063	Consistent with the GALL-SLR Report
3.3.1-064	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.2)
3.3.1-065	Not applicable to NAPS
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 NAPS
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

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-078	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.7)
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
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 NAPS
3.3.1-090	Not used. Addressed by 3.3.1-055
3.3.1-091	Consistent with the GALL-SLR Report
3.3.1-092	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-093	Consistent with the GALL-SLR Report
3.3.1-094	Not used. Addressed by 3.3.1-006 (see SER Section 3.3.2.2.4)
3.3.1-094a	Not used. Addressed by 3.3.1-004 and 3.3.1-205 (see SER Section 3.3.2.2.3)
3.3.1-095	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.4)
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 NAPS
3.3.1-102	Not applicable to NAPS
3.3.1-103	Not applicable to NAPS
3.3.1-104	Consistent with the GALL-SLR Report
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	Consistent with the GALL-SLR Report
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 NAPS
3.3.1-112	Consistent with the GALL-SLR Report (see SER Section 3.3.2.2.9, item 1)
3.3.1-113	Not applicable to NAPS
3.3.1-114	Consistent with the GALL-SLR Report (see SER Section 3.2.2.1.2)
3.3.1-115	Not applicable to NAPS
3.3.1-116	Not applicable to NAPS
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

Component Group (SRP-SLR Item No.)	Staff Evaluation
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 NAPS
3.3.1-123	Consistent with the GALL-SLR Report
3.3.1-124	Consistent with the GALL-SLR Report
3.3.1-125	Consistent with the GALL-SLR Report
3.3.1-126	Consistent with the GALL-SLR Report
3.3.1-127	Consistent with the GALL-SLR Report (see SER Section 3.3.2.2.7)
3.3.1-128	Not Applicable to NAPS
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 (see Section 3.3.2.1.8)
3.3.1-133	Not applicable to NAPS
3.3.1-134	Consistent with the GALL-SLR Report
3.3.1-135	Consistent with the GALL-SLR Report
3.3.1-136	Consistent with the GALL-SLR Report
3.3.1-137	Not applicable to NAPS
3.3.1-138	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.6)
3.3.1-139	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.6)
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
3.3.1-144	Consistent with the GALL-SLR Report
3.3.1-145	Consistent with the GALL-SLR Report
3.3.1-146	Consistent with the GALL-SLR Report (see SER Section 3.3.2.2.3)
3.3.1-147	Not applicable to NAPS
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 NAPS
3.3.1-150	Consistent with the GALL-SLR Report
3.3.1-151	Consistent with the GALL-SLR Report
3.3.1-152	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-153	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-154	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-155	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 NAPS
3.3.1-158	Not applicable to NAPS
3.3.1-159	Not Used. Addressed by 3.3.1-082.
3.3.1-160	Consistent with the GALL-SLR Report See Section 3.3.2.1.3)
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

Component Group (SRP-SLR Item No.)	Staff Evaluation
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 NAPS
3.3.1-167	Consistent with the GALL-SLR Report
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 NAPS
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	Consistent with the GALL-SLR Report
3.3.1-176	Not Used. Addressed by 3.3.1-175.
3.3.1-177	Consistent with the GALL-SLR Report
3.3.1-178	Not applicable to NAPS
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 NAPS
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 NAPS
3.3.1-185	Not applicable to NAPS
3.3.1-186	Not applicable to NAPS (see SER 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 SER 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 NAPS (see SER Section 3.3.2.2.8)
3.3.1-193	Consistent with the GALL-SLR Report
3.3.1-194	Not applicable to NAPS
3.3.1-195	Not applicable to NAPS
3.3.1-196	Not applicable to NAPS
3.3.1-197	Not applicable to NAPS
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 SER Section 3.3.2.2.9, item 2)
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 SER 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 NAPS
3.3.1-208	Not applicable to NAPS

Component Group (SRP-SLR Item No.)	Staff Evaluation
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 NAPS
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 NAPS
3.3.1-215	Not applicable to NAPS
3.3.1-216	Not applicable to NAPS
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 NAPS
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 SER Section 3.3.2.2.4)
3.3.1-223	Not applicable to NAPS (see SER Section 3.3.2.2.10)
3.3.1-224	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-225	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-226	Not applicable to NAPS
3.3.1-227	Not applicable to NAPS (see SER Section 3.3.2.2.10)
3.3.1-228	Not applicable to NAPS (see SER Section 3.3.2.2.4)
3.3.1-229	Not applicable to NAPS
3.3.1-230	Not applicable to NAPS
3.3.1-231	Not applicable to NAPS (see SER Section 3.3.2.2.3)
3.3.1-232	Consistent with the GALL-SLR Report (see SER Section 3.3.2.2.4)
3.3.1-233	Not applicable to NAPS (see SER Section 3.3.2.2.8)
3.3.1-234	Consistent with the GALL-SLR Report (see SER Section 3.3.2.2.10)
3.3.1-235	Consistent with the GALL-SLR Report
3.3.1-236	Not applicable to NAPS
3.3.1-237	Not applicable to NAPS
3.3.1-238	Consistent with the GALL-SLR Report
3.3.1-239	Not applicable to NAPS
3.3.1-240	Not applicable to NAPS (see SER Section 3.3.2.2.10)
3.3.1-241	Consistent with the GALL-SLR Report (see SER Section 3.3.2.2.4)
3.3.1-242	Consistent with the GALL-SLR Report (see SER 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 used. Addressed by 3.3.1-234 and 3.3.1-242 (see SER Section 3.3.2.2.10)
3.3.1-246	Consistent with the GALL-SLR Report (see SER Section 3.3.2.2.4)
3.3.1-247	Consistent with the GALL-SLR Report (see SER Section 3.3.2.2.10)
3.3.1-248	Not applicable to NAPS
3.3.1-249	Consistent with the GALL-SLR Report
3.3.1-250	Not applicable to NAPS
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 NAPS
3.3.1-253	Consistent with the GALL-SLR Report (See SER Section 3.3.2.1.5)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3.1-254	Consistent with the GALL-SLR Report (see SER 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 3.3.1-085, 3.3.1-091, 3.3.1-095, and 3.3.1-253
3.3.1-259	Not applicable to NAPS
3.3.1-260	Consistent with the GALL-SLR Report
3.3.1-261	Not Applicable to NAPS
3.3.1-262	Not Used. Addressed by 3.3.1-238
3.3.1-263	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.9)
3.3.1-264	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3.1-265	Not used. Addressed by 3.3.1-266.
3.3.1-266	Consistent with the GALL-SLR Report
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 staff's review of component groups, as described in SER Section 3.0.2.2, is summarized in the following three sections:

(1) SER Section 3.3.2.1 discusses AMR results for components that the applicant states are either not applicable to NAPS 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 and documents any RAIs issued and the staff's conclusions. The remaining subsections in SER Section 3.3.2.1 document the review of components that required additional information or otherwise require explanation.

(2) SER Section 3.3.2.2 discusses AMR results for which the GALL-SLR Report and SRP-SLR recommend further evaluation.

(3) SER Section 3.3.2.3 discusses AMR results for components that the applicant states are not consistent with, or not addressed in, the GALL-SLR Report. These AMR results typically are identified by generic notes F through J and plant-specific notes in the SLRA.

3.3.2.1 Aging Management Review Results Consistent with the GALL-SLR Report (A-D, Plus Not Used or Not Applicable)

The following subsections document the staff's review of AMR results listed in SLRA Tables 3.3.2-1 through 3.3.2-43 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 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 item. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SER Table 3.3-1, and no separate writeup is required nor provided.

For AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in Sections 3.3.2.1.2 through 3.3.2.1.9 below.

SER Section 3.3.2.1.1 documents the staff's review of AMR items the applicant determined to be not applicable or not used.

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

For SLRA Table 3.3-1, items 3.3.1-010, 3.3.1-025, 3.3.1-030, 3.3.1-044, 3.3.1-047, 3.3.1-051, 3.3.1-065, 3.3.1-073, 3.3.1-089, 3.3.1-101, 3.3.1-102, 3.3.1-103, 3.3.1-111, 3.3.1-113, 3.3.1-115, 3.3.1-116, 3.3.1-122, 3.3.1-128, 3.3.1-133, 3.3.1-137, 3.3.1-147, 3.3.1-149, 3.3.1-157, 3.3.1-158, 3.3.1-166, 3.3.1-172, 3.3.1-178, 3.3.1-181, 3.3.1-184, 3.3.1-185, 3.3.1-186, 3.3.1-192, 3.3.1-194, 3.3.1-195, 3.3.1-196, 3.3.1-197, 3.3.1-207, 3.3.1-208, 3.3.1-210, 3.3.1-214, 3.3.1-215, 3.3.1-216, 3.3.1-218, 3.3.1-223, 3.3.1-226, 3.3.1-227, 3.3.1-228, 3.3.1-229, 3.3.1-230, 3.3.1-231, 3.3.1-233, 3.3.1-236, 3.3.1-237, 3.3.1-239, 3.3.1-240, 3.3.1-248, 3.3.1-250, 3.3.1-252, 3.3.1-259, and 3.3.1-261, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to NAPS. The staff reviewed the SLRA and UFSAR and confirmed that the applicant's SLRA does not have any AMR results that are applicable for these items.

For SLRA Table 3.3-1, 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, 3.3.1-110, 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 BWRs. The staff reviewed the SRP-SLR, confirmed that these items only apply to BWRs and finds that these items are not applicable to NAPS because it is a PWR.

For the following SLRA Table 3.3-1, items, Dominion Energy claimed that the corresponding item in the GALL-SLR Report is not used because it is addressed by another SLRA Table 1, AMR item: 3.3.1-003a (addressed by 3.3.1-003), 3.3.1-018 (addressed by 3.3.1-028 and 3.3.1-124), 3.3.1-030a (addressed by 3.3.1-175), 3.3.1-090 (addressed by 3.3.1-055), 3.3.1-094 (addressed by 3.3.1-006), 3.3.1-094a (addressed by 3.3.1-004 and 3.3.1-205), 3.3.1-159 (addressed by 3.3.1-082), 3.3.1-176 (addressed by 3.3.1-175), 3.3.1-198 (addressed by 3.3.1-064), 3.3.1-245 (addressed by 3.3.1-234 and 3.3.1-242), 3.3.1-258 (addressed by 3.3.1-085, 3.3.1-091, 3.3.1-095, and 3.3.1-253), 3.3.1-262 (addressed by 3.3.1-238), and 3.3.1-265 (addressed 3.3.1-266). The staff reviewed the SLRA and confirmed that the aging effects for each of these items will be addressed by other SLRA Table 1 AMR items. Therefore, the staff finds Dominion Energy's proposal to use alternate items acceptable.

3.3.2.1.2 Loss of Material due to General, Pitting, Crevice Corrosion, Microbiologically Influenced Corrosion (MIC); Flow Blockage due to Fouling

SLRA Table 3.3.1, AMR item 3.3.1-064, addresses loss of material due to general, pitting, crevice corrosion, and microbiologically influenced corrosion (MIC); and flow blockage due to fouling for steel and copper alloy piping and piping components exposed to raw water, treated water, and raw water (potable). For the SLRA Table 2 AMR items that cite generic note B, the SLRA credits the Fire Water System Program to manage loss of material and flow blockage for steel and copper alloy sight glass bodies, strainer bodies, strainer elements, tanks, and valve bodies exposed to raw water. In addition, as amended by letter dated February 4, 2021 (ADAMS Accession No. ML21035A303), SLRA Table 3.3.2-42 cites AMR item 3.3.1-064 for copper alloy piping and piping components exposed to raw water.

SLRA Table 3.3.2-42 cites AMR item 3.3.1-064 for copper alloy greater than 15 percent zinc valve bodies exposed to raw water. In addition, as amended by letter dated February 4, 2021, SLRA Table 3.3.2-42 cites AMR item 3.3.1-064 for copper alloy greater than 15 percent zinc sight glass bodies exposed to raw water. Cracking is considered an aging effect under this material and environment, as recommended by GALL-SLR Report items A-473a, A-473b, and A-473c, associated with Table 1 item 3.3.1-160. As amended by letter dated April 29, 2021 (ADAMS Accession No. ML21119A287), SLRA Table 3.3.1, AMR item 3.3.1-160, is cited in SLRA Table 3.3.2-42 for managing cracking in copper alloy greater than 15 percent zinc sight glass bodies and valve bodies exposed to raw water by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The staff noted that generic note E was cited for these Table 2 AMR items even though managing the associated aging effect for these components in the cited environment with the above program is consistent with the GALL-SLR Report.

Based on its review of components associated with AMR item 3.3.1-064 for which Dominion Energy cited generic note B, the staff finds Dominion Energy's proposal to manage loss of material and flow blockage using the Fire Water System Program acceptable because the visual inspections and flow related tests required by the program are capable of detecting loss of material and flow blockage. In addition, based on its review of components associated with AMR item 3.3.1-160 for which Dominion Energy cited generic note E, the staff finds Dominion Energy's proposal to manage cracking using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program acceptable because it is consistent with the GALL-SLR Report.

3.3.2.1.3 Cracking Due to Stress Corrosion Cracking

During its review of components associated with AMR item 3.3.1-160 for which Dominion Energy cited generic note E, the staff noted that the SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components and Fire Water System Programs to manage the aging effect for copper alloy with greater than 15 percent zinc. For SLRA AMR item 3.3.1-160, the staff determined the need for additional information, which resulted in the issuance of an RAI. RAI B2.1.16-4 and Dominion Energy's response are documented in ADAMS Accession No. ML21119A287, dated April 29, 2021. In its response, Dominion Energy revised AMR item 3.3.1-160 to credit just the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and cited generic note E. Although the applicant cited generic note E for item 3.3.1-160, use of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is consistent with the GALL-SLR recommendation; therefore, the staff finds this acceptable.

3.3.2.1.4 Loss of Material Due to General, Pitting, Crevice Corrosion, MIC, and Flow Blockage Due to Fouling

SLRA Table 3.3.1, item 3.3.1-095 addresses loss of material due to general corrosion (copper alloy only), pitting, crevice corrosion, and MIC, and flow blockage due to fouling for copper-alloy, stainless steel, and nickel-alloy piping, piping components, heat exchanger components, and tanks exposed to wastewater. For the SLRA Table 2 AMR items that cite generic note E and plant-specific note 1, the SLRA credits the External Surfaces Monitoring of Mechanical Components Program to manage the aging effects of the internal and external surfaces of submerged copper-alloy sump pumps. Plant-specific note 1 states that the internal and external environments for these components are such that the external surface condition is representative of the internal surface condition, and this program assignment is similar to that in items VII.E5.A-410 and VII.E5.A-411. Based on its review of components associated with item 3.3.1-095 for which Dominion Energy cited generic note E, the staff finds Dominion Energy's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components Program acceptable because the program can be used for situations where the similarity of the internal and external environments are such that the external surface condition is representative of the internal surface condition.

3.3.2.1.5 Loss of Material Due to Wear and Flow Blockage Due to Fouling

SLRA Table 3.3.1, item 3.3.1-253 addresses loss of material due to wear and flow blockage due to fouling for polyvinyl chloride (PVC) piping and piping components exposed to raw water, raw water (potable), treated water, and wastewater. 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 PVC components. Based on its review of components associated with item 3.3.1-253 for which Dominion Energy cited generic note E, the staff finds Dominion Energy's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components Program acceptable because performing periodic visual inspections on a refueling outage interval can identify the effects of aging prior to a loss of intended function.

3.3.2.1.6 Loss of Coating or Lining Integrity Due to Blistering, Cracking, Flaking, Peeling, Delamination, Rusting, or Physical Damage; Loss of Material or Cracking for Cementitious Coatings/Linings; Loss of Material Due to General, Pitting, Crevice Corrosion, or MIC

As amended by letter dated February 4, 2021 (ADAMS Accession No. ML21035A303), SLRA Table 3.3.1, AMR items 3.3.1-138 and 3.3.1-139, address any type material piping, piping components, heat exchangers, and tanks with internal coatings/linings exposed to closed cycle cooling water, raw water, raw water (potable), treated water, treated borated water, fuel oil, lubricating oil, or wastewater, which will be managed for: (a) loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage (item 3.3.1-138); and (b) loss of material due to general, pitting, crevice corrosion, or MIC (item 3.3.1-139). For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the Fuel Oil Chemistry Program to manage the effects of aging for internally coated carbon steel tanks exposed to fuel oil. The AMR items cite plant-specific note 2, which states "[t]he Fuel Oil Chemistry (B2.1.18) program will manage loss of coating or lining integrity and loss of material for the fuel oil storage tanks. The applicable recommendations of the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.28) Program will be incorporated into the Fuel Oil Chemistry (B2.1.18) Program."

The staff noted that GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," states that an applicant may elect to manage the aging effects for internal coatings/linings for in-scope piping, piping components, heat exchangers, and tanks with an alternative AMP as long as: (a) the recommendations of GALL-SLR Report AMP XI.M42 are incorporated into the alternative program; (b) exceptions or enhancements associated with the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program are included in the alternative AMP; and (c) the UFSAR supplement for the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program is included in the application with a reference to the alternative AMP. Based on its review of components associated with AMR items 3.3.1-138 and 3.3.1-139 for which Dominion Energy cited generic note E, the staff finds

Dominion Energy's proposal to manage the effects of aging using the Fuel Oil Chemistry Program acceptable for the following reasons: (a) the activities to manage the aging effects for internal coatings are consistent with the recommendations of GALL-SLR AMP XI.M42; (b) the exceptions associated with the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program are not applicable to the subject tanks; and (c) as amended by letter dated February 4, 2021, SLRA Section A1.28, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," was revised to include a reference to the Fuel Oil Chemistry Program.

As amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), SLRA Table 3.3.1, AMR item 3.3.1-138, addresses (a) loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage; and (b) loss of material or cracking for cementitious coatings/linings for any type material piping, piping components, heat exchangers, and tanks with internal coatings/linings exposed to closed cycle cooling water, raw water, raw water (potable), treated water, treated borated water, fuel oil, lubricating oil, or wastewater. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the Fire Water System Program to manage the effects of aging for internally-lined ductile iron valve bodies exposed to raw water. The AMR item cites plant-specific note 12, which states the following:

> [a]ging effects for lined ductile iron valves (01-FP-85 and 01-FP-90) are managed as follows: [l]oss of coating or lining integrity; loss of material due to general, pitting, crevice corrosion, and MIC; and flow blockage due to fouling are managed with the Fire Water System (B2.1.16) program. Full flow testing and flushing is performed annually, at design pressure and flow rate, on downstream hydrants to detect flow blockage due to fouling as result of corrosion products or coating debris. Valves are flushed fully open for greater than one minute until all foreign material has cleared. Loss of material due to selective leaching is managed by the Selective Leaching (B2.1.21) program, and long-term loss of material is managed by the One-Time Inspection (B2.1.20) program.

Based on its review of components associated with AMR item 3.3.1-138 for which Dominion Energy cited generic note E, the staff finds Dominion Energy's proposal to manage the effects of aging using the Fire Water System Program acceptable because there is reasonable assurance that, with the frequency of flow tests that are being conducted, flow blockage would be detected just as effectively as if internal visual inspections were being periodically conducted on the valves in accordance with GALL-SLR Report Table XI.M42-1, "Inspection Intervals for Internal Coatings/Linings for Tanks, Piping, Piping Components, and Heat Exchangers."

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

SLRA Table 3.3.1, item 3.3.1-078 addresses loss of material due to general, pitting, and crevice corrosion for steel surfaces exposed to uncontrolled indoor and outdoor air and condensation. 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 and the Structures Monitoring Program to manage the aging effect for the internal and external surfaces, respectively, of the gray cast iron valve bodies exposed to outdoor air. Based on its review of components associated with item 3.3.1-078 for which Dominion Energy cited generic note E, the staff finds Dominion Energy's proposal to manage the effects of aging using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components and the Structures Monitoring Programs acceptable because the programs can be used for structures or components with known age-related degradation mechanisms and rely on established nondestructive examination (NDE) 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. The periodic inspection program is implemented at all units on site with same combination(s) of material, environment, and aging effect.

3.3.2.1.8 Cracking Due to Stress Corrosion Cracking

SLRA Table 3.3.1, item 3.3.1-132 addresses copper-alloy (greater than 15 percent Zn) piping and fittings exposed internally to uncontrolled indoor air that are susceptible to cracking. For the associated AMR item that cites generic note E, the SLRA credits the Fire Water System Program to manage the aging effect for hose rack piping components downstream from hose rack isolation valves. Based on its review of components associated with AMR item 3.3.1-132 for which Dominion Energy cited generic note E, the staff finds Dominion Energy's proposal to manage the effects of aging using the Fire Water System Program acceptable because the program can be used for structures or components with known age-related degradation mechanisms. The Fire Water System also relies on established NDE 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.

3.3.2.1.9 Hardening or Loss of Strength Due to Polymeric Degradation; Loss of Material Due to Peeling, Delamination, Wear; Cracking or Blistering Due to Exposure to Ultraviolet Light, Ozone, Radiation or Chemical Attack

SLRA Table 3.3.1, item 3.3.1-263 addresses polymeric piping, piping components, ducting, ducting components, and seals exposed to air, condensation, raw water, raw water (potable), treated water, wastewater, underground, concrete, and soil that are susceptible to hardening or loss of strength due to polymeric degradation, as well as loss of material due to peeling, delamination, wear; cracking or blistering due to exposure to ultraviolet light, ozone, radiation, or chemical attack; and flow blockage due to fouling. For the associated AMR item that cites generic note E, the SLRA credits the Buried and Underground Piping and Tanks Program to manage hardening or loss of strength, as well as loss of material; cracking or blistering of polymer piping and piping components in an underground environment. The AMR item cites plant-specific note 1, which states that the cited program will manage aging of the external surface of the below-grade Kynar® polyvinylidene fluoride (PVDF) polymer fuel oil piping.

The staff notes that SRP-SLR Table 3.3.1, item 3.3.1-263 credits either AMP XI.M36, External Surfaces Monitoring of Mechanical Components, or AMP XI.M38, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, Programs. However, neither of these AMPs are appropriate for managing the effects of aging in underground, concrete, or soil environments because of limited or no access. In addition, the staff notes that AMP XI.M41, Buried and Underground Piping and Tanks, addresses polymeric materials and provides guidance for polymeric materials in the "preventive actions," "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria" program elements. The staff also notes that PVDF would be included in the GALL-SLR Chapter IX.C, Materials, definition of "various polymeric materials." Consequently, based on its review of components associated with AMR item 3.3.1-263 for which Dominion Energy cited generic note E, the staff finds Dominion Energy's proposal to manage the effects of aging using the Buried and Underground Piping and Tanks Program acceptable because, although it is not currently included in the

GALL-SLR Report, the program is appropriate for managing the effects of aging for this material, environment, and aging effect combination.

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 certain auxiliary systems components as recommended by the GALL-SLR Report and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria contained in SRP-SLR Section 3.3.2.2. The following subsections document the staff's review.

3.3.2.2.1 Cumulative Fatigue Damage

Item 1. SLRA Section 3.3.2.2.1 associated with SLRA Table 3.3.1, AMR item 3.3.1-001, states that TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1) and that the evaluation of this TLAA, for load cycle limits of Unit 1 and Unit 2 NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," plant cranes are addressed in SLRA Section 4.7.1. This is consistent with SRP-SLR Section 3.3.2.2.1 and is, therefore, acceptable. The staff's evaluation regarding the TLAA for load cycle limits of the plant cranes is documented in SER Section 4.7.1.

Item 2. SLRA Section 3.3.2.2.1 associated with SLRA Table 3.3.1, AMR item 3.3.1-002, states that fatigue of Auxiliary Systems and Steam and Power Conversion Systems components is a TLAA and that the evaluation of this TLAA is addressed in SLRA Section 4.3.3. This is consistent with SRP-SLR Section 3.3.2.2.1 and is, therefore, acceptable. The staff's evaluation regarding the TLAA for fatigue of auxiliary systems and steam and power conversion systems components is documented in SER Section 4.3.

3.3.2.2.2 Cracking Due to Stress Corrosion Cracking and Cyclic Loading

SLRA Section 3.3.2.2.2, associated with SLRA Table 3.3.1 items 3.3.1-003, and 3.3.1-003a addresses stainless steel heat exchanger tubing exposed to treated borated water greater than 60 °C (140 °F) in the chemical and volume control system (CVCS), which will be managed for SCC by the GALL-SLR Report AMP XI.M2, "Water Chemistry." The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.2.

The staff noted that the search of Dominion Energy's corrective action database did not find any evidence of SCC in the stainless steel nonregenerative heat exchanger in the CVCS. In its review of components associated with item 3.3.1-003, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the Water Chemistry Program is acceptable because no evidence was found to indicate SCC of the stainless steel heat exchanger tubing in the CVCS. This satisfies the requirements of the Further Evaluation item 3.3.2.2.2 in the SRP-SLR.

The staff also noted that SLRA Section 3.3.2.2.2, associated with SLRA Table 3.3.1, AMR item 3.3.1-003a, addresses cracking due to SCC and cyclic loading for stainless steel heat exchanger tubing exposed to treated borated water greater than 60 °C (140 °F) in the CVCS. Dominion Energy stated in the SLRA that this item is being addressed in item 3.3.1-003. The staff finds this acceptable because in its review of components associated with item 3.3.1-003 the search of Dominion Energy's corrective action database did not find any evidence of cracking due to SCC or cyclic loading in the stainless steel nonregenerative heat exchanger in the CVCS.

Based on the program identified, the staff concludes that Dominion Energy'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 Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.3.2.2.3 Cracking Due to Stress Corrosion Cracking in Stainless Steel Alloys

In SLRA Section 3.3.2.2.3, associated with SLRA Table 3.3.1, item 3.3.1-004 addresses cracking due to SCC in stainless steel piping, piping components, and tanks exposed to air and condensation, which will be managed by the One-Time Inspection Program. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.3.2.2.3. In its review of components associated with AMR item 3.3.1-004, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the One-Time Inspection Program is acceptable because the GALL-SLR describes the One-Time Inspection Program as an acceptable program for demonstrating that SCC does not occur.

In SLRA Section 3.3.2.2.3, associated with SLRA Table 3.3.1, item 3.3.1-205 addresses cracking due to SCC in insulated stainless steel piping, piping components, and tanks exposed to air and condensation, which will be managed by the One-Time Inspection Program. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.3.2.2.3. In its review of components associated with AMR item 3.3.1-205, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the One-Time Inspection Program is acceptable because the GALL-SLR describes the One-Time Inspection Program as an acceptable program for demonstrating that SCC does not occur.

In SLRA Section 3.3.2.2.3, associated with SLRA Table 3.3.1, AMR item 3.3.1-146, addresses cracking due to SCC for stainless steel piping, piping components, and tanks exposed to air, condensation, or an underground environment, which will be managed by the One-Time Inspection and Buried and Underground Piping and Tanks Programs. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.3.2.2.3. In its review of components associated with AMR items 3.3.1-146, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging for AMR item 3.3.1-146 using the Buried and Underground Piping and Tanks Program is acceptable because the GALL-SLR states the periodic inspections conducted as part of this program are capable of detecting cracking.

SLRA Section 3.3.2.2.3, associated with Table 3.3.1, AMR item 3.3.1-094a, addresses cracking due to SCC for stainless steel ducting and ducting components exposed to air or condensation. Dominion Energy stated that this item is not applicable because cracking of stainless steel components exposed to air or condensation is addressed by AMR items 3.3.1-004 and 3.3.1-205. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.3.2.2.3 and finds it acceptable because the plant-specific operating experience does not reveal a history of cracking for these components and the one-time inspections proposed for AMR items 3.3.1-004 and 3.3.1-205 are capable of detecting whether cracking is occurring in stainless steel components exposed to air or condensation.

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. Dominion Energy stated that this item is not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.3.2.2.3 and finds it acceptable because, based on a review of the UFSAR and SLRA, there are no stainless steel tanks in the auxiliary systems within the scope of GALL-SLR Report AMP XI.M29.

3.3.2.2.4 Loss of Material Due to Pitting and Crevice Corrosion in Stainless Steel and Nickel Alloys

SLRA Section 3.3.2.2.4, associated with SLRA Table 3.3.1, AMR items 3.3.1-006, 3.3.1-222, 3.3.1-232, 3.3.1-241, and 3.3.1-246, addresses loss of material due to pitting and crevice corrosion for stainless steel and nickel-alloy piping, piping components, tanks, and heat exchanger components exposed to air, condensation, or an underground environment, which will be managed by the One-Time Inspection and Buried and Underground Piping and Tanks Programs. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.3.2.2.4.

In its review of components associated with AMR items 3.3.1-006, 3.3.1-222, 3.3.1-232, 3.3.1-241, and 3.3.1-246, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the One-Time Inspection Program for AMR items 3.3.1-006, 3.3.1-222, and 3.3.1-232 is acceptable because the plant-specific operating experience does not reveal a history of loss of material due to crevice corrosion or pitting for these components, and the proposed one-time inspections are capable of detecting whether loss of material is occurring. The staff finds that Dominion Energy's proposal to manage the effects of aging for AMR item 3.3.1-246 using the Buried and Underground Piping and Tanks Program is acceptable because the periodic inspections conducted as part of this program are capable of detecting loss of material.

Based on the programs identified, the staff concludes that Dominion Energy's programs meet SRP-SLR Section 3.3.2.2.4 criteria. For those AMR items associated with SLRA Section 3.3.2.2.4, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

SLRA Section 3.3.2.2.4, associated with Table 3.3.1, AMR item 3.3.1-094, addresses loss of material due to pitting and crevice corrosion for stainless steel ducting and ducting components exposed to air or condensation. Dominion Energy stated that this item is not applicable because loss of material of stainless steel components exposed to air or condensation is addressed by AMR item 3.3.1-006. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.3.2.2.4 and find it acceptable because the plant-specific operating experience does not reveal a history of loss of material due to crevice corrosion or pitting for these components, and the one-time inspections proposed for AMR item 3.3.1-006 are capable of detecting whether loss of material is occurring in stainless steel components exposed to air or condensation.

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. Dominion Energy stated that this item is not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR

Section 3.3.2.2.4 and finds it acceptable because, based on a review of the UFSAR and SLRA, there are no stainless steel or nickel-alloy tanks in the auxiliary systems within the scope of GALL-SLR Report AMP XI.M29.

3.3.2.2.5 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA Program.

3.3.2.2.6 Ongoing Review of Operating Experience

SER Section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of operating experience.

3.3.2.2.7 Loss of Material Due to Recurring Internal Corrosion

SLRA Section 3.3.2.2.7, associated with SLRA Table 3.3.1, item 3.3.1-127, addresses loss of material due to recurring internal corrosion in metallic piping components exposed to closed cycle cooling water, raw water, treated water, and wastewater. Dominion Energy stated that its review of operating experience identified this aging effect/mechanism in steel and stainless steel components exposed to raw water in the service water and bearing cooling water systems and in steel components in the fire protection system. The SLRA states that the Open-Cycle Cooling Water System, Fire Water System, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, and Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Programs 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 four programs being credited for managing this aging effect/mechanism. In addition, the operating experience sections associated with each of these programs identifies corrective actions taken or scheduled to address this aging effect/mechanism.

The staff compared Dominion Energy's approach against the criteria in SRP-SLR Section 3.3.2.2.7 for the components associated with item 3.3.1-127. The staff finds that Dominion Energy has met the further evaluation criteria and its approach to manage recurring internal corrosion using the cited programs is acceptable because the four 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. In addition, during its review of the plant-specific operating experience provided by Dominion Energy, the staff did not find any other examples of recurring internal corrosion in auxiliary systems beyond those identified by Dominion Energy.

3.3.2.2.8 Cracking Due to Stress Corrosion Cracking in Aluminum Alloys

SLRA Section 3.3.2.2.8, associated with SLRA Table 3.3.1, AMR items 3.3.1-189 and 3.3.1-254, addresses cracking due to SCC for aluminum piping, piping components, and tanks exposed to air, condensation, raw water, raw water (potable), or wastewater, and heat exchanger components exposed to air or condensation, which will be managed by the One-Time Inspection Program. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.3.2.2.8.

In its review of components associated with AMR items 3.3.1-189 and 3.3.1-254, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the One-Time Inspection Program is acceptable because the plant-specific operating experience does not reveal a history of cracking for these components, and the one-time inspections conducted as part of the program are capable of detecting whether cracking is occurring.

Based on the program identified, the staff concludes that Dominion Energy's programs meet SRP-SLR Section 3.3.2.2.8 criteria. For those AMR items associated with SLRA Section 3.3.2.2.8, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

SLRA Section 3.3.2.2.8, associated with SLRA Table 3.3.1, AMR items 3.3.1-186 and 3.3.1-192, addresses cracking due to SCC for aluminum tanks within the scope of GALL-SLR AMP XI.M29, and underground piping, piping components and tanks. Dominion Energy stated that these items are not applicable. The staff evaluated Dominion Energy'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 UFSAR and SLRA, there are no aluminum tanks within the scope of GALL-SLR AMP XI.M29, and underground piping, piping components and tanks in the auxiliary systems.

SLRA Section 3.3.2.2.8, associated with SLRA Table 3.3.1, AMR item 3.3.1-233, addresses cracking due to SCC for insulated aluminum piping, piping components, and tanks exposed to air or condensation. Dominion Energy stated that this item is not applicable because SCC of aluminum components exposed to air or condensation is addressed by AMR items 3.3.1-189 and 3.3.1-254. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.3.2.2.8 and finds this acceptable because the plant-specific operating experience does not reveal a history of cracking for these components, and the one-time inspections proposed for AMR items 3.3.1-189 and 3.3.1-254 are capable of detecting whether cracking is occurring in aluminum components exposed to air or condensation.

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

Item 1. SLRA Section 3.3.2.2.9, associated with SLRA Table 3.3.1 item 3.3.1-112, addresses loss of material due to general, crevice, or pitting corrosion for steel piping and piping components exposed to concrete. Specifically, SLRA Section 3.3.2.2.9 states the following:

> Loss of material of gray cast iron and steel piping components with an external environment of concrete that do not exit the concrete into soil is not an aging effect requiring management. Piping components that do not exit the concrete into soil are not potentially exposed to groundwater. The concrete in areas containing these components conforms to ACI [American Concrete Institute) 318. Review of NAPS operating experience did not identify degradation of concrete around embedded components that could lead to penetration of water.
>
> Loss of material can occur for steel piping components with an external environment of concrete that are potentially exposed to groundwater. Embedded piping that exits concrete into soil is potentially exposed to groundwater. Loss of material for steel components with an external environment of concrete that exit the concrete into soil is managed by the Buried and Underground Piping and Tanks (AMP B2.1.27) program.

The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.3.2.2.9. For gray cast iron and steel piping components with an external environment of concrete that do not exit the concrete into soil, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal that there are no aging effects requiring management is acceptable for the following reasons: (a) the components are encased in concrete that conforms to ACI 318, consistent with SRP-SLR Section 3.3.2.2.9; (b) plant-specific operating experience did not reveal any instances of degradation of concrete around embedded components that could lead to penetration of water; and (c) the components are not potentially exposed to groundwater. For steel piping components with an external environment of concrete that are potentially exposed to groundwater, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the Buried and Underground Piping and Tanks Program is acceptable because periodic visual inspections are capable of detecting loss of material in steel piping.

Item 2. SLRA Section 3.3.2.2.9, associated with SLRA Table 3.3.1 item 3.3.1-202, addresses loss of material due to crevice or pitting corrosion and cracking due to SCC for stainless steel piping and piping components exposed to concrete. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.3.2.2.9.

SLRA Section 3.3.2.2.9 states that: (a) loss of material and cracking of stainless steel components exposed to concrete is not an aging effect for components that are not potentially exposed to groundwater; and (b) stainless steel piping components exposed to concrete in the drains-aerated, helium vacuum drying, refueling purification, and fuel pit cooling systems are embedded within interior concrete structures and are not potentially exposed to groundwater.

In its review of components associated with item 3.3.1-202, the staff finds that Dominion Energy has met the further evaluation criteria. Dominion Energy's proposal that there are no aging effects requiring management is acceptable because, consistent with the further evaluation criteria, the components are not potentially exposed to groundwater.

Based on the program identified, the staff concludes that Dominion Energy's program meets SRP-SLR Section 3.3.2.2.9 criteria. For those AMR items associated with SLRA Section 3.3.2.2.9, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.3.2.2.10 Loss of Material Due to Pitting and Crevice Corrosion in Aluminum Alloys

SLRA Section 3.3.2.2.10, associated with SLRA Table 3.3.1, AMR items 3.3.1-234, 3.3.1-242, and 3.3.1-247, addresses loss of material due to pitting and crevice corrosion for aluminum piping, piping components, tanks, and heat exchanger components exposed to air, condensation, raw water, or wastewater, which will be managed by the One-Time Inspection Program. The staff reviewed Dominion Energy'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, 3.3.1-242, and 3.3.1-247, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the One-Time Inspection Program is acceptable because the plant-specific operating experience does not reveal a history of loss of material due to pitting or crevice corrosion for these components, and the one-time inspections conducted as part of the program are capable of detecting whether loss of material is occurring.

Based on the programs identified, the staff concludes that Dominion Energy'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 Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

SLRA Section 3.3.2.2.10, associated with SLRA Table 3.3.1, AMR items 3.3.1-223, 3.3.1-227, and 3.3.1-240, addresses loss of material due to pitting or crevice corrosion for aluminum underground piping, piping components, and tanks, tanks within the scope of GALL-SLR AMP XI.M29, and aluminum heat exchanger components exposed to wastewater. Dominion Energy stated that these items are not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.3.2.2.10 and finds it acceptable because based on a review of the UFSAR and SLRA, there are no in-scope aluminum alloy components meeting the above component and environment combinations in the auxiliary systems.

SLRA Section 3.3.2.2.10, associated with SLRA Table 3.3.1, AMR item 3.3.1-245, addresses loss of material due to pitting or crevice corrosion for insulated aluminum piping, piping components, and tanks exposed to air or condensation. Dominion Energy stated that this item is not applicable because loss of material of these aluminum components exposed to air or condensation is addressed by AMR items 3.3.1-234 and 3.3.1-242. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.3.2.2.10 and finds this acceptable because the plant-specific operating experience does not reveal a history of loss of material due to pitting or crevice corrosion for these components and the one-time inspections proposed for AMR items 3.3.1-234 and 3.3.1-242 are capable of detecting loss of material in aluminum components exposed to air or condensation.

3.3.2.2.11 Auxiliary Systems – Fire Protection - Aging Management Evaluation

<u>Internally-lined Gray Cast Iron Piping and Piping Components Exposed to Soil</u>. As amended by letter dated February 4, 2021, SLRA Table 3.3.2-42 states that cracking for internally lined gray cast iron piping and piping components exposed to soil will be managed by the Buried and Underground Piping and Tanks Program. The AMR item cites generic note H, for which Dominion Energy has identified cracking as an additional aging effect. The AMR item cites plant-specific note 11, which states "[c]racking of buried gray cast iron piping due to cyclic loading is managed by the Buried and Underground Piping and Tanks (B2.1.27) Program. CLB fatigue analysis does not exist." The staff's evaluation of Dominion's proposal to manage cracking due to cyclic loading for the subject components is documented in SER Section 3.0.3.2.14.

3.3.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL-SLR Report (F-J)

The following subsections document the staff's review of AMR results listed in SLRA Tables 3.3.2-1 through 3.3.2-45 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 1 item, the subsections are organized by applicable AMR Section and then by material and environment combinations.

For component type, material, and environment combinations not evaluated in the GALL-SLR Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the CLB for the subsequent period of extended operation. The following sections document the staff's evaluation.

3.3.2.3.1 Auxiliary Systems – Chemical and Volume Control – Aging Management Evaluation

Polytetrafluoroethylene (PTFE) - Lined Steel and Stainless Steel Flow Elements Exposed to Treated Borated Water. As amended by letter dated February 4, 2021 (ADAMS Accession No. ML21035A303), SLRA Table 3.3.2 19 states that for PTFE-lined steel and stainless flow elements exposed to treated borated water greater than 60 °C (140 °F) there is no aging effect and no AMP is proposed. The AMR items cite generic note F. In addition, the AMR items cite plant-specific note 3, which states the following in part:

- [t]he boric acid tank heaters maintain the boric acid solution below 66 °C (151 °F). The piping at the flow transmitters is heat traced with the temperature controlled at 77 °C +/- 9.5 °C (170 °F +/- 15 °F).
- [c]onsistent with the Environmental Zone Description for Zone AB-274A, the 40- and 60-year fluences are identified as 8.8E2 rads and 1.32E3 rads, respectively. This results in an extrapolated 80-year fluence of 1.76E3 rads which is less than a gamma dose of less than 104 rads noted in NRC IN 2014-04, "Potential for Teflon® Material Degradation in Containment Penetrations, Mechanical Seals and Other Components," at which there are no observable radiation effects that impact material mechanical properties.
- the flow elements are downstream of the boric acid filters and are protected from scratching, abrasion, and weld splatter. Based on Dupont recommendations for PTFE gaskets, 149 °C (300 °F) may be assumed as the temperature below which creep is not a concern for other PTFE components.

The staff referred to *Fluoroplastics, Volume 1 - Non-Melt Processible Fluoropolymers - The Definitive User's Guide and Data Boo*k and noted that PTFE is inert to chemical attack in most environments, with exceptions including exposure to molten alkali metals, gaseous fluorine at high temperatures and pressures, chlorine trifluoride, and oxygen difluoride. In addition, the staff referred to *DuPont Teflon® PTFE Fluoropolymer Resin Properties Handbook* and noted additional design considerations are recommended to minimize creep when temperatures exceed 149 °C (300 °F). Furthermore, the staff identified the following environmental factors that could result in age-related degradation of PTFE in the Safety Evaluation Report Related to the License Renewal of Fermi 2 (ADAMS Accession No. ML16190A241): (a) long-term exposure to temperatures exceeding 285 °C (545 °F); (b) cumulative radiation exposure exceeding 1E4 rads; and (c) exposure to scratching, abrasion, or weld splatter.

The staff reviewed the associated items in the SLRA to confirm that aging effects are not applicable for this component, material, and environment combination. The staff finds Dominion Energy's proposal acceptable for the following reasons: (a) PTFE is not expected to chemically degrade when exposed to a treated borated water environment; (b) PTFE has a radiation exposure threshold higher than the cumulative dose to which the components will be exposed; (c) PTFE has a temperature exposure threshold higher than what the components will be exposed to; and (d) the PTFE lining is not subjected to scratching, abrasion, or weld splatter.

3.3.2.3.2 Auxiliary Systems – Service Water – Aging Management Evaluation

Steel Piping Components Exposed to Petrolatum. SLRA Table 3.3.2-7 states that aging effects for steel piping and piping components exposed to corrosion preventative petrolatum are not applicable and no AMP is proposed. This AMR item cites generic note G, "Environment not in the GALL-SLR Report for this component and material." This AMR item also cites plant-specific note 3, which states, "Petrolatum (petroleum jelly) is used as a corrosion-inhibiting filler in the annular space surrounding a buried, sleeved service water system pipe. Petrolatum provides a barrier to water intrusion and is an anti-foulant." The staff found note 16 on Drawing No. 11715-SLRM-078A, Revision 0, Sheet 1 of 5, which stated, "Annular space between the 22-[inch] pipe and 24-[inch] sleeve is filled with Trenton Fill-Coat #1 Petrolatum Corrosion Preventative Casing Filler Per DCP 91-011." The staff reviewed information about the Trenton Fill-Coat #1 on the Trenton Anticorrosion Materials company website on July 12, 2021 (https://trentoncorp.com/products/casing-filling/fill-coat-1-hot-applied-wax-casing-filler/) and noted that:

> Fill-Coat #1® is a low melt point, hot-installed petrolatum compound that sets up relatively firm at ground temperatures commonly found in normal pipeline operations. It has good "wetting" and adhesion characteristics and prevents possible corrosion of pipe in casings. Fill-Coat #1 meets the Department of Transportation requirements for shorted casings and is expertly installed from readily available inventories by Trenton personnel. Fill-coat #1 is used to displace water that may otherwise be present in the annular space between a casing and internal carrier pipe. Fill-Coat #1 is delivered to the casing site in Trenton insulated tank trucks and pumped through an opening at the top of the casing vent until the annulus between the casing and the carrier pipe is filled.

The staff reviewed the associated item in the SLRA and considered whether there were any applicable aging effects for the component, material, and environment combination listed. Based on its review of the Trenton Anticorrosion Materials company material information, as noted above, and based on review of the ASM Handbook, Volume 5B, Protective Organic Coatings, the staff finds Dominion Energy's proposal acceptable because there are no known aging effects of steel piping exposed to petrolatum, which is a corrosion-inhibiting compound. Thus, there is no expectation that this component, material, environment combination will degrade the ability of the component to perform its intended function for the subsequent period of extended operation.

3.3.2.3.3 Auxiliary Systems – Compressed Air System – Aging Management Evaluation

Internally Coated Carbon Steel Tanks Exposed to Air-Dry. SLRA Table 3.3.2-39 states that loss of material and loss of coating integrity for internally coated carbon steel tanks exposed to air-dry will be managed by the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program. The AMR items cite generic note G.

During its review, the staff noted that subsequent to Dominion Energy's submittal of its SLRA, SLR-ISG-2021-02-MECHANICAL, "Updated Aging Management Criteria for Mechanical Portions of Subsequent License Renewal Guidance," (ADAMS Accession No. ML20181A434) was issued. SLR-ISG-2021-02-MECHANICAL added new AMR items to manage loss of material (item VII.D.A-414 associated with SRP-SLR item 3.3.1-139) and loss of coating integrity (item VII.D.A-416 associated with SRP-SLR item 3.3.1-138) for internally coated tanks exposed to air-dry using the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program. Therefore, the staff finds Dominion Energy's proposal to manage the effects of aging using the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program acceptable because it is consistent with the GALL-SLR Report, as modified by SLR-ISG-2021-02-MECHANICAL.

3.4 Aging Management of Steam and Power Conversion Systems

3.4.1 Summary of Technical Information in the Application

SLRA Section 3.4 provides AMR results for those components the applicant identified in SLRA Section 2.3.4, "Steam and Power Conversion Systems," as being subject to an AMR. SLRA Table 3.4.1, "Summary of Aging Management Programs for Steam and Power Conversion System," is a summary comparison of the applicant's AMR results with those provided in the GALL-SLR Report for the steam and power conversion systems components.

3.4.2 Staff Evaluation

Table 3.4-1, below, summarizes the 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 System 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 SER Section 3.4.2.2.1)
3.4.1-002	Consistent with the GALL-SLR Report (see SER Section 3.4.2.2.2)
3.4.1-003	Consistent with the GALL-SLR Report (see SER 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 NAPS
3.4.1-008	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-009	Consistent with the GALL-SLR Report
3.4.1-010	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-011	Consistent with the GALL-SLR Report
3.4.1-012	Consistent with the GALL-SLR Report
3.4.1-013	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-014	Consistent with the GALL-SLR Report (see SER Section 3.4.2.1.2)
3.4.1-015	Consistent with the GALL-SLR Report
3.4.1-016	Consistent with the GALL-SLR Report (see SER Section 3.4.2.1.2)
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 used. Addressed by 3.4.1-091 for loss of material for steel heat exchanger components exposed to raw water

Component Group (SRP-SLR Item No.)	**Staff Evaluation**
3.4.1-020	Not used. Addressed by 3.4.1-091 for loss of material for steel heat exchanger components exposed to raw water
3.4.1-021	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-022	Consistent with the GALL-SLR Report
3.4.1-023	Not applicable to NAPS
3.4.1-024	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-025	Consistent with the GALL-SLR Report
3.4.1-026	Not applicable to NAPS
3.4.1-027	Not applicable to NAPS
3.4.1-028	Not applicable to NAPS
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 NAPS
3.4.1-033	Consistent with the GALL-SLR Report
3.4.1-034	Consistent with the GALL-SLR Report
3.4.1-035	Not applicable to NAPS (see SER Section 3.4.2.2.9)
3.4.1-036	Not applicable to NAPS
3.4.1-037	Consistent with the GALL-SLR Report
3.4.1-038	Not used. Addressed by 3.4.1-089
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	Consistent with the GALL-SLR Report
3.4.1-042	Not applicable to NAPS
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 NAPS
3.4.1-046	Consistent with the GALL-SLR Report
3.4.1-047	Consistent with the GALL-SLR Report
3.4.1-048	Not applicable to NAPS
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
3.4.1-051	Not Applicable to NAPS (see SER Section 3.4.2.2.8, item 1)
3.4.1-052	Not applicable to NAPS
3.4.1-053	Not applicable to NAPS
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 NAPS
3.4.1-057	Not applicable to NAPS
3.4.1-058	Consistent with the GALL-SLR Report
3.4.1-059	Consistent with the GALL-SLR Report
3.4.1-060	Consistent with the GALL-SLR Report
3.4.1-061	Not applicable to NAPS (see SER Section 3.4.2.2.6)
3.4.1-062	Not used (addressed by 3.4.1-067)
3.4.1-063	Not applicable to NAPS

Component Group (SRP-SLR Item No.)	Staff Evaluation
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 (see SER Section 3.4.2.1.3)
3.4.1-067	Consistent with the GALL-SLR Report (see SER Section 3.4.2.1.3)
3.4.1-068	Not applicable to NAPS
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 NAPS
3.4.1-071	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-072	Consistent with the GALL-SLR Report
3.4.1-073	Not applicable to NAPS
3.4.1-074	Consistent with the GALL-SLR Report (see SER Section 3.4.2.2.2)
3.4.1-075	Not applicable to NAPS
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
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 Used. Addressed by 3.4.1-072. (see SER Section 3.4.2.2.8, item 2)
3.4.1-083	Consistent with the GALL-SLR Report (see SER Section 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 SER Section 3.4.2.1.2)
3.4.1-086	Not applicable to NAPS
3.4.1-087	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-088	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-089	Consistent with the GALL-SLR Report
3.4.1-090	Not applicable to NAPS
3.4.1-091	Consistent with the GALL-SLR Report
3.4.1-092	Not applicable to NAPS
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 NAPS (see SER Section 3.4.2.2.9)
3.4.1-095	Consistent with the GALL-SLR Report (see SER Section 3.4.2.2.3)
3.4.1-096	Not applicable to NAPS
3.4.1-097	Not applicable to NAPS (see SER Section 3.4.2.2.9)
3.4.1-098	Not applicable to NAPS (see SER Section 3.4.2.2.3)
3.4.1-099	Not applicable to NAPS
3.4.1-100	Not applicable to NAPS (see SER Section 3.4.2.2.2)
3.4.1-101	Not applicable to NAPS
3.4.1-102	Not applicable to NAPS (see SER Section 3.4.2.2.7)
3.4.1-103	Not used. Addressed by 3.4.1-003 (see SER Section 3.4.2.2.3)
3.4.1-104	Not Used. Addressed by 3.4.1-002 (see SER Section 3.4.2.2.2)
3.4.1-105	Not applicable to NAPS (see SER Section 3.4.2.2.7)
3.4.1-106	Consistent with the GALL-SLR Report
3.4.1-107	Not applicable to NAPS
3.4.1-108	This item number is not used in the SRP-SLR or the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4.1-109	Consistent with the GALL-SLR Report (see SER 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 NAPS (see SER 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 NAPS
3.4.1-115	Not applicable to NAPS
3.4.1-116	Not applicable to NAPS
3.4.1-117	Not applicable to NAPS
3.4.1-118	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4.1-119	Not applicable to NAPS (see SER Section 3.4.2.2.9)
3.4.1-120	Not applicable to NAPS (see SER 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 applicable to NAPS
3.4.1-124	Not applicable to NAPS
3.4.1-125	Not applicable to NAPS
3.4.1-126	Not applicable to NAPS
3.4.1-127	Not applicable to NAPS
3.4.1-128	Not applicable to NAPS
3.4.1-129	Not applicable to NAPS
3.4.1-130	Not applicable to NAPS
3.4.1-131	Not applicable to NAPS
3.4.1-132	Not applicable to NAPS
3.4.1-133	Not applicable to NAPS
3.4.1-134	Not applicable to NAPS
3.4.1-135	Consistent with the GALL-SLR Report

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

(1) SER Section 3.4.2.1 discusses AMR results for components that the applicant states are either not applicable to NAPS 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 conclusions. The remaining subsections in SER Section 3.4.2.1 document the review of components that required additional information or otherwise require explanation.

(2) SER Section 3.4.2.2 discusses AMR results for which the GALL-SLR Report and SRP-SLR recommend further evaluation.

(3) SER Section 3.4.2.3 discusses AMR results for components that the applicant states are not consistent with, or not addressed in, the GALL-SLR Report. These AMR results 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 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 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 item. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SER Table 3.4-1, and no separate writeup is required or provided.

SER Section 3.4.2.1.1 documents the 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, 3.4.1-023, 3.4.1-026, 3.4.1-027, 3.4.1-028, 3.4.1-032, 3.4.1-035, 3.4.1-036, 3.4.1-042, 3.4.1-045, 3.4.1-048, 3.4.1-051, 3.4.1-052, 3.4.1-053, 3.4.1-056, 3.4.1-057, 3.4.1-061, 3.4.1-063, 3.4.1-068, 3.4.1-070, 3.4.1-073, 3.4.1-075, 3.4.1-078, 3.4.1-082, 3.4.1-086, 3.4.1-090, 3.4.1-092, 3.4.1-094, 3.4.1-096, 3.4.1-097, 3.4.1-098, 3.4.1-099, 3.4.1-100, 3.4.1-101, 3.4.1-102, 3.4.1-103, 3.4.1-104, 3.4.1-105, 3.4.1-107, 3.4.1-109, 3.4.1-112, 3.4.1-114, 3.4.1-115, 3.4.1-116, 3.4.1-117, 3.4.1-119, 3.4.1-120, 3.4.1-123, 3.4.1-124, 3.4.1-125, 3.4.1-126, 3.4.1-127, 3.4.1-128, 3.4.1-129, 3.4.1-130, 3.4.1-131, 3.4.1-132, 3.4.1-133, and 3.4.1-134, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to NAPS. The staff reviewed the SLRA and UFSAR and confirmed that the applicant's SLRA does not have any AMR results that are applicable for these items.

For the following SLRA Table 3.4-1 items, Dominion Energy claimed that the corresponding item in the GALL-SLR Report is not used because it is addressed by another SLRA Table 1 AMR item: 3.4.1-019 (no in-scope stainless steel heat exchanger components exposed to raw water in the Steam and Power Conversion System and for loss of material for steel heat exchanger (HX) components exposed to raw water addressed by 3.4.1-091), 3.4.1-020 (addressed by 3.4.1-091 for loss of material for steel HX components exposed to raw water), 3.4.1-038 (addressed by 3.4.1-089 for loss of material and flow blockage of steel piping and piping components exposed to raw water), 3.4.1-062 (addressed by 3.4.1-067), 3.4.1-078 (addressed by 3.4.1-077), and 3.4.1-082 (addressed by 3.4.1-072). The staff reviewed the SLRA and confirmed that the aging effects will be addressed by another SLRA Table 1 AMR item. Therefore, the staff finds Dominion Energy's proposal to use alternate items acceptable.

3.4.2.1.2 Loss of Material Due to General, Pitting, Crevice Corrosion, and MIC

SLRA Table 3.4.1, AMR items 3.4.1-014, 3.4.1-016, and 3.4.1-085, addresses the: (a) loss of material due to general, pitting, crevice corrosion, and MIC (AMR item 3.4.1-014); and (b) loss of material due to pitting, crevice corrosion, and MIC (AMR items 3.4.1-016, 3.4.1-083, and 3.4.1-085); for steel, stainless steel, nickel-alloy, copper-alloy (with and without greater than 15 percent Zn) piping and piping components used for chemical additions to treated water systems. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program to manage the aging effects associated with these four AMR items.

In SLRA Table 3.3.2-13, "Neutron Shield Tank Cooling," item 3.4.1-014 addresses general, pitting, crevice corrosion, and MIC for steel chemical addition piping and components connected to the neutron shield surge tank. SLRA Table 3.3.2-13, plant-specific note 1 for item 3.4.1-014 states, "The treated water environment is applicable to the chemical addition components connected to the neutron shield surge tank." In SLRA Table 3.3.2-7, "Service Water," item 3.4.1-016 addresses pitting, crevice corrosion, and MIC for a copper-alloy (greater than 15 percent Zn) tank, and item 3.4.1-085 addresses pitting, crevice corrosion, and MIC for nickel-alloy piping and piping components. SLRA Table 3.4.1-7, plant-specific note 2 for items 3.4.1-016 and 3.4.1-85 states that the treated water environment is a "chemical solution environment associated with the chemical feed portion of the service water system."

In SLRA Table 3.3.2-8, "Bearing Cooling," items 3.4.1-016, 3.4.1-083, and 3.4.1-085, address pitting, crevice corrosion, and MIC for, respectively, a copper-alloy valve body, stainless steel chemical addition surge tank, and stainless steel piping and piping components. SLRA Table 3.4.1-8, plant-specific note 2 for items 3.4.1-016, 3.4.1-083, and 3.4.1-085, states that the "treated water system is associated with the bearing cooling system chemical addition components." SLRA Table 3.3.2-19, "Chemical & Volume Control," addresses pitting, crevice corrosion, and MIC for stainless steel piping and components, including tanks, a valve body, and a pump casing. SLRA Table 3.3.2-19, plant-specific note 2 for item 3.4.1-085, states that the environment is "treated water that corresponds to chemical mixing/addition tanks and piping components."

The staff noted that these components are exposed to localized treated water environments where chemicals are added to maintain a specified treated water environment downstream. These localized environments are not defined by the primary or secondary water chemistry guidelines, and therefore not managed by the Water Chemistry Program.

Based on its review of components associated with items 3.4.1-014, 3.4.1-016, 3.4.1-083, and 3.4.1-085, which cite generic note E in SLRA Tables 3.3.2-7, 3.3.2-8, 3.3.2-13, and 3.3.2-19, the staff finds Dominion Energy's proposal to manage the effects of aging using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Program acceptable because periodic visual inspections are capable of detecting loss of material for these components, which are exposed to treated water environments not managed by the Water Chemistry Program.

3.4.2.1.3 Loss of Coating or Lining Integrity due to Blistering, Cracking, Flaking, Peeling, Delamination, Rusting, or Physical Damage; Loss of Material due to General, Pitting, Crevice Corrosion, or MIC

As amended by letter dated February 4, 2021 (ADAMS Accession No. ML21035A303), SLRA Table 3.4.1, AMR items 3.4.1-066 and 3.4.1-067 address any type material piping, piping components, heat exchangers, and tanks with internal coatings/linings exposed to closed cycle cooling water, raw water, treated water, and lubricating oil which will be managed for the: (a) loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage (item 3.4.1-066); and (b) loss of material due to general, pitting, crevice corrosion, or MIC (AMR item 3.4.1-067). For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the Outdoor and Large Atmospheric Metallic Storage Tanks Program to manage the aging effects for internally coated carbon steel tanks exposed to treated water. The AMR items cite plant-specific note 2, which states "[t]he Outdoor and Large Atmospheric Metallic Storage Tanks (B2.1.17) Program will manage loss of coating or lining integrity and loss of material for the emergency condensate storage tanks. The applicable recommendations of the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (B2.1.28) Program will be incorporated into the Outdoor and Large Atmospheric Metallic Storage Tanks (B2.1.17) Program."

The staff noted that GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," states that an applicant may elect to manage the aging effects for internal coatings/linings for in-scope piping, piping components, heat exchangers, and tanks with an alternative AMP as long as: (a) the recommendations of GALL-SLR Report AMP XI.M42 are incorporated into the alternative program; (b) the exceptions or enhancements associated with the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program are included in the alternative AMP; and (c) the UFSAR supplement for the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program is included in the application with a reference to the alternative AMP. Based on its review of components associated with AMR items 3.4.1-066 and 3.4.1-067 for which Dominion Energy cited generic note E, the staff finds Dominion Energy's proposal to manage the effects of aging using the Outdoor and Large Atmospheric Metallic Storage Tanks Program acceptable for the following reasons: (a) the activities to manage the aging effects for internal coatings are consistent with the recommendations of GALL-SLR AMP XI.M42; (b) the exceptions associated with the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks Program are not applicable to the subject tanks; and (c) as amended by letter dated February 4, 2021, SLRA Section A1.28, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," was revised to include a reference to the Outdoor and Large Atmospheric Metallic Storage Tanks 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 evaluates aging management for certain steam and power conversion systems components as recommended by the GALL-SLR Report and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria contained in SRP-SLR Section 3.4.2.2. The following subsections document the staff's review:

3.4.2.2.1 Cumulative Fatigue Damage Due to Fatigue

SLRA Section 3.4.2.2.1 associated with SLRA Table 3.4.1, AMR item 3.4.1-001, states that fatigue of Auxiliary Systems and Steam and Power Conversion Systems components is a TLAA, and that the evaluation of this TLAA is addressed in SLRA Section 4.3.3. This is consistent with SRP-SLR Section 3.4.2.2.1 and is, therefore, acceptable. The staff's evaluation regarding the TLAA for fatigue of steam and power conversion systems components is documented in SER 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 items 3.4.1-002 and 3.4.1-074, addresses cracking due to SCC for stainless steel piping, piping components, and tanks, exposed to air or condensation, and underground stainless steel piping, piping components, and tanks, which will be managed by the One-Time Inspection or Buried and Underground Piping and Tanks Programs. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.4.2.2.2.

In its review of components associated with AMR items 3.4.1-002 and 3.4.1-074, the staff finds that Dominion Energy has met the further evaluation criteria, Dominion Energy'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 operating experience does not reveal a history of cracking for these components, and the one-time inspections conducted as part of the program are capable of detecting whether cracking is occurring. The staff finds that Dominion Energy's proposal to manage the effects of aging for AMR item 3.4.1-074 using the Buried and Underground Piping and Tanks Program is acceptable because the periodic inspections conducted as part of this program are capable of detecting cracking.

Based on the programs identified, the staff concludes that Dominion Energy's programs meet SRP-SLR Section 3.4.2.2.2 criteria. For those AMR items associated with SLRA Section 3.4.2.2.2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

SLRA Section 3.4.2.2.2, associated with SLRA Table 3.4.1, AMR item 3.4.1-100, addresses cracking for stainless steel tanks within the scope of GALL-SLR Report XI.M29 exposed to air or condensation. Dominion Energy stated that this item is not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.4.2.2.2 and finds it acceptable because, based on a review of the UFSAR and SLRA, there are no in-scope stainless steel tanks within the scope of GALL-SLR report AMP XI.M29 exposed to air or condensation in the steam and power conversion systems.

SLRA Section 3.4.2.2.2, associated with SLRA Table 3.4.1, AMR item 3.4.1-104, addresses cracking of insulated stainless steel piping, piping components, and tanks exposed to air or condensation. Dominion Energy stated that this item is not applicable because cracking of stainless steel piping, piping components, and tanks exposed to air or condensation is addressed by item 3.4.1-002. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.4.2.2.2 and finds this acceptable because the plant-specific operating experience does not reveal a history of cracking for these components, and the one-time inspections proposed for AMR item 3.4.1-002 are capable of detecting whether cracking is occurring.

3.4.2.2.3 Loss of Material Due to Pitting and Crevice Corrosion in Stainless Steel and Nickel Alloys

SLRA Section 3.4.2.2.3, associated with SLRA Table 3.4.1, AMR items 3.4.1-003 and 3.4.1-095, 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, and underground stainless steel and nickel-alloy piping, piping components, and tanks, which will be managed by the One-Time Inspection or Buried and Underground Piping and Tanks, Programs. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.4.2.2.3.

In its review of components associated with AMR items 3.4.1-003 and 3.4.1-095, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy'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 operating experience does not reveal a history of loss of material due to pitting or crevice corrosion for these components, and the one-time inspections conducted as part of the program are capable of detecting whether loss of material is occurring. The staff finds that Dominion Energy's proposal to manage the effects of aging for AMR item 3.4.1-095 using the Buried and Underground Piping and Tanks Program is acceptable because the periodic visual or volumetric inspections conducted as part of these programs are capable of detecting loss of material.

Based on the programs identified, the staff concludes that Dominion Energy's programs meet SRP-SLR Section 3.4.2.2.3 criteria. For those AMR items associated with SLRA Section 3.4.2.2.3, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

SLRA Section 3.4.2.2.3, associated with SLRA Table 3.4.1, AMR item 3.4.1-098, addresses loss of material due to pitting or crevice corrosion for stainless steel or nickel-alloy tanks within the scope of GALL-SLR AMP X.M29 exposed to air or condensation. Dominion Energy stated that these items are not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.4.2.2.3 and finds it acceptable because based on a review of the UFSAR and SLRA, there are no in-scope stainless steel or nickel-alloy tanks within the scope of GALL-SLR AMP XI.M29 exposed to air or condensation in the steam and power conversion system.

SLRA Section 3.4.2.2.3, associated with SLRA Table 3.4.1, 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 and condensation. Dominion Energy stated that this item is not applicable because loss of material of stainless steel or nickel-alloy piping, piping components, and tanks exposed to air or condensation is addressed by item 3.4.1-003. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.4.2.2.3 and finds this acceptable because the plant-specific operating experience does not reveal a history of loss of material due to pitting or crevice corrosion for these components, and the One-Time Inspection Program proposed for item 3.4.1-003 is capable of detecting loss of material.

3.4.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

SER 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

SER Section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of operating experience.

3.4.2.2.6 Loss of Material Due to Recurring Internal Corrosion

SLRA Section 3.4.2.2.6, associated with SLRA Table 3.4.1, item 3.4.1-061, addresses loss of material due to recurring internal corrosion in metallic components exposed to raw water or wastewater in steam and power conversion systems. Dominion Energy stated that its review of operating experience for the associated systems at NAPS confirmed that loss of material due to recurring internal corrosion was not an aging effect requiring management for any associated components in the steam and power conversion systems. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.4.2.2.6 and finds it acceptable because the staff did not identify any examples of recurring internal corrosion in the associated systems during its review of NAPS 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 items 3.4.1-102, 3.4.1-105, 3.4.1-109, and 3.4.1-112, addresses cracking due to SCC for aluminum components. Dominion Energy stated that these items are not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.4.2.2.7 and finds it acceptable because based on a review of the UFSAR and SLRA there are no in-scope aluminum components in the steam and power conversion system.

3.4.2.2.8 Loss of Material Due to General, Crevice, or Pitting Corrosion and Cracking Due to SCC

Item 1. SLRA Section 3.4.2.2.8, associated with SLRA Table 3.4.1, item 3.4.1-051, addresses loss of material due to general, crevice or pitting corrosion for steel piping and piping components exposed to concrete. Dominion Energy stated that this item is not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.4.2.2.8 and finds it acceptable because based on a review of the UFSAR, there are no steel components exposed to concrete in the steam and power conversion systems.

Item 2. SLRA Section 3.4.2.2.8, associated with SLRA Table 3.4.1 item 3.4.1-082, addresses loss of material due to crevice or pitting corrosion and cracking due to SCC for stainless steel piping and piping components exposed to concrete, which will be managed by the Buried and Underground Piping and Tanks Program. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.4.2.2.8.

In its review of components associated with item 3.4.1-082, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the Buried and Underground Piping and Tanks Program is acceptable because periodic visual inspections can be capable of detecting loss of material and cracking in stainless steel piping. Therefore, the staff finds that AMR item 3.4.1-082 will be adequately addressed by AMR item 3.4.1-072.

Based on the program identified, the staff concludes that Dominion Energy's program meets SRP-SLR Section 3.4.2.2.8 criteria. For those AMR items associated with SLRA Section 3.4.2.2.8, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.4.2.2.9 Loss of Material Due to Pitting and Crevice Corrosion in Aluminum Alloys

SLRA Section 3.4.2.2.9, associated with SLRA Table 3.4.1, AMR items 3.4.1-035, 3.4.1-094, 3.4.1-097, 3.4.1-119, and 3.4.1-120, addresses loss of material due to pitting or crevice corrosion for aluminum components. Dominion Energy stated that these items are not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.4.2.2.9 and finds it acceptable because based on a review of the UFSAR and SLRA there are no in-scope aluminum components in the steam and power conversion system.

3.4.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL-SLR Report

The following subsections document the staff's review of AMR results listed in SLRA Tables 3.4.2-1 through 3.4.2-12 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 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.

3.4.2.3.1 Steam and Power Conversion – Feedwater – Aging Management Evaluation

<u>Polymer Valve Bodies Exposed to Lubricating Oil</u>. SLRA Table 3.4.2-5 states that hardening or loss of strength; loss of material; cracking or blistering; and flow blockage for polymers exposed to lubricating oil will be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. This AMR item cites generic note G, because this environment is not in the GALL-SLR Report for this component and material. The staff reviewed the associated item in the SLRA and considered whether the aging effects proposed by Dominion Energy constitute all the applicable aging effects for this component, material, and environment description. Based on its review of the discussion for polymeric materials in GALL-SLR Section XI.C "Use of Terms for Materials," the staff notes that Dominion Energy identified a wide range of potential aging effects associated with polymeric materials, which are comparable to those cited for other environments. The staff finds that Dominion Energy has identified the appropriate aging effects for this component, material, and environment combination. The staff also notes that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components is credited with managing the cited aging effects in other environments. Based on the above discussion, the staff finds Dominion Energy's proposal to manage the effects of aging for polymers exposed to lubricating oil with the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program acceptable.

3.5 <u>Aging Management of Containment, Structures, and Component Supports</u>

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, below, summarizes the staff's evaluation of the component groups listed in SLRA Section 3.5 and addressed in the GALL-SLR Report.

Table 3.5-1 Staff Evaluation for Containments, Structures, and Component Supports Components in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.5.1-001	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.1.1)
3.5.1-002	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.1.1)
3.5.1-003	Not applicable to NAPS (see SER Section 3.5.2.2.1.2)
3.5.1-004	Not applicable to PWRs (see SER Section 3.5.2.2.1.3, item 1)
3.5.1-005	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.1.3, item 1)
3.5.1-006	Not applicable to PWRs (see SER Section 3.5.2.2.1.3, item 2)
3.5.1-007	Not applicable to PWRs (see SER Section 3.5.2.2.1.3, item 3)
3.5.1-008	Not applicable to NAPS (see SER Section 3.5.2.2.1.4)
3.5.1-009	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.1.5)
3.5.1-010	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.1.6)
3.5.1-011	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.1.7)
3.5.1-012	Consistent with the GALL-SLR Report (see SER 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 SER 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 or the GALL-SLR Report
3.5.1-023	Consistent with the GALL-SLR Report
3.5.1-024	Consistent with the GALL-SLR Report
3.5.1-025	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.5.1-026	Consistent with the GALL-SLR Report
3.5.1-027	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.1.5)
3.5.1-028	Consistent with the GALL-SLR Report
3.5.1-029	Consistent with the GALL-SLR Report
3.5.1-030	Consistent with the GALL-SLR Report
3.5.1-031	Consistent with the GALL-SLR Report
3.5.1-032	Not applicable to NAPS
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 SER 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 (see SER Section 3.5.2.2.1.6)
3.5.1-039	Not applicable to PWRs (see SER Section 3.5.2.2.1.6)
3.5.1-040	Not applicable to PWRs (see SER 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 SER Section 3.5.2.2.2.1, item 1)

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.5.1-043	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.2.1, item 2)
3.5.1-044	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.2.1, item 3)
3.5.1-045	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.5.1-046	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.2.1, item 3)
3.5.1-047	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.2.1, item 4)
3.5.1-048	Not applicable to NAPS (see SER Section 3.5.2.2.2.2)
3.5.1-049	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.2.3, item 1)
3.5.1-050	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.2.3, item 2)
3.5.1-051	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.2.3, item 3)
3.5.1-052	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.2.4)
3.5.1-053	Not applicable to NAPS (see SER 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 SER 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 NAPS
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 or the GALL-SLR Report
3.5.1-070	Consistent with the GALL-SLR Report
3.5.1-071	Consistent with the GALL-SLR Report
3.5.1-072	Consistent with the GALL-SLR Report
3.5.1-073	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	Consistent with the GALL-SLR Report
3.5.1-080	Consistent with the GALL-SLR Report
3.5.1-081	Consistent with the GALL-SLR Report
3.5.1-082	Not used. Addressed by 3.5.1-080 (see SER Section 3.5.2.1.1)
3.5.1-083	Consistent with the GALL-SLR Report (see SER Section 3.5.2.1.3)
3.5.1-084	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.5.1-085	Not applicable to NAPS
3.5.1-086	Not used. Addressed by 3.5.1-081 (see SER Section 3.5.2.1.1)
3.5.1-087	Consistent with the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.5.1-088	Consistent with the GALL-SLR Report (see SER Section 3.5.2.1.4)
3.5.1-089	Consistent with the GALL-SLR Report
3.5.1-090	Not applicable to NAPS
3.5.1-091	Consistent with the GALL-SLR Report
3.5.1-092	Consistent with the GALL-SLR Report
3.5.1-093	Not used. Addressed by 3.5.1-092 (see SER Section 3.5.2.1.1)
3.5.1-094	Consistent with the GALL-SLR Report
3.5.1-095	Not used. Addressed by 3.5.1-092 (see SER Section 3.5.2.1.1)
3.5.1-096	Consistent with the GALL-SLR Report
3.5.1-097	Not applicable to NAPS (see SER Section 3.5.2.2.2.6)
3.5.1-098	Consistent with the GALL-SLR Report
3.5.1-099	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.2.4)
3.5.1-100	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.2.4)

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

(1) SER Section 3.5.2.1 discusses AMR results for components that the applicant states are either not applicable to NAPS or are consistent with the GALL-SLR Report. Section 3.5.2.1.1 summarizes the staff's review of items that are not applicable or not used and documents any RAIs issued and the staff conclusions. The remaining subsections in SER Section 3.5.2.1 document the review of components that required additional information or otherwise require explanation.

(2) SER Section 3.5.2.2 discusses AMR results for which the GALL-SLR Report and SRP-SLR recommend further evaluation.

(3) SER Section 3.5.2.3 discusses AMR results for components that the applicant states are not consistent with, or not addressed in, the GALL-SLR Report. These AMR results 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 staff's review of AMR results listed in SLRA Tables 3.5.2-1 through 3.5.2-40 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 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 item. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SER Table-3.5-1 and no separate writeup is required or provided. For AMR items that required additional evaluation (such as responses to RAIs), the staff's evaluation is documented in Sections 3.5.2.1.2 through 3.5.2.1.4 below.

SER Section 3.5.2.1.1 documents the staff's review of AMR items that the applicant determined to be not applicable or not used.

3.5.2.1.1 Aging Management Review Results Identified as Not Applicable

For SLRA Table 3.5 1, items 3.5.1-003, 3.5.1-008, 3.5.1-032, 3.5.1-048, 3.5.1-062, 3.5.1-085, 3.5.1-090, and 3.5.1-097, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to NAPS. The staff reviewed the SLRA, description of the material and environment associated with each AMR item, and the associated AMP and plant-specific documents and has concluded that Dominion Energy's claim is reasonable.

For SLRA Table 3.5-1, items 3.5.1-004, 3.5.1-006, 3.5.1-007, 3.5.1-036, 3.5.1-037, 3.5.1-038, 3.5.1-039, 3.5.1-040, 3.5.1-041, 3.5.1-053, and 3.5.1-076, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable because the associated items are only applicable to BWRs. The staff reviewed the SRP-SLR, confirmed that these items only apply to BWRs, and finds that these items are not applicable to NAPS because it is a PWR.

SLRA Table 3.5.1, AMR items 3.5.1-082, 3.5.1-093, and 3.5.1-095, addresses managing loss of material due to general, pitting, and crevice corrosion for galvanized steel components exposed to outdoor air. Dominion Energy stated that the corresponding items in the GALL-SLR Report are not used because they are addressed by another SLRA Table 1, AMR item (i.e., 3.5.1-080 or 3.5.1-092). The staff reviewed the SLRA and confirmed that the aging effects will be addressed by another SLRA Table 1 AMR item. The staff noted that Table IX.C in the GALL-SLR Report classifies "galvanized steel" material under the category of "steel," and the proposed items address loss of material of steel components exposed to outdoor air. Therefore, the staff finds Dominion Energy's proposal to use an alternate item acceptable.

SLRA Table 3.5.1, AMR item 3.5.1-086, addresses managing the effects of aging for loss of material due to general, pitting, and crevice corrosion of galvanized steel structural bolting exposed to air-outdoor environment. Dominion Energy stated that this item is not applicable/not used; however, items relevant to galvanized steel structural bolting experiencing effects of aging for loss of material due to general, pitting, and crevice corrosion are evaluated in accordance with SLRA item 3.5.1-081. The staff evaluated Dominion Energy's claim and finds it acceptable because Table IX.C of GALL-SLR classifies "galvanized steel" under the category "steel" and because the staff reviewed SLRA Tables 3.5.2-38 and 3.5.2-40 and confirmed that the applicant manages the effects of aging for ASME Section XI, Subsection IWF structural steel bolting for loss of material with SLRA item 3.5.1-081.

3.5.2.1.2 Loss of Mechanical Function Due to Corrosion, Distortion, Dirt or Debris Accumulation, Overload, Wear

SLRA Table 3.5.1, AMR item 3.5.1-057, addresses loss of mechanical function due to corrosion, distortion, dirt or debris accumulation, overload, or wear for constant and variable load steel spring hangers, guides, and stops exposed to an air-indoor uncontrolled environment. For the SLRA Table 2 AMR item that cites generic note E, the SLRA credits the SLRA B2.1.34 Structures Monitoring AMP to manage the aging effect for loss of mechanical function of steel in an air-indoor uncontrolled environment for spring hangers, guides, and stops. The AMR item cites plant-specific note 4, which states that "[t]he Structures Monitoring (B2.1.34) program instead of the ASME Section XI, Subsection IWF, (B2.1.31) program will 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 Dominion Energy cited generic note E, the staff finds Dominion Energy's proposal to manage the effects of aging using the SLRA B2.1.34 Structures Monitoring AMP acceptable because Dominion Energy plans to enhance the AMP's parameters monitored or inspected and acceptance criteria program elements with revised procedures to monitor for indications of excessive loss of material due to corrosion or wear and debris or dirt that could result in loss of mechanical function of non-ASME supports and associated components (i.e., spring hangers, guides, stops) and because Dominion Energy's Structures Monitoring AMP detection of aging effects program element, consistent with that of GALL-SLR, can detect and quantify aging degradation for the referenced supports and associated components before they experience loss of intended functions during the period of extended operation. The staff's review of the Structures Monitoring AMP is documented in SER Section 3.0.3.2.18.

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

SLRA Table 3.5.1, AMR item 3.5.1-083, addresses loss of material due to general, pitting, and crevice corrosion for steel elements and bolting exposed to an air-indoor uncontrolled or outdoor, water-flowing or -standing environment. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the ASME Section XI, Subsection IWF, Program or Structures Monitoring Program to manage the aging effect for steel elements and bolting in component supports. The AMR items cite plant-specific note 5 or note 6. Note 5 states that the ASME Section XI, Subsection IWF, Program, instead of the Inspection of Water-Control Structures Associated with Nuclear Power Plants Program, will manage the aging effects applicable to this component type, material, and environment combination for ASME Class 2 and Class 3 supports. Plant-specific note 6 states that the Structures Monitoring Program, instead of the Inspection of Water-Control Structures Associated with Nuclear Power Plants Program, will 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 3.5.1-083 for which Dominion Energy cited generic note E, the staff finds Dominion Energy's proposal to manage the effects of aging using the ASME Section XI, Subsection IWF Program or Structures Monitoring Program acceptable because they are consistent with the GALL-SLR Report recommendations to ensure that monitoring and inspections of steel elements and bolting are conducted to detect loss of material prior to a loss of intended function during the period of extended operation. The credited programs use similar inspection techniques and inspection frequencies as the GALL-SLR Report recommended program.

3.5.2.1.4 Loss of Preload Due to Self-Loosening

SLRA Table 3.5.1, AMR item 3.5.1-088, addresses loss of preload due to self-loosening for structural bolting exposed to any environment. For the SLRA Table 2 AMR items that cite generic note E, the SLRA credits the ASME Section XI, Subsection IWE Program, the 10 CFR Part 50, Appendix J Program, or the Inspection of Overhead Heavy Load and Light Load Program to manage the aging effect for stainless steel bolting associated with the containment and material handling systems, respectively.

Based on its review of components associated with AMR item 3.5.1-088 for which Dominion Energy cited generic note E, the staff finds Dominion Energy's proposal to manage the effects of aging using the ASME Section XI, Subsection IWE Program, 10 CFR Part 50, Appendix J Program, or Inspection of Overhead Heavy Load and Light Load Program acceptable because the alternate programs implement similar visual inspection techniques and inspection frequencies as the program recommended by the GALL-SLR Report.

3.5.2.2 Aging Management Review Results for Which Further Evaluation Is Recommended by the GALL-SLR Report

In SLRA Section 3.5.2.2, the applicant further evaluates aging management for certain containment, structures, and component supports components as recommended by the GALL-SLR Report and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria contained in SRP-SLR Section 3.5.2.2. The following subsections document the staff's review.

3.5.2.2.1 Pressurized Water Reactor and Boiling Water Reactor Containments

3.5.2.2.1.1 Cracking and Distortion Due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, and Cracking Due to Differential Settlement and Erosion of Porous Concrete Subfoundations

SLRA Section 3.5.2.2.1.1, associated with SLRA Table 3.5.1, AMR items 3.5.1-001 and 3.5.1-002, addresses cracking and distortion of concrete elements due to increased stress levels from settlement, the reduction of foundation strength, and cracking due to differential settlement of concrete foundation and erosion of porous concrete subfoundations exposed to soil and water-flowing environments. These aging effects will be managed by the ASME Section XI, Subsection IWL Program and the Structures Monitoring Program. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.1.

In its review of components associated with AMR items 3.5.1-001 and 3.5.1-002, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the ASME Section XI, Subsection IWL Program and the Structures Monitoring Program is acceptable because: (1) years of settlement monitoring concluded that rock founded structures, which include the NAPS containments, are not settling; (2) plant operating experience has not identified cracking or distortion associated with settlement; and (3) the accessible concrete components are monitored by the Structures Monitoring Program or the ASME Section XI, Subsection IWL Program to confirm the absence of any visible effects due to settlement. A subsurface drainage system used for construction purposes does exist under the containment; however, this system is not relied on to control settlement.

Based on the programs identified, the staff concludes that Dominion Energy's programs meet SRP-SLR Section 3.5.2.2.1.1 criteria. For those AMR items associated with SLRA Section 3.5.2.2.1.1, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.5.2.2.1.2 Reduction of Strength and Modulus Due to Elevated Temperature

SLRA Section 3.5.2.2.1.2, associated with SLRA Table 3.5-1, AMR item 3.5.1-003, addresses reduction of strength and modulus of elasticity due to elevated temperature in concrete components (e.g., dome, wall, basemat, ring girders, buttresses, containment, or concrete fill in annulus) of containment structures exposed to an air-indoor uncontrolled or air-outdoor environment. Dominion Energy stated that this item is not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.5.2.2.1.2 and finds it acceptable because the concrete containment components are not exposed to the temperatures required for this aging effect to occur. In its SLRA review, the staff referred to UFSAR Sections 3.8.2.1.4.2 and 3.8.2.2, and TS 3.6.5, and noted that all containment penetrations for piping systems carrying multiple pipe lines, and for piping systems carrying thermally hot (over 65.5 °C (150 °F) fluids are sleeved penetrations, thermally hot pipes are insulated to prevent the temperature of the concrete adjacent to the sleeve from exceeding 93.3 °C (200 °F), and the maximum average bulk air temperature inside the containment is limited to 46 °C (115 °F). Therefore, the containment concrete is not expected to exceed the GALL-SLR Report recommended threshold limits of 65.5 °C (150 °F) for general areas and 93.3 °C (200 °F) for local areas, and plant operating experience has not identified any aging effects for containment concrete related to elevated temperature.

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

Item 1. SLRA Section 3.5.2.2.1.3.1 associated with SLRA Table 3.5.1, AMR items 3.5.1-004, 3.5.1-005, and 3.5.1-035, addresses loss of material due to general, pitting and crevice corrosion for inaccessible and accessible areas of drywell shell, drywell head, and containment liner (including liner anchors and integral attachments) of steel material exposed to an air-indoor uncontrolled environment. Dominion Energy stated that item 3.5.1-004 is not applicable as it applies to BWR containments only. For components associated with items 3.5.1-005 and 3.5.1-035 Dominion Energy stated that the aging effects will be managed by the ASME Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J AMPs. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.3, item 1.

The staff evaluated Dominion Energy's nonapplicability claim for SLRA Table 3.5.1, AMR item 3.5.1-004 and finds it acceptable because the AMR item only applies to BWR containment drywell shells, and the NAPS containments are PWR designs that do not incorporate drywell shells.

For items 3.5.1-005 and 3.5.1-035, the staff noted that Dominion Energy concluded a plant-specific program to manage this aging effect in accessible and inaccessible areas of the NAPS containment liner and integral attachments is not required based on the following: (1) one instance of corrosion of the liner from the concrete side was identified (prior to first renewed license) and appropriately repaired by removing and replacing a larger portion of liner as a corrective action, and only minor indications of corrosion have been identified in accessible areas and these have also been repaired by corrective action; (2) acceptability of inaccessible areas are evaluated whenever conditions are identified in accessible areas that could indicate potential degradation of the liner in inaccessible areas; (3) the concrete containments were designed, constructed, and inspected in accordance with ACI and ASTM standards (e.g., ACI 301, ASTM C260), which provided for controlled good quality, dense, well cured, air entrained, and low permeability concrete; (4) the design satisfied crack control criteria of ACI 318-63; and (5) the ASME Section XI, Subsection IWL Program monitors and manages any cracks in the containment concrete that could potentially provide a pathway for water to reach inaccessible areas of the steel liner. In its review of components associated with AMR items 3.5.1-005 and 3.5.1-035, the staff finds that Dominion Energy has met the further evaluation criteria. Dominion Energy'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 in accessible and inaccessible areas has been identified, evaluated, appropriately corrected by repair, and has generally been minor, (2) the design and construction of containment concrete has been in accordance with applicable ACI and ASTM standards to produce durable concrete, (3) containment concrete is monitored for cracks by the ASME Section XI, Subsection IWL AMP, and (4) the continued monitoring using the proposed AMPs provides reasonable assurance that any occurrence of corrosion of the containment liner and its integral attachments will be identified and corrected prior to loss of intended function.

Based on the programs identified, the staff concludes that Dominion Energy's programs meet the SRP-SLR Section 3.5.2.2.1.3, item 1 criteria. For those AMR items associated with SLRA Section 3.5.2.2.1.3, item 1, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy 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 3.5.2.2.1.3.2, associated with SLRA Table 3.5.1, AMR item 3.5.1-006, addresses loss of material for steel torus shell exposed to air-indoor uncontrolled or treated water environments. Dominion Energy stated that this item is not applicable as it applies to BWR containments only. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.5.2.2.1.3, item 2, and finds it acceptable because NAPS containments are PWR designs that do not incorporate torus shells.

Item 3. SLRA Section 3.5.2.2.1.3.3, associated with SLRA Table 3.5.1, AMR item 3.5.1-007, addresses loss of material for steel suppression chamber shell, steel torus ring girders and steel downcomers exposed to air-indoor uncontrolled or treated water environments. Dominion Energy stated that this item is not applicable as it applies to BWR containments only. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.5.2.2.1.3, item 3, and finds it acceptable because NAPS containments are PWR designs that do not incorporate torus, downcomers, or suppression chambers.

3.5.2.2.1.4 Loss of Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature

SLRA Section 3.5.2.2.1.4, associated with SLRA Table 3.5.1, AMR item 3.5.1-008, addresses loss of prestress forces due to relaxation, shrinkage, creep, and elevated temperature for prestressed concrete containments exposed to air-indoor uncontrolled and air-outdoor environment. Dominion Energy stated that this item is not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.5.2.2.1.4 and finds it acceptable because the NAPS containments do not use prestressed tendons. Therefore, a TLAA for prestressed tendons is not necessary. The staff makes this same conclusion in SER Section 4.5, "Concrete Containment Tendon Prestress."

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 (DM) weld material exposed to air indoor uncontrolled or air-outdoor environment. The staff reviewed Dominion Energy'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 SER Section 4.6.1.

For components associated with AMR item 3.5.1-040, Dominion Energy stated the item is not applicable because its applicability is for BWR only. The staff evaluated Dominion Energy's nonapplicability claim for SLRA Table 3.5.1, AMR item 3.5.1-040, and finds it acceptable because the AMR item only applies to BWR Mark II containment downcomers and vent headers and the NAPS containments are of PWR design that do not incorporate downcomers and vent headers.

For components associated with AMR item 3.5.1-027, Dominion Energy stated that the aging effects will be managed by the ASME Section XI, Subsection IWE Program by performing supplemental surface examinations or other appropriate techniques for fuel transfer tube, fuel transfer enclosure, fuel transfer tube blind flange, DM weld penetrations, and high-temperature penetrations, or by the 10 CFR Part 50, Appendix J Program for airlocks only by crediting a Type B local leak rate test. For other containment pressure-retaining boundary components (i.e., cold penetrations components and equipment hatch) subject to cyclic loading for which CLB fatigue analysis do not exist, Dominion Energy stated that the aging effect does not require management based on a fatigue waiver analysis performed for these components in accordance with Subarticle N-415.1 of the ASME Code, Section III, that satisfied the six conditions specified in the ASME Code for waiver of a detailed fatigue analysis.

For the cold penetration components and equipment hatch (CLB fatigue analysis does not exist) materials listed in SLRA Table 4.6.1 1), which are also associated with AMR item 3.5.1027, the staff noted that Dominion Energy performed a fatigue waiver analysis for cyclic loading effects of pressure, temperature, and design earthquake in accordance with the 1968 Edition of the ASME Code, Section III, Subarticle N 415.1, "Vessels Not Requiring Analysis for Cyclic Operation," to justify that the aging effect does not require management for these components. The staff noted that the fatigue waiver analysis used conservative design cycles for 80 years of operation of 2,000 for operating pressure cycles (1,500 cycles for Condition 1 atmospheric to operating pressure, which is still conservative), 8,000 for operating temperature cycles, and 40 for design earthquake cycles. The staff further noted that results of this analysis determined that a detailed fatigue analysis was not required for stress fluctuations caused by temperature, pressure, and design earthquake cycles, since the six conditions for fatigue waiver in the ASME Code were shown to be satisfied for each type of material of these components, and therefore surface examinations are not required for these components. The staff verified the analysis results supporting this conclusion during the audit from review of audited calculation 11715EA14, Revision 0, Addendum 00D, "Reactor Containment Liner Analysis – Reactor Containment and Cold Penetrations Fatigue Evaluation for 80Year Plant Life, North Anna Unit 1 and Unit 2," and audited document ETE-SLR-2020-2334, Revision 0, Attachment 2 "Summary of Fatigue Waiver – Pressure Retaining Components Subject to Cyclic Loading, but Have No CLB Fatigue Analysis." Therefore, the staff finds that Dominion Energy has met the criteria in Interim Staff Guidance SLR-ISG-2021-03-STRUCTURES, Appendix A, to justify that the aging effect of cracking due to cyclic loading does not require management for cold penetrations (except DM welds) and equipment hatch.

In its review of components associated with AMR item 3.5.1-027 (i.e., fuel transfer tube, fuel transfer enclosure, fuel transfer tube blind flange, DM weld penetrations, high-temperature penetrations, and airlocks), the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the ASME Section XI, Subsection IWE Program or the 10 CFR50, Appendix J Program for airlocks only is acceptable because: (a) the examination methods proposed for detecting cracking (i.e., supplemental surface examinations (or other applicable technique) or crediting an Appendix J Type B local leak rate test (for airlocks only)) are consistent with those recommended in GALL-SLR AMP XI.S1, "ASME Section XI, Subsection IWE," and (b) Dominion Energy's ASME Section XI, Subsection IWE Program with enhancements was determined to be consistent with GALL-SLR Report AMP XI.S1 in SER Section 3.0.3.2.16.

In its review of components associated with AMR item 3.5.1-027 (i.e., containment cold penetrations components and equipment hatch; materials listed in SLRA Table 4.6.1 1), the staff finds that Dominion Energy has met the further evaluation criteria. Specifically, Dominion Energy's justification that cracking due to cyclic loading aging effect does not require management is acceptable because Dominion Energy performed a fatigue waiver analysis for these components in accordance with the ASME Code, Section III, Subarticle N 415.1. Dominion Energy's fatigue waiver analysis satisfied the six conditions specified in the Code to conclude that a detailed fatigue analysis is not necessary and the aging effect does not require management.

Based on the programs identified and the fatigue waiver analyses performed, the staff concludes that Dominion Energy'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 that Dominion Energy 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, as amended in SLRA Supplement 1 by letter dated February 4, 2021, associated with SLRA Table 3.5.1, AMR items 3.5.1-010, 3.5.1-038 and 3.5.1-039, addresses cracking due to SCC for penetration sleeves, penetration bellows, suppression chamber shell and vent line bellows made of stainless steel, or carbon steel with DM welds exposed to an air–indoor uncontrolled environment, which will be managed by the ASME Section XI, Subsection IWE Program, and the 10 CFR Part 50, Appendix J Program. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.6.

For components associated with AMR items 3.5.1-038 and 3.5.1-039, Dominion Energy stated in SLRA Table 3.5.1 that these items are not applicable because their applicability is for BWR only. The staff evaluated Dominion Energy's nonapplicability claim for AMR items 3.5.1-038 and 3.5.1-039 and finds it acceptable because these items correspond to SRP-SLR Table 3.5-1 items 38 and 39, which only apply to BWR containment suppression chamber shell and BWR vent line bellows, respectively, and the NAPS containments are PWR designs that do not incorporate these components.

For components associated with AMR items 3.5.1-010, Dominion Energy stated that the aging effect will be managed by the ASME Section XI, Subsection IWE Program, and the 10 CFR Part 50, Appendix J Program. From its review of SLRA Section 3.5.2.2.1.6, as amended by letter dated February 4, 2021, the staff noted that the NAPS containment pressure-retaining boundary does not have stainless steel bellows. The staff also noted from SLRA Tables 3.5.2-1 and 3.3.2-1, that AMR item 3.5.1-010 is applicable for NAPS to DM welds of carbon steel penetration sleeves connected to stainless steel, high energy pipes and stainless steel containment pressure-retaining boundary portions of the fuel transfer tube, fuel transfer tube enclosure, and fuel transfer tube blind flange exposed to an air–indoor uncontrolled environment. The staff noted that plant operating experience has not identified SCC associated with these stainless steel and DM weld components. The staff further noted that visual examinations are supplemented with periodic surface examinations performed once during each 10-year inspection interval to manage cracking due to SCC for the specific components listed above. The staff noted that the further evaluation is also applicable to stainless steel bolting associated with stainless steel blind flanges for electrical penetrations; however, cracking due to SCC is unlikely to occur for these electrical penetration components for the following reasons: (1) they are not exposed to an environment conducive to SCC (i.e., exposed to temperatures less than 60 °C (140 °F) and environment is dry and free of contaminants that facilitate SCC); and (2) plant-specific operating experience has not identified SCC in these components. Therefore, Dominion Energy proposed to monitor these SS bolting and blind flanges for potential SCC using the ASME Section XI, Subsection IWE, and 10 CFR 50, Appendix J Programs without performing augmented surface examinations.

In its review of components associated with AMR item 3.5.1-010, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy'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: (a) the ASME Section XI, Subsection IWE Program will be enhanced by including periodic surface examination (or equivalent inspection technique, such as EVT-1, that can detect cracking due to fatigue and SCC), in addition to visual examination, for specific containment penetration components susceptible to SCC; (b) the proposed surface examination frequency of once in 10 years is adequate considering no plant-specific operating experience of SCC; (c) VT-1 examination of bolting per Examination Category E-G and general visual examinations per Examination Category E-A of the IWE Program are sufficient for stainless steel bolting and associated blind flanges for electrical penetrations since the environmental conditions required for SCC are not present for these components; and (d) the proposed programs and examination method enhancement (for applicable components) are consistent with the GALL-SLR Report recommendations to adequately manage this aging effect during the subsequent period of extended operations.

Based on the programs identified, the staff concludes that Dominion Energy's programs meet SRP-SLR Section 3.5.2.2.1.6 criteria. For those AMR items associated with SLRA Section 3.5.2.2.1.6, as amended, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy 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, as amended by Supplement 1 dated February 4, 2021 (ADAMS Accession No. ML21035A303), addresses loss of material (spalling, scaling) and cracking due to freeze-thaw of inaccessible areas of concrete components exposed to air-outdoor or groundwater/soil environments. These aging effects will be managed by the ASME Section XI, Subsection IWL Program. The staff reviewed Dominion Energy'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 staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the ASME Section XI, Subsection IWL Program is acceptable. The plant-specific program enhancement is not necessary because: (1) the concrete mix designs contain an air-entraining admixture capable of entraining 3 to 6 percent air; (2) the containments were designed, constructed and inspected in accordance with ACI and ASTM standards to produce durable concrete; (3) plant operating experience has not identified any aging effects related to freeze-thaw in accessible areas; and (4) the IWL Program will evaluate acceptability of inaccessible areas when conditions exist in accessible areas that could be indicative of degradation in inaccessible areas. Additionally, the ASME Section XI, Subsection IWL 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.

Based on the program identified, the staff concludes that Dominion Energy's program meets 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 Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.5.2.2.1.8 Cracking Due to Expansion from Reaction with Aggregates

SLRA Section 3.5.2.2.1.8, associated with SLRA Table 3.5.1, AMR item 3.5.1-012, addresses cracking due to expansion from reaction with aggregates of inaccessible areas of concrete containment components exposed to air, groundwater, or soil, which will be managed by the ASME Section XI, Subsection IWL Program. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.8.

During its review, the staff noted that Dominion Energy incorporated augmented inspections for alkali-silica reaction (ASR) into the ASME Section XI, Subsection IWL Program. These augmented inspections include visual examination for pattern cracking with darkened crack edges, water ingress, and misalignment to identify conditions that could be indicative of ASR; such conditions would be addressed in the corrective action program. The staff also noted that plant operating experience has not identified indications of ASR in containment concrete. The staff further noted that, the ASME Section XI, Subsection IWL Program, includes evaluations of degradation in accessible areas that could indicate, or result in, degradation in inaccessible areas.

In its review of components associated with AMR item 3.5.1-012, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the ASME Section XI, Subsection IWL Program is acceptable because:

(1) plant operating experience has not identified visual indications of ASR in accessible areas; (2) the ASME Section XI, Subsection IWL Program includes augmented inspections to detect indications of ASR; and (3) the ASME Section XI, Subsection IWL Program provides evaluation of conditions in inaccessible areas if ASR is indicated in accessible areas.

Based on the program identified, the staff concludes that Dominion Energy's program meets 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 Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.5.2.2.1.9 Increase in Porosity and Permeability Due to Leaching of Calcium Hydroxide and Carbonation

SLRA Section 3.5.2.2.1.9, associated with SLRA Table 3.5.1, AMR item 3.5.1-014, as amended by Supplement 1 dated February 4, 2021, addresses increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of concrete containment components exposed to water-flowing environment, which will be managed by ASME Section XI, Subsection IWL. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.9.

During its review, the staff noted that plant operating experience has identified evidence of leaching of calcium hydroxide and carbonation in accessible areas; however, Dominion Energy has determined that the observed leaching does not adversely impact the structural integrity. The staff also noted that the ASME Section XI, Subsection IWL Program, includes evaluations of degradation in accessible areas that could indicate, or result in, degradation in inaccessible areas and inspects normally inaccessible structural components when they are made accessible for maintenance or plant modifications.

In its review of components associated with AMR item 3.5.1-014, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the ASME Section XI, Subsection IWL Program is acceptable and a plant-specific enhancement is not necessary because: (1) Dominion Energy has determined that observed leaching of calcium hydroxide and carbonation in accessible areas does not impact structural integrity; (2) the ASME Section XI, Subsection IWL Program inspects for evidence of the aging effect in accessible areas and requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas; and (3) the ASME Section XI, Subsection IWL Program will perform opportunistic inspections of normally inaccessible areas when scheduled maintenance or planned plant modifications permit access.

Based on the program identified, the staff concludes that Dominion Energy's program meets 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 Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

In SLRA Section 3.5.2.2, the applicant further evaluates aging management, as recommended in the GALL-SLR Report, for the containment, structures, and component supports components and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of component groups for which the GALL-SLR Report recommends further evaluation against the criteria contained in SRP-SLR Section 3.5.2.2. The following subsections document the staff's review.

3.5.2.2.2.1 Aging Management of Inaccessible Areas

Item 1. SLRA Section 3.5.2.2.2.1, item 1, as amended by Dominion Energy's SLRA Supplement 1 dated February 22, 2021 (ADAMS Accession No. ML21035A303), associated with SLRA Table 3.5-1, AMR item 3.5.1-042, addresses loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures exposed to an air-outdoor or groundwater/soil environment. NAPS is located in a severe weathering region, as identified in Figure 1, "Location of Weathering Regions" of ASTM C33. Dominion Energy stated that a plant-specific AMPs or plant-specific enhancements to Structures Monitoring Program for inaccessible areas are not required to manage loss of material and cracking due to freeze-thaw. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 1.

In its review of components associated with AMR items 3.5.1-042, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the Structures Monitoring Program is acceptable because: (1) the concrete mix designs (except for concrete structures located in the Switchyard) contain an air-entraining admixture capable of entraining 3 to 5 percent air; concrete structures located in the Switchyard were designed and constructed consistent with ACI 301 or ACI 318, and these ACI codes provide guidance on entraining air into the concrete mix for concrete structures potentially exposed to freezing and thawing condition, for which the concrete has air content within the GALL-SLR Report range from 3 percent to 8 percent; and plant operating experience has not identified any aging effects related to freeze-thaw in accessible areas. Therefore, a plant-specific program or plant-specific enhancements to Structures Monitoring Program are not needed; (2) the reinforced-concrete structures were designed, constructed and inspected in accordance with ACI and ASTM standards to produce durable concrete; and (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 the acceptability of inaccessible areas when observed aging effects in accessible areas could be indicative of degradation in inaccessible areas.

Based on the program identified, the staff concludes that Dominion Energy'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 Dominion Energy 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 3.5.2.2.2.1, item 2, associated with SLRA Table 3.5-1, AMR item 3.5.1-043, addresses cracking due to expansion from reaction with aggregates in inaccessible concrete areas of Groups 1-5 and 7-9 structures exposed to any environment, which will be managed by the Structures Monitoring Program. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 2.

During its review, the staff noted that Dominion Energy incorporated visual inspections criteria for ASR into the Structures Monitoring Program. These criteria include visual examination for pattern cracking with darkened crack edges, water ingress, and misalignment to identify conditions that could be indicative of ASR; such indications will be addressed in the corrective action program. The staff noted that plant operating experience has not identified any indications of aggregate reactions for the concrete structures at NAPS, except for precast concrete poles that support overhead electrical circuits. The staff also noted that there is a design change currently being implemented that either replaces or refurbishes the precast concrete poles. After the design change is implemented, only three precast concrete poles, which are adjacent to the Turbine Building, will remain. The design change will reinforce these three precast concrete poles with a carbon fiber polymer wrap, which provides confinement and strengthening to the poles, and will minimize future ASR induced expansion. The staff further noted that the Structures Monitoring Program includes evaluations of degradation in accessible areas that could indicate, or result in, degradation in inaccessible areas.

In its review of components associated with AMR item 3.5.1-043, the staff finds that Dominion Energy has met the further evaluation criteria, Dominion Energy's proposal to manage the effects of aging using the Structures Monitoring Program is acceptable, and plant-specific AMPs are not needed because: (1) plant operating experience has not identified any indications of aggregate reactions for the concrete structures at NAPS; (2) there are corrective actions in place by replacing or refurbishing the precast concrete poles, which support overhead electrical circuits, and reinforcing three remaining precast concrete poles with a carbon fiber polymer wrap, which will minimize future ASR induced expansion; (3) the visual inspections for ASR performed every 5 years under the Structure Monitoring Program will be capable of identifying conditions that could be indicative of ASR in accessible areas; and (4) the Structures Monitoring Program inspects for evidence of the aging effect in accessible areas and requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas.

Based on the program identified, the staff concludes that Dominion Energy'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 Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. SLRA Section 3.5.2.2.2.1, item 3, associated with: (a) SLRA Table 3.5-1, AMR item 3.5.1-044, which addresses cracking and distortion due to increased stress levels from settlement in inaccessible areas of all structures exposed to a soil environment, which will be managed by the Structures Monitoring Program; and (b) SLRA Table 3.5-1, AMR item 3.5.1-046, which addresses reduction in foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundations in below-grade inaccessible concrete areas of Groups 1-3 and 5-9 structures exposed to a water-flowing environment, which will be managed by the Structures Monitoring Program. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 3.

In its review of components associated with AMR items 3.5.1-044 and 3.5.1-046, the staff notes that further evaluation is only necessary if the applicant relies on a dewatering system to manage this aging effect. The staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the Structures Monitoring Program without further evaluation is acceptable because Dominion Energy does not credit a dewatering system in its CLB for controlling settlement at NAPS.

Based on the program identified, the staff concludes that Dominion Energy'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 that Dominion Energy 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 4</u>. SLRA Section 3.5.2.2.2.1, item 4, as amended by Dominion Energy's SLRA Supplement 1 dated February 22, 2021 (ADAMS Accession No. ML21035A303), associated with SLRA Table 3.5-1, AMR item 3.5.1 047, addresses increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of concrete components for Groups 1-3, 5, and 7-9 structures exposed to a water-flowing environment, which will be managed by the Structures Monitoring Program. Dominion Energy stated that plant-specific AMPs or plant-specific enhancements to the Structures Monitoring Program are not required to manage this aging effect in inaccessible areas. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 4.

During its review, the staff noted that for AMR item 3.5.1-047, the applicability is limited to the inaccessible areas of concrete components for Groups 1-3, 5, and 7-9 structures exposed to a water-flowing environment. The staff noted that a search of Dominion Energy's UFSAR confirmed that no in-scope containment internal structures (Group 4) exposed to a water-flowing environment are present. The staff also noted that the Structures Monitoring Program inspects 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. The staff further noted that the Structures Monitoring Program requires evaluation of inspection results for the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or result in degradation of inaccessible areas. In addition, the staff noted that although plant operating experience has identified evidence of leaching in accessible areas, Dominion Energy's evaluation determined that the observed leaching did not adversely impact the structural integrity or result in a loss of intended functions of the associated concrete structures.

In its review of components associated with item 3.5.1-047, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the Structures Monitoring Program is acceptable because: (1) Dominion Energy'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 AMP is not needed for inaccessible areas; (2) the Structures Monitoring Program inspects for evidence of the aging effect in accessible areas and requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas; and (3) the Structures Monitoring program will perform opportunistic inspections of normally inaccessible areas when scheduled maintenance or planned plant modifications permit access.

Based on the program identified, the staff determines that Dominion Energy'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 Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.2 Reduction of Strength and Modulus Due to Elevated Temperature

SLRA Section 3.5.2.2.2.2, associated with SLRA Table 3.5-1, AMR item 3.5.1-048, addresses reduction of strength and modulus of elasticity due to elevated temperature in Groups 1-5 concrete structures exposed to an air-indoor uncontrolled environment. Dominion Energy stated that this item is not applicable. The staff evaluated Dominion Energy's claim against the criteria in SRP-SLR Section 3.5.2.2.2.2 and finds it acceptable because based on the staff's review of the SLRA and UFSAR Sections 9.1.3.1 and 9.1.3.5, NAPS's concrete temperatures are maintained below the GALL-SLR Report recommended threshold limits of 65.5 °C (150 °F) for general areas and 93.3 °C (200 °F) for local areas, and review of operating experience has identified no issues related to elevated temperatures affecting concrete structures. Therefore, the concrete components are not exposed to the temperatures required for this aging effect to occur.

3.5.2.2.2.3 Aging Management of Inaccessible Areas for Group 6 Structures

<u>Item 1</u>. SLRA Section 3.5.2.2.2.3, item 1, as amended by Dominion Energy's SLRA Supplements 1 and 2 dated February 22, 2021, and March 17, 2021 (ADAMS Accession Nos. ML21035A303 and ML21076B025), associated with SLRA Table 3.5-1, AMR item 3.5.1-049, addresses loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of water-control structures (Group 6) exposed to an air-outdoor or groundwater/soil environment. NAPS is located in a severe weathering region, as identified in Figure 1, "Location of Weathering Regions," of ASTM C33. Dominion Energy stated that a plant-specific AMP or plant-specific enhancements to Structures Monitoring Program for inaccessible areas are not required to manage loss of material and cracking due to freeze-thaw. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.3, item 1.

In its review of components associated with AMR items 3.5.1-049, the staff finds that Dominion Energy has met the further evaluation criteria and Dominion Energy's proposal to manage the effects of aging using the Structures Monitoring Program is acceptable because: (1) the concrete mix designs for water-control structures contain an air-entraining admixture capable of entraining 3 to 5 percent air and plant operating experience has not identified any aging effects related to freeze-thaw in accessible areas; therefore a plant-specific program is not needed; (2) the reinforced-concrete for water-control structures (Group 6) were designed, constructed, and inspected in accordance with ACI and ASTM standards to produce durable concrete; and (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 the acceptability of inaccessible areas when observed aging effects in accessible areas could be indicative of degradation in inaccessible areas.

Based on the program identified, the staff concludes that Dominion Energy's program meets SRP-SLR Section 3.5.2.2.2.3, item 1, criteria. For those AMR items associated with SLRA

Section 3.5.2.2.2.3, item 1, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy 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 (Group 6) exposed to any environment, which will be managed by the Structures Monitoring Program. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.3, item 2.

During its review, the staff noted that Dominion Energy incorporated visual inspection criteria for ASR into the Structures Monitoring Program. These criteria include visual examination for pattern cracking with darkened crack edges, water ingress, and misalignment to identify conditions that could be indicative of ASR; such indications will be addressed in the corrective action program. The staff also noted that plant operating experience has not identified any indications of aggregate reactions for the concrete structures associated with the water-control structures (Group 6). The staff further noted that the Structures Monitoring Program includes evaluations of degradation in accessible areas that could indicate, or result in, degradation in inaccessible areas.

In its review of components associated with item 3.5.1-050, the staff finds that Dominion Energy has met the further evaluation criteria and Dominion Energy's proposal to manage the effects of aging using the Structures Monitoring Program is acceptable and a plant-specific AMP is not needed because: (1) plant operating experience has not identified any indications of aggregate reactions for the concrete structures associated with the water-control structures; (2) the visual inspections for ASR performed every 5 years under the Structures Monitoring Program will be capable of identifying conditions that could be indicative of ASR in accessible areas; and (3) the Structures Monitoring Program inspects for evidence of the aging effect in accessible areas and requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas.

Based on the program identified, the staff concludes that Dominion Energy'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 Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. SLRA Section 3.5.2.2.2.3, item 3, as amended by Dominion Energy's SLRA Supplement 1 dated February 22, 2021 (ADAMS Accession No. ML21035A303), associated with SLRA Table 3.5-1, AMR item 3.5.1-051, addresses increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of concrete components for water-control structures (Group 6) exposed to a water-flowing environment, which will be managed by the Structures Monitoring Program. Dominion Energy stated that plant-specific AMPs or plant-specific enhancements to Structures Monitoring Program are not required to manage this aging effect in inaccessible areas. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.3, item 3.

During its review, the staff noted that the Structures Monitoring Program inspects 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. The staff also noted that the Structures Monitoring Program requires evaluation of inspection results for the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or result in degradation of inaccessible areas. The staff further noted that although plant operating experience has identified evidence of leaching in accessible areas, Dominion Energy's evaluation determined that the observed leaching did not adversely impact the structural integrity or result in loss of intended functions of the associated concrete structures.

In its review of components associated with item 3.5.1-051, the staff finds that Dominion Energy has met the further evaluation criteria and Dominion Energy's proposal to manage the effects of aging using the Structures Monitoring Program is acceptable because: (1) Dominion Energy'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 AMPs or plant-specific enhancements to Structures Monitoring Program are not needed for inaccessible areas; (2) the Structures Monitoring Program inspects for evidence of the aging effect in accessible areas and requires that evaluation of inspection results includes consideration of the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of, or result in, degradation to inaccessible areas; and (3) the Structures Monitoring Program will perform opportunistic inspections of normally inaccessible areas when scheduled maintenance or planned plant modifications permit access.

Based on the program identified, the staff determines that Dominion Energy'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 that Dominion Energy 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: (a) stainless steel (SS) tank liners exposed to standing water, and (b) aluminum and SS support members, welds, bolted connections, and support anchorage to building structure exposed to air or condensation, which will be managed by the Structures Monitoring Program or the ASME Section XI, Subsection IWF Program. The staff reviewed Dominion Energy's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.4. The staff noted that Dominion Energy has identified plant-specific operating experience associated with these aging effects in SS piping components exposed to air or condensation in an underground environment with groundwater in-leakage. The staff also noted that the operating experience review did not identify cracking of SS components in other air environments.

For the SLRA Table 2 AMR item associated with AMR item 3.5.1-052 that cites generic note E, the SLRA credits the Structures Monitoring Program to manage these aging effects for the SS containment sump liner. Based on its review of components associated with AMR item 3.5.1-052 for which Dominion Energy cited generic note E, the staff finds that Dominion Energy has met the further evaluation criteria and Dominion Energy's proposal to manage the effects of aging using the Structures Monitoring Program is acceptable because: (a) plant-specific operating experience has not revealed a history of pitting or crevice corrosion or cracking for SS containment sump liners, and (b) the use of periodic visual inspections to detect cracking and loss of material in SS sump liners will allow for degradations to be detected and corrective action to be taken prior to a loss of intended function.

Dominion Energy stated that for AMR item 3.5.1-052, there are no SS tank liners that are within the scope of subsequent license renewal and that the applicability is limited to the containment sump liner exposed to standing water. The staff noted that a search of Dominion Energy's UFSAR confirmed that no other in-scope SS tank liners components exposed to standing water are present except for those described in SLRA Section 3.5.2.2.2.4.

The staff noted that the components associated with AMR item 3.5.1-099 addresses the portion of the applicable SS structural component exposed to an air environment, which do not perform a pressure-retaining function. In its review of components associated with AMR item 3.5.1-099, the staff finds that Dominion Energy has met the further evaluation criteria and Dominion Energy's proposal to manage the effects of aging for the applicable SS components using the ASME Section XI, Subsection IWF, Program is acceptable because the use of periodic visual inspections to detect cracking and loss of material in SS structural support components will allow for degradations to be detected and corrective action to be taken prior to a loss of intended function.

Dominion Energy also stated that, for AMR item 3.5.1-099, there are no aluminum support components that are within the scope of the ASME Section XI, Subsection IWF Program (i.e., aluminum Class 1, 2, 3, or MC structural support components) and that the applicability is limited to the stainless steel support components exposed to an air environment. The staff noted that a search of Dominion Energy's UFSAR confirmed that no in-scope aluminum support components exposed to air with condensation are present except for those described in SLRA Section 3.5.2.2.2.4.

The staff noted that the components associated with AMR item 3.5.1 100 addresses the portion of the aluminum and SS structural components exposed to an air environment that do not perform a pressure-retaining function. In its review of components associated with AMR item 3.5.1-100, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the Structures Monitoring Program for the applicable non-ASME code aluminum and SS structural components is acceptable because the use of periodic visual inspections to detect cracking and loss of material in aluminum and SS structural support components will allow for degradations to be detected and corrective action to be taken prior to a loss of intended function.

Based on the programs identified, the staff concludes that Dominion Energy'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 Dominion Energy 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, states that there are no TLAAs associated with component support members, anchor bolts, and welds for

Groups B1.1 and B1.2 component supports. Further, the applicant stated that Group B1.3 component supports are associated with BWRs, and therefore, not applicable. SLRA Table 3.5.1, item 3.5.1-053, addresses cumulative fatigue damage, cracking due to fatigue, and cyclic loading in component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 component supports. The staff evaluated Dominion Energy's claim and finds it acceptable because the staff independently reviewed the applicant's UFSAR and confirmed that there are no TLAAs associated with component support members, anchor bolts, and welds for Groups B1.1 and B1.2 component supports and that North Anna is a PWR.

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 addresses Dominion Energy's further evaluation of aging effects of irradiation on concrete and steel structures near the RV in two subparts:

- Concrete Biological Shield (CBS) Wall Evaluation
- Reactor Vessel (RV) Steel Support Evaluation

Concrete Biological Shield (CBS) Wall Evaluation

SLRA Section 3.5.2.2.2.6, associated with SLRA Table 3.5.1, AMR item 3.5.1-097, addresses Dominion Energy's further evaluation related to reduction of strength and mechanical properties of the CBS Wall (or primary shield wall) exposed to irradiation (neutron and gamma radiation and radiation-induced heating) in air–indoor uncontrolled environment. Based on its evaluation, which stated that the neutron fluence and gamma radiation exposure levels and gamma heating temperature levels on the CBS Wall are less than the respective SRP-SLR threshold limits and that plant-specific operating experience has not identified degradation due to irradiation, Dominion Energy determined that a plant-specific AMP to manage the effects of irradiation on the reinforced-concrete CBS wall is not required. The staff reviewed Dominion Energy's evaluation of the CBS wall against the criteria in SRP-SLR Section 3.5.2.2.2.6.

The staff reviewed SLRA Section 3.5.2.2.2.6, which states that the configuration of the RV steel support assemblies (SSAs) (include the Neutron Shield Tank (NST) and its sliding feet) and the adjacent CBS wall, are similar between NAPS and Surry Power Station (SPS). This SLRA Section states that the analytical methods used to estimate neutron fluence and gamma dose at the CBS Wall and the RV SSAs were the same as those found acceptable for SPS for the subsequent period of extended operation, documented in SPS SER (ADAMS Accession No. ML20052F523). The SLRA Section 3.5.2.2.2.6 also states that the effective full-power years (EFPY) value for Units 1 and 2 for 80 years of operation is 72 EFPY (as explained in SLRA Section 4.2.1, which the staff reviewed and evaluated in SER Section 4.2.1), which was used to estimate the fluence/dose values on the CBS Wall. The SLRA further states that the expected maximum concrete temperature of the CBS wall due to gamma dose radiation heating is 51.7 °C (125.1 °F). The SLRA states that no plant-specific operating experience of concrete irradiation degradation has been identified.

During its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy's technical reports, calculations, drawings, and other documentation related to SLRA Section 3.5.2.2.2.6 related to CBS Wall aging effects due to irradiated concrete and verified that the configuration of the NAPS NST and adjacent CBS Wall were similar to SPS. The staff noted that conclusions made in the SLRA with respect to aging management of the concrete CBS Wall depend, in part, on the reported 72 EFPY fluence and gamma dose estimates at the end of the subsequent period of extended operation.

During its evaluation of SLRA Section 3.5.2.2.2.6, the staff noted that Dominion Energy used two analytical models to investigate the impact of neutron and gamma radiation to Units 1 and 2 CBS Walls and NSTs for 72 EFPY of plant operation. The first is a plant-specific Westinghouse analytical model used for deriving these estimates for the inner surface of the CBS Wall at the axial height of the limiting fluence from the RV (i.e., at the traditional beltline region and above and below the NST). The methodology used is described in the audited Westinghouse Letter Reports LTR-REA-20-2, Revision 0, “North Anna Unit 1 and Unit 2 Reactor Cavity Concrete Neutron Fluence and Gamma Dose,” and LTR-REA-20-3, Revision 0, “North Anna Unit 1 and Unit 2 Neutron Shield Tank (NST) Fluence,” respectively, and in Regulatory Guide 1.190, “Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence.”

For the plant-specific analyses, Westinghouse performed discrete ordinates radiation transport calculations on a fuel-cycle-specific basis to determine the neutron and gamma environment within the reactor, cavity, and CBS Wall geometry using the two-dimensional/one-dimensional fluence rate synthesis methodology described in RG 1.190 and WCAP-14040-A, Revision 4, “Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves” (ADAMS Accession No. ML050120209). Furthermore, Dominion Energy reported the Westinghouse projected neutron fluence and gamma dose values for 72 EFPY for the areas of (1) the CBS Wall at the beltline region, (2) above the NST, and (3) below the NST, and the latter two are identified as potentially limiting due to unshielded streaming radiation effects. Dominion Energy also reported key limiting fluence results for the NST on the RV-side (adjacent to the core region) for 72 EFPY. The second model developed by EPRI in Report 3002013051 (the example plant used is SPS, which has similar configuration to NAPS) assessed the neutron and gamma radiations and potential gamma heating of the wall concrete; however, Dominion Energy used the EPRI model for assessment of gamma heating effects on the CBS Wall. The staff also noted that the maximum gamma dose at the CBS Wall estimated along the beltline by the EPRI model and the Westinghouse model were approximately similar.

The staff finds that the methodology described in SLRA Section 3.5.2.2.2.6 used for fluence/dose estimates for the CBS Wall and NST acceptable as follows:

- Information from the NAPS plant-specific analyses was used to support a fluence estimate at the CBS Wall surface just above the NST. This location corresponds to the location of the maximum calculated neutron fluence and gamma dose from the audited Westinghouse model, because this location is the closest non-shielded area of the CBS Wall to the centerline of the core. While RG 1.190 is only valid for the traditional beltline region of the RV, an appropriate level of detail was provided in the Westinghouse model for the geometry and composition of the relevant structures with some homogenization of regions that are not expected to have a significant effect on the fluence for the regions laterally adjacent to the RV. Consistent with the WCAP-14040-A methodology, the axial flux in the core was characterized with a burnup weighted average of the respective power distributions from individual operating cycles, with the most recent operating cycle considered to be representative of future operating cycles. The staff finds Dominion Energy’s approach to be reasonable given that significant effects due to changes in operations would be addressed by the licensee prior to making such changes.
- The uncertainty in the Westinghouse fluence calculations near the top of the NST may be significantly higher than that for the traditional beltline region due to the lack of validation and the modeling simplifications near the top of the core. However, the underlying transport methodology has been shown to be capable of achieving

uncertainties of no more than about 13 percent for fast neutron fluence (as stated in WCAP-14040-A) and there is a reasonable level of detail in the extended model. Furthermore, the uncertainty or error in the neutron fluence predictions provided for the CBS Wall would need to exceed 200 percent to approach the lower limit of 1×10^{19} n/cm^2 indicated in SRP-SLR Section 3.5.2.2.2.6, which is a conservative upper bound of neutron fluence for concrete without degradation. Therefore, the staff finds that there is reasonable assurance that the uncertainties in the neutron fluence prediction will be accommodated by the available margin to the SRP-SLR damage threshold for neutron fluence. A similar line of reasoning applies to the gamma radiation predictions, but the predicted gamma dose would have to increase by approximately 30 fold to approach the corresponding SRP-SLR damage threshold for gamma dose (1×10^8 Gy). The significantly larger margin to the SRP-SLR gamma heating damage threshold helps offset the fact that the gamma dose prediction capabilities of the WCAP-14040-A methodology have not been as well validated as the neutron fluence prediction capabilities.

- The staff finds that the Westinghouse methodology-based results on gamma dose estimates, despite its lack of validation for this purpose, is reasonably acceptable for use at NAPS. The gamma dose results align closely with those obtained in EPRI Report 3002013051 methodology (the second analytical model used by Dominion Energy). The relative agreement between the two methodologies provides a level of confidence that the assessment of gamma heating of the CBS wall in the EPRI report is reasonable. The Westinghouse methodology validation as described and reviewed by the NRC in WCAP-14040-A focused on validation of the fast neutron fluence predictions. However, as previously noted, EPRI Report 3002013051 has not been submitted to the NRC for review or endorsement, and the staff did not find it necessary to do a review of the EPRI report calculations. As a result, this SER does not represent a generic endorsement of the EPRI findings in its report.

During its evaluation of SLRA Section 3.5.2.2.2.6, based on the Westinghouse analyses, the staff confirmed that the maximum (limiting) values of neutron fluence and gamma dose for the Units 1 and 2 CBS Walls occur at an azimuthal angle of zero degrees and at a location above the NSTs. The staff also confirmed that the limiting values of fluence/gamma dose projected to the end of the subsequent period of extended operation (72 EFPY) for the CBS Wall are those estimated for Unit 2. These are 3.15×10^{18} n/cm^2 (E > 0.1 MeV) for neutron fluence and 2.93×10^6 Gy for gamma dose at approximate locations of 288 cm (about 113 in) and 282 cm (about 111 in), respectively, above the core midplane. The staff noted that although the EPRI Report 3002013051 discusses the SPS, it is equally applicable to NAPS because the CBS wall and NST configurations of the two plants, as noted above, are similar. The report states that the maximum concrete temperature of the CBS wall is estimated to be 61.7 °C (125.1 °F). This is below the threshold temperature limit for concrete in SRP-SLR Section 3.5.2.2.2.2 of 65.5 °C (150 °F) for general areas and 93.3 °C (200 °F) for local areas. The staff finds the concrete gamma heating temperature estimate to be acceptable, for the following reasons: (a) it is close to the maximum operating temperature of water in the NST of 120 °F (UFSAR Table 9.2-7), which is located near the CBS Wall concrete surface; (b) there is a considerable margin between that temperature with the SRP-SLR stated concrete temperature acceptance limit; (c) there is no operating experience identified degradation for the CBS Wall due to irradiation over the past 10 years; and (d) accessible portions of the CBS Wall are periodically inspected for such effects of aging by the SLRA Section B2.1.34 Structures Monitoring Program.

Based on review of SLRA Section 3.5.2.2.2.6, the staff finds that Dominion Energy has met the further evaluation criteria in SRP-SLR 3.5.2.2.2.6 for the CBS Wall concrete so a plant-specific AMP is not required to manage aging effects of irradiation on the CBS Wall during the subsequent period of extended operation. The staff finds Dominion Energy's determination acceptable for the following reasons: (a) the calculated limiting neutron fluence on the CBS Wall of 3.15×10^{18} n/cm^2 (E > 0.1 MeV, 72 EFPY) is less than the SRP-SLR threshold limit of 1×10^{19} n/cm^2 (E > 0.1 MeV); (b) the calculated limiting gamma dose on the CBS Wall of 2.93×10^8 rad (2.93×10^6 Gy) for 72 EFPY is less than the SRP-SLR threshold limit of 1×10^{10} rad; (c) the use of 72 EFPY for fluence/gamma dose estimates of the CBS Wall is representative of 80 years of operation as estimated in SLRA Section 4.2.1 (evaluated by the staff in SER Section 4.2.1); (d) the maximum temperature estimated in the CBS Wall concrete including radiation-induced heating of 125.1 °F is less than the SRP-SLR Section 3.5.2.2.2.2 limit of 200 °F for local areas and 150 °F for general areas with sufficient margin; (e) there is no plant-specific operating experience to date of concrete irradiation degradation; and (f) the accessible areas of the CBS Wall will continue to be monitored by visual inspection on a 5-year interval using the Structures Monitoring Program (SLRA Section B2.1.34).

Conclusion. For the CBS Wall associated with the evaluation in SLRA Section 3.5.2.2.2.6, the staff concludes that a plant-specific AMP is not required to manage aging effects due to irradiation and, as such, Dominion Energy's evaluation for CBS Wall meets the SRP-SLR Section 3.5.2.2.2.6 criteria and its SLRA is consistent with the GALL-SLR Report. Further, Dominion Energy has demonstrated that the effects of aging due to radiation for Units 1 and 2 CBS Walls 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).

Reactor Vessel Steel Support Evaluation

This subsection to SLRA Section 3.5.2.2.2.6, as amended by Supplement 1 dated February 4, 2021, describes Dominion Energy's further evaluation of Units 1 and 2 RV SSAs for loss of fracture toughness aging effect due to neutron irradiation embrittlement. Each Unit's RV SSA includes the NST constructed of welded steel plates and the RV sliding feet assemblies exposed to an air-indoor uncontrolled environment. Based on a fracture mechanics evaluation and noting that there is no plant-specific operating experience to date at NAPS for such aging effect, Dominion Energy determined, consistent with its SPS application and staff findings in the SPS SER (ADAMS Accession Nos. ML18291A828 and ML20052F523, respectively), that this aging effect on RV SSAs does not require aging management for the subsequent period of extended operation. The staff evaluated Dominion Energy's determination based on the GALL-SLR Report and SRP-SLR principles.

Dominion Energy's SLRA determination was based on the audited Westinghouse LTR-REA-20-3, Revision 0, "North Anna Unit 1 and Unit 2 Neutron Shield Tank (NST) Fluence." Based on the estimated fluence, Dominion Energy screened the NAPS RV SSAs for loss of fracture toughness and selected the fracture mechanics methodology for their evaluation consistent with the criteria and methodologies of Chapter 4, "RPV Support Re-Evaluation Criteria," of NUREG-1509, "Radiation Effects on Reactor Pressure Vessel Support." Dominion Energy stated that the staff previously accepted the fracture mechanics methodology for a similar evaluation in the SPS SER (ADAMS Accession No. ML20052F523). Dominion Energy stated that methodology originated in Project Topical Report (PTR), "Reactor Vessel Support for Unit No. 1 Surry Power Station, Life Extension Evaluation of the Reactor Vessel Support, including Appendix 3, Resistance to Brittle Fracture of the NST Materials." The staff verified similarities in NAPS and SPS RV SSAs during the audit as noted above and documented in the audit report (ADAMS Accession No. ML21036A060).

To calculate tensile stresses for fracture mechanics evaluation of NST steel plates, consistent with the design basis, Dominion Energy used the RV deadweight, design basis earthquake (DBE) derived seismic forces, and thrust forces due to RCS pipe ruptures (i.e., loss-of-coolant accident (LOCA) loads). Specifically, Dominion Energy combined the DBE and LOCA loads through the square-root of sum of the squares (SRSS) methodology, without crediting longer RCS branch line break opening times that would have reduced the magnitude of the LOCA loads. Dominion Energy reported in the SLRA that the calculated peak tensile stresses from these applied loads are 7.93 ksi at the NST inner shell and 12.44 ksi at top of NSTs (i.e., sliding feet areas). The staff finds the methodology used to calculate these tensile stresses acceptable because they are based on appropriate design basis event loads combined in a manner consistent with the staff position in NUREG-0484, Revision 1, “Methodology for Combining Dynamic Responses” (ADAMS Accession No. ML13260A310) and include conservatisms by having no reduction in LOCA loads taken due to longer RCS branch line break opening times.

In the SLRA Section 3.5.2.2.2.6, as amended by Supplement 1, Dominion Energy based its fracture mechanics evaluation of the NAPS NST steel plates on the fracture toughness K_{Ic} instead of K_{Ia} (synonymous with K_{IR}) and stated that this was permissible per Section 4.3.4.1 of NUREG-1509, “Radiation Effects on Reactor Pressure Vessel Supports,” when information on material toughness is available. To this end, Dominion Energy provided values for the nil-ductility temperatures (NDTs) for the NAPS NST ASTM-A516 Grade 60 steel plates. The staff verified in Section 4.3.4.1 of NUREG-1509, that using K_{Ic} for fracture toughness in this manner is permissible and noted that NDT is known to correlate with a material’s fracture toughness (e.g., see ASTM STP 919, Oldfield, W. and Server, W. L., “NDTT, RT_{NDT}, and Fracture Toughness: A Study of Their Interrelationships Using a Large Data Base and Computer Models”).

In the SLRA, Dominion Energy bound its fracture mechanics evaluation of irradiated NAPS NST steel plates to two cases. Case 1 was selected for steel plates having a minimum yield stress value of 32 ksi, and Case 2, for those of yield stress of 52 ksi. The staff verified that 32 ksi is the minimum value of yield strength specified in Section II, “Materials,” Part D, “Properties,” of the ASME Code for ASTM-A516 Grade 60 carbon steel plates. During the audit, however, the staff observed that to bound its fracture mechanics evaluation, Dominion Energy also considered two additional cases. Case 3 was selected for steel plates having yield stress of 42.9 ksi, and Case 4 for those of a yield stress of 62.9 ksi. Dominion Energy confirmed that Case 2 bounds Case 3 in its response to Request for Confirmation of Information (RCI) 3.5.2.2.2.6-A(b) dated March 25, 2021 (ADAMS Accession No. ML21084A182). Dominion Energy also confirmed in its response to RCI 3.5.2.2.2.6-A(c) that Case 4 was selected to check for the effects of higher levels of irradiation, reflected by the higher steel plate yield stress. Dominion Energy further confirmed in its response to RCI 3.5.2.2.2.6-A (a) that the observed difference in critical stress values (discussed in the next paragraph) between Cases 2 and 4 was small. For these reasons, Dominion Energy decided not to include Cases 3 and 4 in its amended Supplement 1 SLRA Section 3.5.2.2.2.6 and confirmed this in its response to RCI 3.5.2.2.2.6-A(d). The staff reviewed Dominion Energy’s approach discussed above and finds Case 2 adequately addresses the effects of aging due to radiation on the NAPS NST steel plates because the increase in yield stress expected as a result of irradiation was appropriately considered and included in the fracture mechanics evaluation.

Using a minimum K_{Ic} value of 33.2 ksi√in calculated from ASME Code Nonmandatory Appendix G, "Fracture Toughness Criteria for Protection Against Failure" found in Section III, Division 1, Appendices and/or Section XI, and the cases described above, Dominion Energy determined the critical stress values for postulated through-wall and surface flaws for the inner (closer to RV) NST steel plate surfaces to be as shown in Table 1 of SLRA Section 3.5.2.2.2.6, as amended by SLRA Supplement 1. Dominion Energy confirmed in its response to RCI 3.5.2.2.2.6-B (a) dated March 25, 2021 (ADAMS Accession No. ML21084A182), that the postulated surface flaw is an inner NST plate surface flaw with a depth of quarter plate thickness (¼T). Dominion Energy determined the critical stress values by setting the applied stress intensity factor to K_{Ic} and back-calculating the stress, as confirmed by Dominion Energy in its responses to RCIs 3.5.2.2.2.6-B(b) and 3.5.2.2.2.6-B(c). Dominion Energy stated that since the maximum applied tensile stresses during applicable design basis events are 12.44 ksi (at the RV sliding foot) and 7.93 ksi (at the NST inner plate-shell), which are less than the limiting critical stress values of 15.8 ksi for the postulated through-wall flaw and 30 ksi for the postulated ¼T surface flaw, brittle fracture will not occur.

The staff reviewed Dominion Energy's fracture mechanics evaluation of the postulated flaws for Units 1 and 2 NSTs in the SLRA and noted that the smallest margin relative to the critical stress value is 15.8/12.44 or 1.27, which corresponds to Case 2, through-wall flaw in Table 1 of SLRA Section 3.5.2.2.2.6 as amended by Supplement 1. The staff noted that Section 4.3.4.1 of NUREG-1509 references the acceptance criteria of the ASME Code, Section XI, Article IWB-3000, for the fracture mechanics evaluation and that the margin specified in IWB-3612 for the combined load of DBE and LOCA loads (i.e., faulted conditions) considered for the NAPS NSTs is √2 or approximately 1.41. The staff finds that the margin of 1.27 for the NAPS NSTs is acceptable, even though it is less than 1.41 for the following reasons: (a) the limiting applied stress value of 12.44 ksi is at the RV sliding feet assembly, which is at the top of the NAPS NSTs, where the projected fluence values, as stated in SLRA Section 3.5.2.2.2.6, as amended by SLRA Supplement 1, are approximately one order of magnitude lower (actual values confirmed in NAPS RAI 3.5.2.2.2.6-3 response evaluated below) than those at the maximum fluence locations; (b) combining the DBE and LOCA loads through SRSS methodology results conservatively in a higher total applied load; (c) the LOCA load not taking credit for longer RCS branch line break opening times resulting conservatively in a higher total applied load; (d) the margin of √2 from the in-service inspection rules of ASME Code, Section XI, is intended for flaws found during in-service inspections (i.e., as-found flaws, not postulated flaws); and (e) the ASME Code, Section XI margin of √2 is intended for the Reactor Pressure Vessel, which is a pressure boundary component that is subject to more stringent acceptance criteria because of its higher safety significance relative to the RV steel support components.

The staff noted, however, that Dominion Energy in its fracture mechanics evaluation did not discuss the weldments and heat affected zones (HAZ) for the NAPS NST plates. Therefore, by letter dated March 4, 2021 (ADAMS Accession No. ML21063A540), the staff requested Dominion Energy through RAI 3.5.2.2.2.6-1 to clarify how the fracture mechanics evaluation for the steel plates bound those of the weldments and HAZs of the NAPS NSTs. In its response to RAI 3.5.2.2.2.6-1, by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), Dominion Energy explained the applicability of the fracture mechanics evaluation to the NAPS NST plates, weldments, and HAZs. The staff finds Dominion Energy's response to RAI 3.5.2.2.2.6-1 acceptable for the following reasons: (a) the evaluation is based on "ASME Code, Section XI, Nonmandatory Appendix G, Figure G-2210-1" provided formula for K_{Ic} estimate, which includes data for weldments and HAZ; and (b) it includes an example demonstrating that HAZ is tougher than base metal (both materials in the irradiated condition) and cites embrittlement curves that included weld metal data that were indistinguishable from the base metal data, which collectively provide sufficient evidence that weldments and HAZ are at least as tough as the base metal. Based on the above discussion, the staff finds that Dominion Energy fracture mechanics evaluation adequately addressed the loss of fracture toughness of the NAPS NST steel plates, weldments, and HAZs for the subsequent period of extended operation.

The staff also noted that the SLRA Section 3.5.2.2.2.6, as amended by Supplement 1, states that Dominion Energy plans to manage the effects of aging on the external surfaces of the NSTs, including their support skirts through the Structures Monitoring (B2.1.34) and the External Surfaces Monitoring of Mechanical Components (B2.1.23) Programs. The staff finds this proposal acceptable for the following reasons: (a) the “corrective actions” program element of SLRA Section B2.1.34, Structures Monitoring, is enhanced with an associated commitment (Commitment 34) in SLRA Table A4.0-1, that procedures for Units 1 and 2 NST evaluations consider their RV structural support function; and (b) the Structures Monitoring (B2.1.34) and the External Surfaces Monitoring of Mechanical Components (B2.1.23) programs collectively manage the effects of aging for loss of material external to NSTs so that they will continue to perform their intended function, including structural support of the RV, during the subsequent period of extended operation.

The SLRA Section 3.5.2.2.2.6, as amended by Supplement 1, further states that Dominion Energy will use the Closed Treated Water Systems Program (B2.1.12) for loss of material on the internal surfaces of the NST steel plates. The staff, consistent with its past evaluation as documented in the SPS SLRA SER (ADAMS Accession No. ML20052F523), finds this proposal acceptable for the following reasons: (a) the NAPS closed treated water system has a similar, if not the same, configuration as that of SPS; hence chemicals administered to the NAPS NST Units 1 and 2 fluid, provide a similar level of protection as that at SPS; and (b) over the last 10 years, iron concentration in the NST fluid chemistry remained “at the instrument detection level,” as noted in SLRA Section B2.1.12, Closed Treated Water Systems “Operating Experience Summary,” verified by the staff during the audit (ADAMS Accession No. ML21036A060) and confirmed in RAI 3.5.2.2.2.6-2 (see discussion below). The staff, in reviewing the plant-specific operating experience for Unit 1 NST, however, noted elevated chromates in the fluid beyond those discussed in audited procedures and EPRI Report No. 3002000590 “Closed Cooling Water Chemistry Guideline,” Revision 2, referenced in SLRA Section B2.1.12. By letter dated March 4, 2021 (ADAMS Accession No. ML21063A540), the staff requested Dominion Energy to clarify the role of conductivity as a monitoring diagnostic parameter for the NST fluid and to discuss the cause of its elevated value in the Unit 1 NST fluid in RAI 3.5.2.2.2.6-2. The staff was concerned about the levels of high conductivity detected in the Unit 1 NAPS fluid and requested an additional clarification in the RAI regarding why high conductivity values are not of concern to Unit 1 NST structural steel integrity, including its effects on the NST irradiated steel plates fracture mechanics evaluation. The staff found Dominion Energy’s response to RAI 3.5.2.2.2.6-2, dated April 1, 2021 (ADAMS Accession No. ML21091A187) part (1), acceptable because consistent with the guidance in EPRI Report No. 3002000590, Revision 2, Dominion Energy uses conductivity to monitor program effectiveness, troubleshoot corrosion control, identify programmatic problems, and assist in overall problem diagnoses. The staff finds Dominion Energy’s response to part (2) of RAI 3.5.2.2.2.6-2 acceptable because conductivity, prior to its increase to 5290 µSiem/cm (microsiemens per centimeter) due to a human performance error, was in line with the guidance suggested in EPRI Report No. 3002000590, Revision 2. The staff also finds part (3) of applicant’s response acceptable for the following reasons: (a) an engineering evaluation of elevated chromates for Unit 1 NST concluded that the overaddition of chromates would not adversely affect the structural integrity of the Unit 1 NST and that of the associated cooling system including its seals, since carbon seals are not installed in the recirculation pumps; and (b) in addition to conductivity, sampling of Units 1 and 2 NST fluid chemistry showed no detectable concentration of iron and copper in the fluid to indicate potential loss of material. As such and based on the above, the staff finds that there is a reasonable assurance that the NAPS NSTs will continue to perform their intended function for the subsequent period of extended operation.

The SLRA Section 3.5.2.2.2.6, as amended by Supplement 1, further discusses the Units 1 and 2 RV structural steel supports sliding feet assemblies and states that the 72 EFPY fluence is estimated to be one order of magnitude lower than the areas adjacent to the core. It states that the ASME Section XI, Subsection IWF Program manages loss of mechanical function of RV sliding feet assemblies including surfaces containing Lubrite® lubricant. The staff confirmed that the reduced level of radiation at the top of Units 1 and 2 NSTs sliding feet assemblies' in Dominion Energy's response to RAI 3.5.2.2.2.6-3 (further elaborated below) (ADAMS Accession No. ML21091A187) is comparable to the environment encountered at SPS, which the staff evaluated and reached a reasonable assurance of the lubricant's capability to perform its intended function(s), documented in the SPS SER (ADAMS Accession No. ML20052F523). For the reasons of reduced radiation exposure at the sliding feet locations and because loss of mechanical function aging effect of sliding surfaces containing Lubrite® lubricant will be managed by the ASME Section XI, Subsection IWF (B2.1.31) Program, the staff finds Dominion Energy's determination that there would be no significant aging effects of loss of mechanical function of Lubrite® in NAPS RV support sliding feet surfaces due to temperature or radiation during the subsequent period of extended operation, acceptable.

The SLRA Section 3.5.2.2.2.6, as amended by Supplement 1, also states that the sliding feet components at NAPS fabricated to AISI 4330 modified steel specifications, have a lower yield strength than the VASCOMAX steel used in similar assemblies at SPS. It also states that they are exposed to an environment similar to that at SPS and hence are innocuous to SCC because the triplet of susceptible material, sustained tensile stresses, and corrosive high-temperature environment necessary for SCC does not exist. The staff finds Dominion Energy's determination of the absence of SCC acceptable for the following reasons: (a) its review of GALL-SLR does not list the AISI 4330 steel in examples of alloy steels susceptible to SCC; (b) UFSAR Section 3.8.2.2 indicates that the temperature in the containment ranges from 30 °C to 46 °C (86 °F to 115 °F), which is far less than that required to promote SCC; and (c) the staff's audit (ADAMS Accession No. ML21036A060) did not identify an aqueous or harsh environment, sustained high stresses that could factor into the SCC triplet, or operating experience manifesting the presence of SCC in the RV sliding feet assemblies.

Additionally, during the audit the staff reviewed calculations CE-1634 and CE-1634-00A regarding the structural integrity of the RV SSA (sliding foot assemblies and NST). Despite the reduction of pipe rupture loads noted in UFSAR Section 18.3.5.3 that factor in the audited aforementioned calculations (see audit report ADAMS Accession No. ML21036A060), the staff could not determine whether the effects of aging, including those of streaming radiation on the nozzle support pads/sliding feet assemblies were adequately addressed for the subsequent period of extended operation. By letter dated March 4, 2021 (ADAMS Accession No. ML21063A540), the staff requested clarification on the effects of radiation on the nozzle support pads/sliding feet assemblies in RAI 3.5.2.2.2.6-3. The staff finds Dominion Energy's response to RAI 3.5.2.2.2.6-3 dated April 1, 2021 (ADAMS Accession No. ML21091A187) acceptable for the following reasons: (a) the Westinghouse fluence calculations summarized in Table 3-3 of the response demonstrate that streaming radiation on the nozzle support pads/sliding feet assemblies for 72 EFPY is an order of magnitude less than the EPRI screening value for which managing the effects of aging due to irradiation is required; and (b) Dominion Energy's ASME Section XI, Subsection IWF (B2.1.31) Program manages, consistent with SRP-SLR and GALL-SLR, the effects of aging for all other considerations for these components. Therefore, the staff finds that there is reasonable assurance that the entirety of the NAPS NSTs nozzle support pads/sliding feet assemblies will continue to perform their intended function for the subsequent period of extended operation.

Based on review of SLRA Section 3.5.2.2.2.6, as amended by Supplement 1, responses to RCI 3.5.2.2.2.6-A, RCI 3.5.2.2.2.6-B, RAI 3.5.2.2.2.6-1, RAI 3.5.2.2.2.6-2, and RAI 3.5.2.2.2.6-3, the staff finds that Dominion Energy has met the intent of SRP-SLR further evaluation criteria consistent with GALL-SLR Report principles regarding the structural integrity of Units 1 and 2 RV SSAs (NST structural steel and sliding feet assemblies).

The staff also finds that Dominion Energy's conclusion that a plant-specific program is not required to manage aging effects of irradiation for the RV SSA for the subsequent period of extended operation is acceptable for the following reasons:

(a) Dominion Energy's fracture mechanics and fluence evaluations provided reasonable assurance that effects of aging for loss of fracture toughness due to irradiation or other relevant aging effects will not occur during the subsequent period of extended operation.

(b) Dominion Energy's proposal to continue to manage aging effects for loss of material and loss of mechanical function using the ASME Section XI Subsection IWF, Structures Monitoring, External Surfaces Monitoring of Mechanical Components, and Closed Treated Water Systems AMPs (as applicable), provide reasonable assurance that applicable aging effects will be adequately monitored and managed.

(c) To date, Dominion Energy has not identified plant-specific operating experience of RV SSA degradation due to irradiation aging effects.

(d) Dominion Energy has adequately addressed the staff's concerns related to all potential aging effects consistent with SRP-SLR and GALL-SLR Report principles.

Conclusion: Based on the programs identified to manage loss of material and loss of mechanical function of the RV SSAs, the staff finds that Dominion Energy's program(s) and AMRs in the SLRA as amended by SLRA Supplement 1 dated February 4, 2021, are acceptable. Further, the staff finds that Dominion Energy adequately assessed through fracture mechanics evaluations that a plant-specific program is not needed to manage the effects of aging due to radiation (loss of fracture toughness, loss of function due to irradiation embrittlement) for Units 1 and 2 NST RV SSAs. Therefore, Dominion Energy's evaluation of the NST structural steel and RV support sliding feet assemblies meets the intent of SRP-SLR further evaluation criteria, consistent with the GALL-SLR Report principles. As such, the staff concludes that the SLRA Section 3.5.2.2.2.6, as amended by Supplement 1, is consistent with the GALL-SLR Report to manage the effects of aging for the NST structural steel and RV support sliding feet assemblies. The staff also concludes that Dominion Energy has demonstrated that the effects of aging for the RV SSAs will be adequately managed so that their intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.3 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA Program.

3.5.2.2.4 Ongoing Review of Operating Experience

SER Section 3.0.5 documents the staff's evaluation of the applicant's ongoing review of operating experience.

3.5.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL-SLR Report

The following subsections document the staff's review of AMR results listed in SLRA Tables 3.5.2 1 through 3.5.2 40 that are either not consistent with or not addressed in the GALL-SLR Report and that are usually denoted with generic notes F through J. To efficiently capture and identify multiple applicable AMR items in each subsection and because these AMR items often are not associated with a Table 1 item, the subsections are organized by applicable AMR Section and then by material and environment combinations.

For component type, material, and environment combinations not evaluated in the GALL-SLR Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the CLB for the subsequent period of extended operation. The following sections document the staff's evaluation.

3.5.2.3.1 Structures and Component Supports – Fuel Building – Aging Management Evaluation – SLRA Table 3.5.2-16

Stainless Steel Spent Fuel Pool Liner Plates Exposed to Treated Borated Water

SLRA Table 3.5.2-16 states that the cumulative fatigue damage aging effect for stainless steel spent fuel pool liner plates exposed to treated borated water is addressed by a TLAA. The AMR item cites generic note H, and plant-specific note 4, which states "[t]he evaluation of the spent fuel pool liner plates fatigue is addressed in Section 4.7.4, Spent Fuel Pool Liner Fatigue Analysis." The staff confirmed that there is a TLAA dispositioned in SLRA Section 4.7.4 for this component and material. The staff's evaluation of the TLAA for stainless steel spent fuel pool liner fatigue is documented in SER Section 4.7.4.

3.5.2.3.2 Structures and Component Supports – SBO Structures for Offsite Power – Aging Management Evaluation – SLRA Table 3.5.2-26

Carbon Fiber Reinforced Polymer Wrap Exposed to Air

SLRA Table 3.5.2-26 states that hardening or loss of strength, loss of material, and cracking or blistering for CFRP wrap exposed to air will be managed by the Structures Monitoring Program. The AMR item cites generic note H. The AMR item also cites plant-specific note 3, which states that the CFRP wrap is associated with concrete poles. However, for this item, the staff determined the need for additional information, which resulted in the issuance of an RAI. RAI 3.5.2.3-1 and Dominion Energy's response are documented in ADAMS Accession No. ML21091A186.

In its response, the staff noted that Dominion Energy revised SLRA Section B2.1.34 to include a new enhancement that will ensure that the aging effects of hardening or loss of strength, loss of material, cracking, or blistering that could lead to the reduction or loss of intended function will be managed by the Structures Monitoring Program for the CFRP wrap used in concrete poles from the reserve station service transformer tube bus. Dominion Energy also revised SLRA Section A1.34 and SLRA Table A4.0-1, item 34, to indicate that CFRP wrap is in the scope of the Structures Monitoring Program. The staff finds Dominion Energy's response and changes to SLRA Sections B2.1.34, A1.34, and Table A4.0-1, item 34, acceptable because the new enhancement will ensure that the aging effects associated with CFRP wrap in concrete poles will be managed by the Structures Monitoring Program during the period of extended operations.

The staff reviewed the associated items in the SLRA and considered whether the aging effects proposed by Dominion Energy constitute all of the applicable aging effects for this component, material, and environment description. Based on its review of the GALL-SLR Report, which identifies the same aging effects/mechanism for similar polymeric materials used in mechanical components, the staff finds that Dominion Energy has identified all applicable aging effects for this component, material, and environment combination. The staff also notes that mechanical programs managing similar materials rely on visual inspections to manage these aging effects. The staff finds Dominion Energy's proposal to manage the effects of aging acceptable because the use of visual inspections to manage these aging effects will allow Dominion Energy to detect degradations and take corrective action before there is a loss of intended function(s).

3.5.2.3.3 Structures and Component Supports – Tank Foundations and Missile Barriers – Aging Management Evaluation – SLRA Table 3.5.2-33

<u>Stainless Steel Elements Exposed to Soil</u>

SLRA Table 3.5.2-33 states that loss of material for stainless steel elements exposed to soil will be managed by the Structures Monitoring Program. The AMR item cites generic note H. The AMR item also cites plant-specific note 2, which states that the stainless steel elements are associated with missile barriers.

The staff reviewed the associated items in the SLRA and considered whether the aging effects proposed by Dominion Energy constitute all of the applicable aging effects for this component, material, and environment description. Based on its review of the GALL-SLR Report, which states that stainless steel components are susceptible to loss of material due to pitting and crevice corrosion, microbiologically-influenced corrosion, and cracking due to SCC depending on its environment, the staff finds that Dominion Energy has identified all applicable aging effects for this component, material, and environment combination. The staff notes that cracking due to SCC is not expected to prevent this component from maintaining its intended function as a missile barrier. The staff finds Dominion Energy's proposal to manage the effects of aging acceptable because the use of periodic visual inspections to detect loss of material in missile barriers will allow for this component to be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

3.6 <u>Aging Management of Electrical and Instrumentation and Controls</u>

3.6.1 Summary of Technical Information in the Application

SLRA Section 3.6 provides AMR results for those components the applicant identified in SLRA Section 2.5, "Electrical and Instrumentation and Control Systems," as being subject to an AMR. SLRA Table 3.6.1, "Summary of Aging Management Programs for the Electrical Components Evaluated in Chapter VI of the GALL-SLR Report," is a summary comparison of the applicant's AMR results with those provided in the GALL-SLR Report for electrical components.

3.6.2 Staff Evaluation

Table 3.6-1, below, summarizes the 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 Evaluated in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.6.1-001	Consistent with the GALL-SLR Report
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 NAPS (see SER Section 3.6.2.2.3)
3.6.1-005	Not applicable to NAPS (see SER Section 3.6.2.2.3 and 3.6.2.3.2)
3.6.1-006	Not applicable to NAPS (see SER Section 3.6.2.2.3 and 3.6.2.3.2)
3.6.1-007	Not applicable to NAPS (see SER Section 3.6.2.2.3 and 3.6.2.3.2)
3.6.1-008	Consistent with the GALL-SLR Report
3.6.1-009	Consistent with the GALL-SLR Report
3.6.1-010	Consistent with the GALL-SLR Report
3.6.1-011	Consistent with the GALL-SLR Report
3.6.1-012	Consistent with the GALL-SLR Report
3.6.1-013	Consistent with the GALL-SLR Report
3.6.1-014	Consistent with the GALL-SLR Report
3.6.1-015	Consistent with the GALL-SLR Report
3.6.1-016	Consistent with the GALL-SLR Report (see SER Section 3.6.2.3.1)
3.6.1-017	Consistent with the GALL-SLR Report (see SER Section 3.6.2.3.1)
3.6.1-018	Consistent with the GALL-SLR Report (see SER Section 3.6.2.3.1)
3.6.1-019	Consistent with the GALL-SLR Report
3.6.1-020	Consistent with the GALL-SLR Report
3.6.1-021	Consistent with the GALL-SLR Report (see SER Section 3.6.2.3.2)
3.6.1-022	Consistent with the GALL-SLR Report (see SER Section 3.6.2.3.1)
3.6.1-023	Consistent with the GALL-SLR Report
3.6.1-024	Consistent with the GALL-SLR Report
3.6.1-025	This item number is not used in the SRP-SLR nor in the GALL-SLR Report
3.6.1-026	This item number is not used in the SRP-SLR nor in the GALL-SLR Report
3.6.1-027	Not applicable to NAPS
3.6.1-028	This item number is not used in the SRP-SLR nor in the GALL-SLR Report
3.6.1-029	Not applicable to NAPS (see SER Section 3.6.2.2.2)
3.6.1-030	Not applicable to NAPS (see SER Section 3.6.2.2.2)
3.6.1-031	Not applicable to NAPS (see SER Section 3.6.2.2.2)
3.6.1-032	Not applicable to NAPS

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

(1) SER Section 3.6.2.1 discusses AMR results for components that the applicant states are either not applicable to NAPS or are consistent with the GALL-SLR Report. Section 3.6.2.1.1 summarizes the staff's review of items that are not applicable.

(2) SER Section 3.6.2.2 discusses AMR results for which the GALL-SLR Report and SRP-SLR recommend further evaluation.

(3) SER 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 typically are identified by generic notes F through J and plant-specific notes in the SLRA.

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

The following subsections document the staff's review of AMR results listed in SLRA Tables 3.6.2-1 through 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 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 item. The staff's conclusion of "Consistent with the GALL-SLR Report" is documented in SER Table 3.6-1, and no separate writeup is required or provided. The staff did not identify any AMR items that required additional review with an associated writeup.

SER Section 3.6.2.1.1 documents the staff's review of AMR items that the applicant determined to be not applicable or not used.

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

For SLRA Table 3.6-1, items 3.6.1-004, 3.6.1-005, 3.6.1-006, 3.6.1-007, 3.6.1-027, 3.6.1-029, 3.6.1-030, 3.6.1-031, and 3.6.1-032, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to NAPS. The staff reviewed the SLRA and UFSAR and confirmed that the applicant's SLRA does not have any AMR results that are applicable for these items.

3.6.2.2 Aging Management Review Results for Which Further Evaluation Is Recommended by the GALL-SLR Report

In SLRA Section 3.6.2.2, the applicant further evaluates aging management for certain electrical and instrumentation and controls system components as recommended by the GALL-SLR Report and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of these component groups against the criteria contained in SRP-SLR Section 3.6.2.2. The following subsections document the staff's review.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

SLRA Section 3.6.2.2.1 states that environmental qualification is a TLAA as defined by 10 CFR 54.3. Dominion Energy's evaluation of this TLAA is addressed in Section 4.4, "Environmental Qualification (EQ) of Electrical Equipment." This is consistent with SRP-SLR Section 3.6.2.2.1, which states that TLAAs are defined in 10 CFR 54.3, and are evaluated in accordance with 10 CFR 54.21(c)(1). The staff finds that it is acceptable to address electrical environmental qualification as a TLAA and documents its evaluation of the TLAA for EQ of electrical equipment in SER Section 4.4.

3.6.2.2.2 Reduced Insulation Resistance Due to Age Degradation of Cable Bus Arrangements Caused by Intrusion of Moisture, Dust, Industrial Pollution, Rain, Ice, Photolysis, Ohmic Heating, and Loss of Strength of Support Structures and Louvers of Cable Bus Arrangements Due to General Corrosion and Exposure to Air-Outdoor

SLRA Section 3.6.2.2.2, associated with SLRA Table 3.6.1, items 3.6.1-029, 3.6.1-030, and 3.6.1-031, addresses reduced insulation resistance due to age degradation of cable bus arrangements caused by intrusion of moisture, dust, industrial pollution, rain, ice, photolysis, ohmic heating, and loss of strength of support structures and louvers of cable bus arrangements due to general corrosion and exposure to air-outdoor. Dominion Energy stated that these items are not applicable because there are no in-scope cable bus arrangements at North Anna. The staff reviewed North Anna electrical arrangement drawings, photos, and reviewed a search of the operating experience data base provided by Dominion Energy, using the keyword “cable bus.” The staff finds SLRA Section 3.6.2.2.2 statement acceptable because cable bus arrangements are not utilized at North Anna.

3.6.2.2.3 Loss of Material Due to Wind-Induced Abrasion, Loss of Conductor Strength Due to Corrosion, and Increased Resistance of Connection Due to Oxidation or Loss of Preload for Transmission Conductors, Switchyard Bus, and Connections

SLRA Section 3.6.2.2.3 associated with SLRA Table 3.6.1, items 3.6.1-004, 3.6.1-005, 3.6.1-006, and 3.6.1-007 addresses loss of conductor strength due to corrosion, increased resistance of connection due to oxidation or loss of preload, and loss of material due to wind-induced abrasion in transmission conductors, transmission connections, as well as switchyard buses and connections. The criteria in SRP-SLR Section 3.6.2.2.3 state that the GALL-SLR Report recommends further evaluation of a plant-specific AMP to ensure that the aging effects are adequately managed. A discussion of each of these AMR items is provided as follows.

<u>Transmission Conductors Composed of Aluminum Steel Exposed to Air Outdoor</u>. SLRA item 3.6.1-004 addresses the aging effect of loss of conductor strength due to corrosion in transmission conductors composed of aluminum and steel exposed to air outdoor environment. SLRA Section 3.6.2.2.3 states that NAPS does not use these components. The in-scope transmission conductors are 545.6 thousand circular mil (MCM) aluminum conductor aluminum reinforced conductors and are not subject to corrosion that requires aging management. The staff noted that according to GALL-SLR Report item 3.6.1 021, aluminum conductor alloy reinforced (ACAR) and all aluminum conductor (AAC) transmission conductors do not require an AMP to manage the aging effect of loss of conductor strength due to corrosion. The staff finds the applicant’s proposal acceptable because the in-scope transmission conductors at NAPS are AAC as verified during the staff’s audit (ADAMS Accession No. ML21036A060).

<u>Transmission Connectors Composed of Aluminum and Steel Exposed to an Air Outdoor Environment</u>. SLRA item 3.6.1-005, as supplemented by the letter dated February 4, 2021, addresses the aging effect of increased resistance of connection due to oxidation or loss of preload in transmission connectors composed of aluminum and steel, exposed to air outdoor environment. SLRA Section 3.6.2.2.3 stated that oxidation and loss of preload are not

applicable aging effects for NAPS transmission connectors based on NAPS design and operating experience.

Dominion Energy stated that at NAPS, transmission connector surfaces are coated with corrosion inhibitors to avoid connection oxidation. The SLRA also stated that NAPS transmission connectors are installed and torqued using aluminum bolts, nuts, and lock washers to prevent loss of preload. Dominion Energy concluded that based on NAPS design and operating experience, oxidation and loss of preload are not applicable aging mechanisms for NAPS transmission connectors.

The staff reviewed the associated items in the SLRA as supplemented by the letter dated February 4, 2021. The staff conducted an audit (ADAMS Accession No. ML21036A060) and confirmed that these aging effects are not applicable for this component, material, and environmental combination. The staff noted that NAPS' bolted transmission connectors employ corrosion inhibitors and bolting practices that prevent loss of preload and corrosion of the contact surfaces. The staff finds the applicant's further evaluation acceptable because the NAPS transmission connectors have not exhibited significant aging effects based on site specific experience and routine maintenance and inspections.

Switchyard Bus and Connections Composed of Aluminum, Copper, Bronze, Stainless Steel, Galvanized Steel Exposed to Air Outdoor. SLRA item 3.6.1-006 addresses the aging effects of loss of material due to wind-induced abrasion, increased resistance of connection due to oxidation, or loss of preload in switchyard bus and connections composed of aluminum and stainless steel exposed to air outdoor environment. SLRA Section 3.6.2.2.3 stated that loss of material and increased resistance of connection are not applicable aging effects for NAPS switchyard bus and connections.

Dominion Energy stated that NAPS uses aluminum tubular switchyard buses supported by post insulators. Connections between in-scope switchyard bus and active components, such as circuit breakers, are short lengths of flexible aluminum conductors that are not typically subject to vibration under wind loading. Switchyard buses are not subject to abrasion induced by wind loading due to its rigid mounting.

Dominion Energy further stated that NAPS is located in a largely agricultural area on a man-made freshwater lake. Salt spray and salt coating are not present in the environment at NAPS. There are no nearby industrial facilities that produce airborne industrial effluents affecting NAPS. Aluminum cable and bus material does not experience any appreciable aging effects in this environment. Aluminum switchyard bus and cable connections are treated with corrosion inhibitors to avoid connection oxidation. Connection hardware includes aluminum and stainless steel. Connections that are assembled using aluminum or stainless-steel bolts and nuts include lock washers and are torqued to prevent loss of preload. Dominion Energy concluded that based on design and confirmed by operating experience, wind-induced abrasion and increased resistance of connection due to oxidation and loss of preload are not applicable aging mechanisms for switchyard bus and connections at NAPS.

The staff reviewed the associated items in the SLRA, conducted an audit (ADAMS Accession No. ML21036A060), and confirmed that these aging effects are not applicable for this component, material, and environment combination. The staff noted that the switchyard bus connections are rigidly mounted, torqued, and use lock washers and corrosion inhibitors to preclude oxidation and loss of preload. The staff finds Dominion Energy's evaluation acceptable because operating experience and periodic inspections have also demonstrated that increased connection resistance due to corrosion, oxidation, or loss of preload is not an AERM at NAPS.

Transmission Conductors Composed of Aluminum Steel Exposed to Air Outdoor. SLRA item 3.6.1-007 addresses the aging effects of loss of material due to wind-induced abrasion in transmission conductors composed of aluminum and steel exposed to an air outdoor environment. SLRA Section 3.6.2.2.3 stated that loss of material due to wind loading and abrasion is not an applicable aging effect for NAPS transmission conductors.

Dominion Energy stated that in-scope transmission conductors operate at distribution voltages (34.5 kV) instead of transmission voltages. They are installed with shorter spans, at lower elevations, and with less sag than transmission conductors. Thus, they tend to be less affected by wind loading than transmission conductors. Based on design and confirmed by operating experience, wind-induced abrasion is not an applicable aging mechanism for transmission conductors at NAPS.

The staff reviewed the associated items in the SLRA and conducted an audit (ADAMS Accession No. ML21036A060). The staff noted that wind-induced vibration and abrasion have not been shown to be a contributor to loss of material based on industry operating experience and at NAPS. Therefore, the staff finds that loss of material (wear) of transmission conductors and connections due to wind-induced abrasion is not an AERM at NAPS.

Conclusion. Based on its audit and application review, the staff concludes that Dominion Energy has met the SRP-SLR Section 3.6.2.2.3 criteria. For those items that apply to SLRA Section 3.6.2.2.3, the staff finds that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff’s evaluation of the applicant’s QA Program.

3.6.2.2.5 Ongoing Review of Operating Experience

SER Section 3.0.5 documents the staff’s evaluation of the applicant’s ongoing review of operating experience.

3.6.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL-SLR Report

The following subsections document the staff’s review of AMR results listed in SLRA Tables 3.6.2-1 through 3.6.2-3 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 1 item, the subsections are organized by applicable AMR Section and then by material and environment combinations.

For component type, material, and environment combinations not evaluated in the GALL-SLR Report, the staff reviewed the applicant’s evaluation to determine whether the applicant has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the CLB for the subsequent period of extended operation. The following sections document the staff's evaluation.

3.6.2.3.1 Fuse Holders – Not Part of Active Equipment (Metallic Clamps and Insulation Material)

Section 3.6.2.3, Fuse Holders – Not Part of Active Equipment (Metallic Clamps and Insulation Material) associated with SLRA items 3.6.1-016, 3.6.1-017, and 3.6.1-018 addresses increased electrical resistance of connection due to chemical contamination, corrosion, oxidation, fatigue from ohmic heating, thermal cycling, electrical transients, and fatigue caused by frequent fuse removal/manipulation or vibration, of fuse holders (i.e., metallic clamps) exposed to air-indoor controlled or uncontrolled environment, and SLRA item 3.6.1-022 addresses reduced insulation resistance due to thermal/thermo-oxidative degradation of organics, radiolysis, and photolysis (ultra violet (UV) sensitive materials only) of organics, radiation-induced oxidation, and moisture intrusion of fuse holders (i.e., electrical insulation material, Bakelite, phenolic melamine or ceramic, and molded polycarbonate) in air-indoor controlled or uncontrolled environment. The applicable aging effects/mechanisms will be managed by the Fuse Holders AMP B2.1.43.

In its review of components associated with AMR items 3.6.1-016, 3.6.1-017,3.6.1-018, and 3.6.1-022, the staff finds that Dominion Energy has met the further evaluation criteria, and Dominion Energy's proposal to manage the effects of aging using the Fuse Holders AMP B2.1.43 is acceptable because it is consistent with the GALL-SLR Report. Dominion Energy stated that for AMR items 3.6.1-016, 3.6.1-017,3.6.1-018, and 3.6.1-022, the applicability is limited to the 52 fuse holders located in the control rod drive (CRD) room that are exposed to air-indoor uncontrolled environment. The remaining in-scope fuse holders are located in air-indoor controlled environment (main control room) and are not subject to aging effects described in GALL-SLR Report. The staff noted that a search of Dominion Energy's corrective actions program and UFSAR confirmed that no in-scope fuse holders (not part of active equipment) exposed to air-indoor uncontrolled environment are present in the electrical systems except for the 52 fuse holders in the CRD room identified in SLRA 3.6.2.3.

Based on the fuse holders program identified (AMP B2.1.43), the staff concludes that Dominion Energy's program meets the GALL-SLR Report. For those AMR items associated with SLRA Section 3.6.2.3, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that Dominion Energy has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21 (a)(3).

3.6.2.3.2 Transmission Connectors Composed of Aluminum, and Steel, and Switchyard Bus and Connections Composed of Aluminum, Stainless Steel, Copper, Bronze, and Galvanized Steel, and Transmission Conductors Composed of Aluminum, and Steel, Exposed to Air Outdoor

In SLRA Table 3.6.2, Dominion Energy stated that the aging effects related to the following are not applicable: transmission conductors composed of aluminum exposed to air outdoor environment (Table 1, item 3.6.1-021); transmission connectors composed of aluminum, and steel exposed to an air outdoor environment (Table 1, item 3.6.1-005); switchyard bus and connections composed of aluminum, copper, bronze, stainless steel, and galvanized steel exposed to air outdoor environment (Table 1, item 3.6.1-006); and transmission conductors composed of aluminum and steel exposed to air outdoor environment (Table 1, item 3.6.1-007).

As a result, Dominion Energy proposed no AMPs for the above component, material, and environment combinations. These AMR items cite generic note I, which states that the aging effect in NUREG-2191 for this component, material, and environment combination is not applicable. In addition to note I, the SLRA further provides plant-specific notes 1 through 4 for these AMR items respectively, as follows:

> Plant-specific note 1. Loss of material and increased resistance of connection are not applicable aging effects for switchyard bus and connections at NAPS. The in-scope switchyard bus and connections are subject to neither wind induced abrasion nor oxidation or loss of pre-load.
>
> Plant-specific note 2. Loss of material is not an applicable aging effect for transmission conductors at NAPS. The in-scope transmission conductors are not subject to wind induced abrasion.
>
> Plant-specific note 3. Increased resistance of connection is not an applicable aging effect for transmission connections at NAPS. The in-scope transmission connections are not subject to oxidation or loss of preload.
>
> Plant-specific note 4. Loss of conductor strength is not an applicable aging effect for transmission conductors at NAPS. The in-scope transmission conductors are aluminum conductor aluminum alloy reinforced conductors.

The staff finds that Dominion Energy's assessment for SLRA Table 3.6.2 item 3.6.1-021 (transmission conductors composed of aluminum exposed to air outdoor environment) is consistent with GALL-SLR Report Section VI Electrical Components Table A, "Equipment Not Subject to 10 CFR 50.49 Environmental Qualification Requirements" item VI.A.LP-46, which recommends no AMP and no further evaluation for aluminum conductors.

The staff's evaluation of Dominion Energy's claim regarding SLRA Table 3.6.1, items 3.6.1-005, 3.6.1-006, and 3.6.1-007, is documented in SER Section 3.6.2.2.3.

3.7 Conclusion for Aging Management Review Results

The staff reviewed SLRA Section 3, "Aging Management Review Results," and SLRA Appendix B, "Aging Management Programs," as supplemented. Based on its audits and its review of the applicant's AMRs results and AMPs, the staff concludes that the applicant has demonstrated that it will adequately manage the applicable aging effects in a way that maintains intended functions consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3), The staff also reviewed the applicant's applicable UFSAR supplement program summaries and concludes that, as required by 10 CFR 54.21(d), the UFSAR supplement adequately describes the AMPs and activities credited for managing aging at NAPS.

With regard to these matters, the staff concludes that actions have been identified and have been or will be taken, such that there is reasonable assurance that the activities authorized by subsequent renewed operating licenses for North Anna Power Station, Unit 1 and Unit 2, if issued, will continue to be conducted in accordance with the CLB, and that any changes made to the CLB in order to comply with 10 CFR 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 <u>Identification of Time-Limited Aging Analyses and Exemptions</u>

This section of the safety evaluation report (SER) provides the staff's evaluation of the applicant's basis for identifying those time-limited aging analyses (TLAAs) and exemptions that need to be identified in the subsequent license renewal application (SLRA).

The regulation in Title 10 of the *Code of Federal Regulations* (10 CFR) 54.21(c)(1) requires an applicant for license renewal to identify each evaluation, analysis, or calculation (henceforth referred to as "analysis") in the current licensing basis (CLB) that conforms to the definition of a TLAA, as defined in 10 CFR 54.3, "Definitions." TLAAs are defined in 10 CFR 54.3 (a) as:

> […] those licensee calculations and analyses that:

(1) Involve systems, structures, and components within the scope of license renewal, as delineated in [10 CFR] 54.4 (a);

(2) Consider the effects of aging;

(3) Involve time-limited assumptions defined by the current operating term, for example, 40 years [for initial license renewal or 60 years for subsequent license renewal];

(4) Were determined to be relevant by the licensee in making a safety determination;

(5) Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component [SSC] to perform its intended functions, as delineated in [10 CFR] 54.4(b); and

(6) Are contained or incorporated by reference in the CLB.

The regulations at 10 CFR 54.21(c)(1) require that the applicant provide a list of TLAAs as defined in 10 CFR 54.3 and demonstrate that:

(i) The analyses remain valid for the period of extended operation;

(ii) The analyses have been projected to the end of the period of extended operation; or

(iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

In addition, 10 CFR 54.21(c)(2) requires applicants to list all plant-specific exemptions granted in accordance with 10 CFR 50.12, "Specific Exemptions," and in effect that are based on TLAAs. For any such exemption, the applicant must also provide an evaluation that justifies the continuation of the exemption for the subsequent period of extended operation.

The U.S. Nuclear Regulatory Commission's (NRC's) acceptance criteria and procedures for reviewing TLAA identification methodologies and results in an SLRA are given in Chapter 4.1 of NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants" (SRP-SLR). SRP-SLR Section 4.1.2 gives the acceptance criteria and SRP-SLR Section 4.1.3 gives the review procedures.

The SRP-SLR Report may be accessed in the NRC's Agencywide Documents Access and Management System (ADAMS) at Accession No. ML16274A402.

4.1.1 Summary of Technical Information in the Application

4.1.1.1 Identification of TLAAs

SLRA Section 4.1 summarizes the methodology that the applicant used to identify those analyses that may potentially conform to the definition of a TLAA in 10 CFR 54.3(a). Specifically, SLRA Section 4.1.1 states that keyword searches were performed on the CLB documentation to determine whether these potential TLAAs exist in the CLB. The CLB search included:

- changes to the Updated Final Safety Analysis Report (UFSAR)
- changes to the Technical Specifications (TS) and bases
- NRC Safety Evaluation Reports (SERs) for the original operating license
- subsequent NRC Safety Evaluations (SEs)
- docketed licensing correspondence between the applicant and the NRC
- vendor, NRC-sponsored, and licensee topical reports
- calculations
- code stress reports or code design reports
- drawings
- specifications

The applicant provides its list of TLAAs in SLRA Table 4.1.5-2, "Time-Limited Aging Analyses and Dispositions." The applicant discusses and evaluates these TLAAs in applicable subsections of SLRA Sections 4.2 through 4.7. The applicant's evaluations of these TLAAs provide its bases for demonstrating acceptance of the TLAAs in accordance with the criteria in 10 CFR 54.21(c)(1)(i), (ii), or (iii).

SLRA Section 4.1.4 states that a review of docketed licensing correspondence, the operating license, and the UFSAR was performed to identify exemptions in effect. Each exemption in effect was then evaluated to determine whether it was based on a TLAA as defined in 10 CFR 54.3. The applicant confirmed that it identified no exemptions granted pursuant to 10 CFR 50.12 currently in effect that are based upon a TLAA.

4.1.2 Staff Evaluation

4.1.2.1 Identification of TLAAs

The staff reviewed the applicant's TLAA identification methodology and results in accordance with the acceptance criteria and review procedures in SRP-SLR Sections 4.1 2 and 4.1.3, respectively.

The staff reviewed SLRA Tables 4.1.5-1 and 4.1.5-2, and readily available CLB documents (e.g., UFSAR and Technical Specifications). Based on its review, the staff determined that the applicant appropriately dispositioned the potential TLAAs identified in SLRA Table 4.1.5-1 based on their applicability to North Anna Power Station, Units 1 and 2 (NAPS, North Anna, or applicant). The staff verified that the analyses identified in SLRA Table 4.1.5-2 conform to the six criteria for defining TLAAs in 10 CFR 54.3. Therefore, the staff finds that the identification of these TLAAs is acceptable and in accordance with 10 CFR 54.21(c)(1).

In addition, during its audit (ADAMS Accession No. ML21036A060), the staff reviewed Dominion Energy's methodology for identifying TLAAs and confirmed the following:

- Current licensing-basis and design basis documentation were searched to identify potential TLAAs. The staff noted that specific key words were used during this search that would identify potential TLAAs.
- Each potential TLAA was reviewed against the six criteria of 10 CFR 54.3(a) and those that met all six criteria were identified as TLAAs requiring evaluation for the subsequent period of extended operation.
- A search of docketed licensing correspondence, the operating license, and the UFSAR identified the active exemptions currently in effect in accordance with 10 CFR 50.12.
- Plant-specific exemptions were then reviewed to determine whether the exemption was based on a TLAA and to verify that no 10 CFR 50.12 exemptions involved a TLAA as defined in 10 CFR 54.3.

During its review, the staff performed an independent search of the UFSAR and a sample of docketed licensing correspondence and NRC SERs to identify potential TLAAs and any exemptions for the CLB that were granted pursuant to 10 CFR 50.12. Based on this independent search, the staff did not (1) identify TLAAs that were not already identified in the SLRA by the applicant, nor (2) identify any plant-specific exemptions granted in accordance with 10 CFR 50.12 that are in effect and are based on TLAAs as defined in 10 CFR 54.3.

The staff provides its evaluations of these TLAAs in SER Sections 4.2 through 4.7.

4.1.3 Conclusion

Based on its review and independent search, the staff concludes that the systematic approach the applicant took to search its CLB and design basis documentation identified the analyses that meet all six criteria of a TLAA, in accordance with 10 CFR 54.21(c)(1). In addition, based on its review and independent search, the staff finds that the systematic approach taken by the applicant to search its CLB for exemptions that were based on a TLAA is acceptable. Thus, the staff finds that there are no TLAAs that are required to be listed as exemptions by 10 CFR 54.21(c)(2).

On the basis of its review, the staff concludes that the applicant has provided an acceptable list of TLAAs as defined in 10 CFR 54.3(a). The staff also concludes that the CLB does not include any exemptions that were granted in accordance with 10 CFR 50.12, are based on a TLAA, and remain in effect for the CLB. Therefore, the staff concludes that the applicant does not need to identify or evaluate any regulatory exemptions in accordance with the requirements specified in 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 Dominion Energy’s TLAA for neutron fluence projections that quantify the number of neutrons that contact the reactor vessel (RV) surfaces and that have been used as inputs to the neutron embrittlement analyses that evaluate the reduction of fracture toughness aging effects resulting from neutron irradiation.

Updated neutron fluence evaluations were performed and documented in WCAP-18015-NP, Revision 2, "Extended Beltline Pressure Vessel Fluence Evaluations Applicable to North Anna 1 & 2" (ADAMS Accession No. ML20140A336). Reactor pressure vessel (RPV) beltline and extended beltline fast neutron fluences (E > 1.0 MeV) at the end of 80 years of operation were calculated for Units 1 and 2. The analysis methodologies used to calculate the Units 1 and 2 RPV fluences satisfy the guidance set forth in Regulatory Guide (RG) 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence." The NRC has approved these methodologies, which are described in detail in WCAP-14040-A, Revision 4, "Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves" (ADAMS Accession No. ML050120209).

Dominion Energy dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the neutron fluence analyses have been projected to the end of the subsequent period of extended operation and dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(ii).

4.2.1.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAA for neutron fluence projections 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 4.2.3.1.1.2 and the acceptance criteria in SRP-SLR Section 4.2.2.1.1.2. Specifically, the staff reviewed whether the applicant: (a) identified the neutron fluence for each beltline material at the end of the subsequent period of extended operation, (b) used the staff-approved methodology to calculate the neutron fluence, and (c) applied the methodology consistently with the guidance in RG 1.190.

The applicant performed the calculations for neutron fluence projections based on the NRC-approved methodology as described in WCAP-14040-A. The plant-specific calculation results were documented in WCAP-18015-NP. The staff's review results are summarized below.

In performing the fast neutron exposure evaluations for the Units 1 and 2 RVs, the applicant conducted a series of fuel-cycle-specific forward transport calculations by using the three-dimensional flux synthesis technique as described in WCAP-18015-NP. The staff determined that the WCAP-18015-NP's use of the discrete ordinate transport code, cross-section library, cross-section angular representation is in conformance with the NUREG/CR-6115, "PWR and BWR Pressure Vessel Fluence Calculation Benchmark Problems and Solutions," issued September 2001 (ADAMS Accession No. ML012900043), and RG 1.190, and is, therefore, acceptable.

For the Units 1 and 2 transport calculations, the [r, θ], [r, z] and [r] reactor models were constructed to include the necessary RV details as described in Section 2.2.2 of WCAP-18015-NP. The staff finds that the spatial mesh and angular quadrature and the pointwise inner iteration flux convergence criterion as used with these reactor models for WCAP-18015-NP are in conformance with RG 1.190 and are, therefore, acceptable.

Regarding the development of source distribution used in the transport calculation, the relevant information was outlined in Section 2.2.3 of WCAP-18015-NP. The staff finds that the preparation of the core neutron source for the transport calculation is in conformance with NUREG/CR-6115 and RG 1.190 and is, therefore, acceptable.

Therefore, the results from the neutron transport calculations provided data in terms of fuel cycle-averaged neutron flux, which when multiplied by the appropriate fuel cycle length, would generate the incremental fast neutron exposure for each fuel cycle to the end of the subsequent period of extended operation.

Based on the review of WCAP-18015, WCAP-14040-A, and associated references, the staff finds that the applicant provided an evaluation of the dosimetry sensor sets from the surveillance capsules withdrawn from both Units 1 and 2. The dosimetry analyses documented show that the ±20 percent (1σ) acceptance criterion specified in RG 1.190 is met.

Consistent with Sections 3.1 and 4.2 of NUREG-2192, the applicant identified the beltline materials and their locations: the materials surrounding the active fuel region of the core in addition to the nozzle shell to intermediate shell circumferential weld located close to the active fuel region and the lower extent of the nozzle shell forging, which is connected to the nozzle shell to intermediate shell circumferential weld. In addition, the applicant included the extended beltline materials: inlet and outlet nozzles (and their associated welds to the vessel shell) that are located above the active fuel region, since they are projected to experience neutron fluence in excess of 1.0×10^{17} n/cm^2 (E > 1.0 MeV) at the end of the subsequent period of extended operation.

As stated in SLRA Section 4.2.1, the inlet and outlet nozzles were treated as extended beltline material due to their locations outside the beltline region, and the neutron fluence at these nozzles was also projected for the subsequent period of extended operation. The staff finds from WCAP-18015 that the model used for the transport calculation as mentioned above has been expanded axially to encompass the inlet and outlet nozzles and calculate the neutron fluence at the extended beltline material. The uncertainty analysis was then performed to demonstrate that the ±20 percent (1σ) acceptance criterion specified in RG 1.190 is met. Although, as described in RG 1.190, it is the staff's regulatory position that RG 1.190 is a guide for the applicant to project neutron fluence for the beltline region and is not directly applicable to the extended beltline region, the applicant expanded its axial and radial model using appropriate modeling techniques and performed additional validation to ensure that the uncertainties would be consistent with RG 1.190. Hence, the staff finds the applicant's evaluation acceptable.

The applicant further stated that, while the fluence projections for the inlet and outlet nozzles may have greater uncertainty than other beltline materials, these fluence projections were acceptable for performing RV integrity assessments for the subsequent period of extended operation. The basis for this determination is consistent with LTR-SDA-19-099, "Evaluation of Conservatisms and Margins Associated with North Anna Units 1 and 2 Reactor Vessel Integrity Extended Beltline Evaluations for Subsequent License Renewal," which the staff reviewed during the audit (ADAMS Accession No. ML21036A060). The staff finds that this justification, as obtained from LTR-SDA-19-099 and also provided in SLRA Section 4.2.1, is acceptable.

Based on the radiation transport calculation results and the beltline and extended beltline materials information, the staff confirmed that the applicant had tabulated and transmitted the fast neutron (E > 1.0 MeV) fluence projections to 72 effective full power years (EFPYs), equivalent to 80 years of operation, for both beltline and extended beltline materials in SLRA Tables 4.2.1-1 and 4.2.1-2 for Units 1 and 2, respectively.

The staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses for the neutron fluences at RV locations have been projected to the end of the subsequent period of extended operation. In addition, it meets the acceptance criteria in

SRP-SLR Section 4.2.2.1.1.2 because the methods used to calculate the neutron fluence are consistent with the NRC-approved methodology (WCAP-14040-A) where the methodology adheres to the guidance of RG 1.190, as summarized above, and provided the neutron fluence projections for each beltline and extended beltline material at the end of the subsequent period of extended operation.

4.2.1.3 UFSAR Supplement

SLRA Section A3.2.1 provides the UFSAR supplement summarizing the TLAA for neutron fluence projections. The staff reviewed SLRA Section A3.2.1 consistent with the review procedures in SRP-SLR Section 4.2.3.2.

Based on the review of the UFSAR supplement, the staff finds it acceptable because it meets the acceptance criteria in SRP-SLR Section 4.2.2.2. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the TLAA for neutron fluence projections to the end of the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.2.1.4 Conclusion

On the basis of its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(ii), that the neutron fluence analyses for the RV have been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, 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 Dominion Energy's TLAA for upper-shelf energy (USE). Dominion Energy dispositioned the USE TLAA in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the subsequent period of extended operation. Dominion Energy amended one of the references for this SLRA section by letter dated February 4, 2021 (ADAMS Accession No. ML21035A303).

4.2.2.2 Staff Evaluation

The staff reviewed Dominion Energy's USE TLAA and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the acceptance criteria in SRP-SLR Section 4.2.2.1.2.2 and the review procedures in SRP-SLR Section 4.2.3.1.2.2.

The regulations in 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities, Appendix G, "Fracture Toughness Requirements," Paragraph IV.A.1.a require that RPV beltline materials must have initial USE values of at least 75 ft-lb. The regulations also require that RPV beltline materials maintain at least 50 ft-lb throughout the operating life of the RPV, unless it is demonstrated that lower USE values will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the American Society of Mechanical Engineers (ASME) Code.

SLRA Tables 4.2.2-1 and 4.2.2-2 provide the weight percent copper (wt. % Cu) and initial USE values for the RPV beltline and extended beltline materials of Units 1 and 2. Dominion Energy used the wt. % Cu and the 72 EFPY fluence values in SLRA Tables 4.2.1-1 and 4.2.1-2 attenuated to quarter-thickness (1/4T) of the RPV to project USE values at 72 EFPY consistent with the recommended methodology in RG 1.99, Revision 2, “Radiation Embrittlement of Reactor Vessel Materials” (ADAMS Accession No. ML003740284). The projected decrease in USE values, expressed in percentages, is shown in SLRA Tables 4.2.2-3 and 4.2.2-4. Details of the calculation of the projected decrease in USE values are in WCAP-18364-NP, Revision 1, “North Anna Units 1 and 2 Time-Limited Aging Analysis on Reactor Vessel Integrity for Subsequent License Renewal (SLR)” (ADAMS Accession No. ML20246G701). Dominion Energy then calculated 72 EFPY USE values by subtracting the projected decrease in USE values from the initial USE values. SLRA Tables 4.2.2-3 and 4.2.2-4 show the projected 72 EFPY USE values.

The staff observed that Dominion Energy obtained wt. % Cu values from reliable sources, such as CLB calculations and datasheets from the original RPV manufacturer (see the staff’s observations in the audit summary report, ADAMS Accession No. ML21036A060). The staff confirmed the wt. % Cu values with those reported for the original RPV beltline materials in the surveillance capsule reports for Capsule W of each unit (ADAMS Accession Nos. ML12242A091 and ML12298A446, respectively). The staff also verified the wt. % Cu values with previously approved values available in the docket. For example, the staff’s SE for the 32.3 EFPY and 34.3 EFPY pressure-temperature (P-T) limit curves of North Anna Power Station (NAPS) Units 1 and 2 (issued by letter dated May 2, 2001, ADAMS Accession No. ML011230549) shows wt. % Cu values from the basis document, WCAP-15112, Revision 1, “North Anna Units 1 and 2 WOG Reactor Vessel 60-Year Evaluation Minigroup Heatup and Cooldown Limit Curves for Normal Operation,” issued October 1998, which is the same basis document for the current (i.e., 60-year) NRC-approved pressure-temperature limit curves of Units 1 and 2. The staff verified that Dominion Energy’s projected decrease in USE values, expressed in percentages, is consistent with the methodology in RG 1.99, Revision 2, “Radiation Embrittlement of Reactor Vessel Materials,” issued May 1988. The staff confirmed that Dominion Energy properly accounted for surveillance capsule data when they became available. Based on the discussion above, the staff finds the % Cu values in SLRA Tables 4.2.2-1 and 4.2.2-2 acceptable.

In Pressurized-Water Reactor Owners Group (PWROG)-18005-NP, Revision 2, “Determination of Unirradiated RT_{NDT} and Upper-Shelf Energy Values of the North Anna Units 1 and 2 Reactor Vessel Materials” (ADAMS Accession No. ML20246G706), Dominion Energy determined initial (i.e., unirradiated) USE values of RPV beltline and extended beltline materials from Certified Material Test Reports and from the RPV surveillance program and compared them with the original initial USE values. The comparison of the original and updated initial USE values is summarized in Tables 5 and 6 of PWROG-18005-NP, Revision 2, for Units 1 and 2, respectively. Details of the determination of updated initial USE values are in Attachment 2 to PWROG-18005-NP, Revision 2, for Unit 1 and in Attachment 3 to PWROG-18005-NP, Revision 2, for Unit 2. Dominion Energy calculated the updated initial USE values based on the 1982 version of ASTM International E185 (ASTM E185-2) 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 for NAPS Units 1 and 2 by confirming that, for the RPV beltline and extended beltline materials, there were no test temperatures 150 °F above the Charpy upper-shelf onset temperature.

The staff verified that Dominion Energy calculated the updated initial USE values consistent with ASTM E185-82. The staff noted that in determining updated initial USE values, Dominion Energy also used information from these NRC-accepted documents: PWROG-17090-NP-A, Revision 0, "Generic Rotterdam Forging and Weld Initial Upper-Shelf Energy Determination" (ADAMS Accession No. ML20024E238), Branch Technical Position 5-3, Position 1.2 in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," and BAW-2224, "North Anna Units 1 and 2 Response to Closure Letter for NRC Generic Letter 92-01, Revision 1," July 1994 (ADAMS Accession Nos. ML20072T819 and ML20072T831). Based on the discussion above, the staff finds the updated initial USE values in SLRA Tables 4.2.2-1 and 4.2.2-2 acceptable.

Finally, the staff confirmed the 72 EFPY USE values in SLRA Tables 4.2.2-3 and 4.2.2-4 from the projected decrease in USE values and updated initial USE values.

Dominion Energy stated that the limiting 72 EFPY USE value of 50 ft-lbs for Unit 1 corresponds to Inlet Nozzle Forging 11. Dominion Energy explained the conservatisms in fluence values in determining this limiting 72 EFPY USE value of 50 ft-lbs, which is the value below which an equivalent margins analysis (EMA) would be needed to show acceptability through the subsequent period of extended operation. The staff noted that, even without these conservatisms and if its 72 EFPY USE value were to fall below 50 ft-lbs, Inlet Nozzle Forging 11 of Unit 1 would still be acceptable in accordance with the requirements in 10 CFR Part 50, Appendix G, Paragraph IV.A.1.a for USE because it would be addressed by the EMA performed for Units 1 and 2 as described in the next paragraph.

Dominion Energy stated that the Unit 2 Intermediate Shell Forging 04 is predicted to drop below a USE value of 50 ft-lb before 72 EFPY and addressed this drop in USE value through the EMA in report PWROG-19047-P/NP, Revision 0, "North Anna Units 1 and 2 Reactor Vessels Low Upper-Shelf Fracture Toughness Equivalent Margin Analysis" (ADAMS Accession No. ML20149K667). Dominion Energy stated that, in addition to the Unit 2 Intermediate Shell Forging 04, PWROG-19047-P/NP includes EMAs for the following materials at each unit: Upper Shell Forging, Intermediate Shell Forging, Inlet Nozzle Forgings, Outlet Nozzle Forgings, Inlet Nozzle Welds, and Outlet Nozzle Welds. Dominion Energy submitted PWROG-19047-P/NP, Revision 0, to the NRC for review and approval by letter dated May 27, 2020 (ADAMS Accession No. ML20149K668). Dominion Energy stated that the EMA in PWROG-19047-P/NP, Revision 0: (1) utilized the J-integral resistance (J-R) material Model 6B in BAW 2192, Revision 0, Supplement 2P-A/2NP-A, "Low Upper-Shelf Toughness Fracture Mechanics Analysis of Reactor Vessels of B&W [Babcock & Wilcox] Owners Reactor Vessel Working Group for Levels A & B Service Loads" (ADAMS Accession No. ML20234A361) for the Rotterdam welds (i.e., welds of RPVs fabricated by the Rotterdam Dockyard Company) and the J-R model in NUREG/CR-5729, "Multivariable Modeling of Pressure Vessel and Piping J-R Data," issued May 1991, for the nozzles and the forging material in the region of the nozzles, both of which are described in detail in the report, (2) is based on the projected RPV neutron fluence values at 80 years of operation at the RPV inlet and outlet nozzle regions, which are projected to exceed 1.0×10^{17} n/cm^2 (E > 1.0 MeV), (3) considered Level A/B and Level D loading conditions, and (4) is based on the ductile flaw extension and stability methodologies in Appendix K of ASME Code Section XI. The staff concluded in its final SE of PWROG-19047-P/NP, Revision 0 (ADAMS Accession No. ML21264A535) that PWROG-19047-P/NP, Revision 0, as modified by the final SE, may be referenced in the NAPS SLRA as a basis for demonstrating that the USE TLAA for the components in the scope of the report has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

Therefore, as discussed above, the staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(ii), that the USE analyses and EMAs have been projected to the end of the subsequent period of extended operation (i.e., to 72 EPFY). Additionally, the staff finds that the USE TLAA meets the acceptance criteria in NUREG-2192, Revision 0, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants," issued July 2017 (SRP-SLR), Section 4.2.2.1.2.2, because for each material: (a) the applicant has projected the USE analyses to the end of the subsequent period of extended operation and demonstrated that it meets the 50-ft-lb criterion, and (b) for RPV materials whose USE values for 72 EFPY have been projected to be less than 50 ft-lb, the applicant has performed an EMA projected to the end of the subsequent period of extended operation that meets the requirements of 10 CFR Part 50, Appendix G.

4.2.2.3 UFSAR Supplement

SLRA Section A3.2.2, "Upper-Shelf Energy," provides the UFSAR supplement summarizing the applicant's USE TLAA. The staff reviewed the UFSAR supplement consistent with the review procedures in SRP-SLR Section 4.2.3.2.

Based on its review of the UFSAR supplement, the staff finds it meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is therefore acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the USE TLAA, as required by 10 CFR 54.21(d).

4.2.2.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(ii), that the USE TLAA for the ferritic RPV beltline and extended beltline materials have been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, 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, "Pressurized Thermal Shock," describes Dominion Energy's evaluation of pressurized thermal shock (PTS) of the NAPS, Units 1 and 2, RPV beltline and extended beltline components that accounts for neutron embrittlement through the end of the subsequent period of extended operation. Section 50.61 of 10 CFR, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events," defines the reference temperature to protect against PTS events, reference temperature for pressurized thermal shock (RT_{PTS}). SLRA Tables 4.2.3-1 and 4.2.3-2 show the applicant's 72 EFPY RT_{PTS} calculations for the RPV beltline materials. RT_{PTS} calculations for extended beltline materials are documented in WCAP-18364-NP (ADAMS Accession No. ML20246G701). Dominion Energy applied the methodologies of 10 CFR 50.61 and RG 1.99, Revision 2, to determine RT_{PTS}.

Dominion Energy dispositioned the PTS TLAA in accordance with 10 CFR 54.21(c)(1)(ii), by demonstrating that the TLAA has been projected to the end of the subsequent period of extended operation (72 EFPY).

4.2.3.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAA on PTS and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the acceptance criteria in SRP-SLR Section 4.2.2.1.4.2 and the review procedures in SRP-SLR Section 4.2.3.1.4.2.

The staff's review focused on confirming Dominion Energy's 72 EFPY adjusted reference temperature (ART) calculations at the clad/base metal interface location presented in SLRA Tables 4.2.3-1 and 4.2.3-2. As described in SER Section 4.2.4.2, the staff found acceptable all of the input values required for calculation of RT_{PTS} for each material (e.g., Cu and Ni contents, $RT_{NDT(U)}$, σ_Δ, and σ_U), along with the calculation of the chemistry factor (CF) for those materials with surveillance data as required by 10 CFR 50.61. The staff noted that, if the clad/base metal interface fluence values are less than 1×10^{17} n/cm^2 (E > 1 MeV), Dominion Energy set the ΔRT_{PTS} and the corresponding term to account for uncertainties due to ΔRT_{PTS}, σ_Δ, to zero, consistent with the fluence threshold established in Appendix H, "Reactor Vessel Material Surveillance Program Requirements," to 10 CFR Part 50 for monitoring changes in the fracture toughness properties of ferritic materials.

The staff's independent confirmatory calculations of RT_{PTS}, which used the clad/base metal interface fluence values from SLRA Tables 4.2.1-1 and 4.2.1-2, confirmed the RT_{PTS} values cited by the applicant in Tables 4.2.3-1 and 4.2.3-2. Therefore, the staff confirmed that the applicant correctly applied the methodology of 10 CFR 50.61 for calculating RT_{PTS}. Further, the staff confirmed that the RT_{PTS} values for all of the RPV materials remain below the 10 CFR 50.61 screening criteria.

Based on the results of this review, the staff finds that Dominion Energy has demonstrated pursuant to 10 CFR 54.21(c)(1)(ii) that the analyses for the reactor pressure vessel materials have been projected to the end of the subsequent period of extended operation.

4.2.3.3 UFSAR Supplement

SLRA Section A.3.2.3 provides the UFSAR supplement summarizing the PTS TLAA. The staff reviewed SLRA Section A.3.2.3 consistent with the review procedures in SRP-SLR Section 4.2.3.2.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the PTS TLAA, as required by 10 CFR 54.21(d).

4.2.3.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses for the PTS associated with the RPV materials have been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, 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, "Adjusted Reference Temperature," describes Dominion Energy's evaluation of the ART of the NAPS, Units 1 and 2, RPV beltline and extended beltline components that accounts for neutron embrittlement through the end of the subsequent period of extended operation. ART is the sum of the initial nil-ductility reference temperature ($RT_{NDT(U)}$), the adjustment in RT_{NDT} (ΔRT_{NDT}) that is caused by increasing neutron irradiation exposure to the components, and an additional margin term included in the calculation to account for uncertainties in the $RT_{NDT(U)}$ and ΔRT_{NDT} values. SLRA Tables 4.2.4-5 through 4.2.4-8 provide the applicant's 72 EFPY ART calculations for the RPV beltline and extended beltline components. Dominion Energy applied the methodology in RG 1.99, Revision 2, to determine ART.

Dominion Energy dispositioned the ART TLAA in accordance with 10 CFR 54.21(c)(1)(ii), by demonstrating that the TLAA has been projected to the end of the subsequent period of extended operation (72 EFPY).

4.2.4.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAA on ART and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the acceptance criteria in SRP-SLR Section 4.2.2.1.4.2 and the review procedures in SRP-SLR Section 4.2.3.1.4.2.

The staff's review focused on confirming Dominion Energy's 72 EFPY ART calculations at the quarter-thickness (1/4T) location presented in SLRA Tables 4.2.4-5 through 4.2.4-8. The staff confirmed that Dominion Energy applied the methodology of RG 1.99, Revision 2, in determining the 72 EFPY ART values at the 1/4T location for the vessel beltline materials. The staff noted that SLRA Tables 4.2.4-5 through 4.2.4-8 do not show the ART values at the three-quarters thickness (3/4T) location and that these ART values are determined by changing the input for radial distance from the inside surface to 3/4T in the fluence attenuation formula in RG 1.99, Revision 2. For the extended beltline materials, Dominion Energy calculated ART at the surface location. Dominion Energy reported the ART values for the 3/4T location in WCAP-18364 (ADAMS Accession No. ML20246G701).

The applicant stated in Section 4 of PWROG-18005 (ADAMS Accession No. ML20246G706) that Cu and Ni content of vessel materials were reassessed only for those materials not addressed by the current 10 CFR Part 50, Appendix G licensing basis. The materials reassessed included the NAPS Unit 1 and Unit 2 reactor vessel closure head flanges, inlet and outlet nozzles, nozzle to shell welds, bottom head ring and bottom head dome welds, bottom head ring segments, and bottom head domes. The applicant summarized the Cu and Ni content of the vessel materials, including those reassessed and those forming the current licensing basis, in Tables 9 and 10 of PWROG-18005. The applicant justified the updated chemistry values not covered by the current licensing basis through several methods, including use of Certified Material Test Reports. The licensee stated that, when specific component data was lacking, the licensee used a generic value defined as the mean plus one standard deviation of similar materials. Regulatory Guide 1.99, Revision 2, states that generic values may be used when component data are not available, if justification is provided. For those cases where generic values were used, the applicant provided the source of the reference data in the footnotes to Tables 9 and 10. The staff finds that the applicant used acceptable methods to reassess Cu and Ni content for those materials not addressed in the current licensing basis. For those materials addressed by the current licensing basis, the staff finds that they remain valid for the subsequent period of extended operation.

The staff reviewed the applicant's determination of $RT_{NDT(U)}$, which is documented in PWROG-18005 (ADAMS Accession No. ML20246G706). The applicant updated its evaluation of $RT_{NDT(U)}$, since the last determination was made when Units 1 and 2 began operating (1978 and 1980, respectively). The applicant used two methods for determining $RT_{NDT(U)}$. When appropriate data were available, the applicant used American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code Section III, NB-2331. If data were not available, the applicant invoked the methodology of Branch Technical Position 5-3, "Fracture Toughness Requirements." The staff notes that the applicant reported Master Curve testing for unirradiated RT_{NDT} of Lower Shell Forging 03. Use of the Master Curve method requires NRC review and approval. However, the applicant did not make use of this methodology in licensing-basis calculations, such as the determination of ART. Therefore, the staff will not address this topic until such time that Dominion Energy requests to make use of Master Curve results in licensing-basis calculations. Overall, the applicant demonstrated in PWROG-18005 that it implemented acceptable methods for determining $RT_{NDT(U)}$.

In determining ART for the various RPV materials, the applicant calculated ART in accordance with both Regulatory Positions 1.1 (surveillance data available) and 2.1 (surveillance data not available) in RG 1.99, Revision 2. The staff reviewed the applicant's basis for choosing which position to adopt in the licensing basis, as documented in WCAP-18364-NP, Appendix C (ADAMS Accession No. ML20246G706). The applicant's position is described in WCAP-18364-NP, Appendix C, thusly:

- The greater of the RG 1.99, Revision 2, Position 1.1 chemistry factor (CF) and 2.1 CF is used with a full margin term for evaluation of the reactor vessel beltline material when one or more of the surveillance data fall outside of the Position 2.1 CF trend line by more than one times σ_Δ (data is non-credible), and one or more of the surveillance data fall more than two times σ_Δ above the Position 1.1 CF trend line.

- The lesser of the Regulatory Guide 1.99, Revision 2 Position 1.1 and 2.1 CFs is used with a full margin term for evaluation of the reactor vessel beltline material when one or more of the surveillance data fall outside of the Position 2.1 CF trend line by more than one times σ_Δ, and none of the surveillance data fall more than two times σ_Δ above the Position 1.1 CF trend line.

The NRC has approved this approach in the applicant's CLB, including the 60-year pressure-temperature limits for heatup and cooldown. The staff considers the CLB to be adequate for the purposes of license renewal. Therefore, the staff finds that this approach is acceptable for determining whether to adopt Regulatory Position 1.1 or 2.1 in determining CF and, hence, ART.

The staff performed confirmatory calculations of the licensee's ART values, utilizing the $RT_{NDT(U)}$ and ΔRT_{NDT} values, the margins due to uncertainties in both $RT_{NDT(U)}$ and ΔRT_{NDT}, the effects of attenuation of the 72 EFPY fluence values in SLRA Tables 4.2.1-1 and 4.2.1-2 to the 1/4T location, and the CF values described above. The staff noted that, if attenuated fluence values are less than 1×10^{17} n/cm^2 (E > 1 MeV), Dominion Energy set the ΔRT_{NDT} and the corresponding term to account for uncertainties due to ΔRT_{NDT}, σ_Δ, to zero, consistent with the fluence threshold established in Appendix H to 10 CFR Part 50 for monitoring changes in the fracture toughness properties of ferritic materials. The staff's independent confirmatory calculations of ART confirmed the values cited by the applicant in Tables 4.2.4-1 through 4.2.4-8. Therefore, the staff confirmed that the applicant correctly applied the RG 1.99, Revision 2, methodology for calculating ART.

Based on this review, the staff finds that Dominion Energy has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses for ART of the reactor pressure vessel materials have been projected to the end of the subsequent period of extended operation.

4.2.4.3 UFSAR Supplement

SLRA Section A.3.2.4 provides the UFSAR supplement summarizing the ART TLAA. The staff reviewed SLRA Section A.3.2.4 consistent with the review procedures in SRP-SLR Section 4.2.3.2.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the ART TLAA, as required by 10 CFR 54.21(d).

4.2.4.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses for the ART associated with the RPV materials have been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, 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, "Pressure-Temperature Limits," summarizes Dominion Energy's evaluation of the TLAA related to P-T limit calculations for the RPV components at NAPS, Units 1 and 2. Dominion Energy dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of neutron embrittlement on the intended functions of the RPV materials will be adequately managed during the subsequent period of extended operation.

Dominion Energy stated that the P-T limits for the subsequent period of extended operation (72 EFPY) need not be submitted as a part of the SLRA because the P-T limits are required to be updated through the licensing process in 10 CFR 50.90, "Application for Amendment of

License, Construction Permit, or Early Site Permit," when necessary for P-T limits that are located in the NAPS technical specifications (TS). Dominion Energy also stated that the CLB will ensure that the P-T limits for the subsequent period of extended operation will be updated before exceeding the 50.3 EFPY for Unit 1 and 52.3 EFPY for Unit 2 for which they are valid. Furthermore, Dominion Energy stated that the Reactor Vessel Material Surveillance Aging Management Program (AMP) in SLRA Section B2.1.19, and NAPS's TS will ensure that the updated P-T limits will be based on the updated ARTs.

4.2.5.2 Staff Evaluation

The staff reviewed Dominion Energy's P-T limits TLAA and the corresponding disposition in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the acceptance criteria in SRP-SLR Section 4.2.2.1.4.3 and the review procedures in SRP-SLR Section 4.2.3.1.4.3.

The staff noted that the Dominion Energy's basis for dispositioning the TLAA in accordance with 10 CFR 54.21(c)(1)(iii) is consistent with the basis in SRP-SLR Section 4.2.2.1.4.3. This section of the SRP-SLR specifies that an applicant's 10 CFR 50.90 license amendment process is adequate for dispositioning P-T limits TLAA in accordance with 10 CFR 54.21(c)(1)(iii) and applies to licensing bases that have P-T limit curves in the limiting conditions of operation (LCOs) of the plant-specific TS. Since Dominion Energy will update the P-T limits through the 10 CFR 50.90 process for the subsequent period of extended operation before exceeding the 50.3 EFPY for Unit 1 and 52.3 EFPY for Unit 2 for which the CLB P-T limits remain valid, the staff finds that Dominion Energy's disposition of the P-T limits TLAA in accordance with 10 CFR 54.21(c)(1)(iii) is consistent with the acceptance criteria in SRP-SLR Section 4.2.2.1.4.3, and is, therefore, acceptable.

Therefore, in accordance with 10 CFR 54.21(c)(1)(iii), the staff finds Dominion Energy will adequately manage the P-T limits through the subsequent period of extended operation.

4.2.5.3 UFSAR Supplement

SLRA Section A3.2.5, "Pressure-Temperature Limits," provides the UFSAR supplement summarizing the P-T limits TLAA. The staff reviewed SLRA Section A3.2.5 consistent with the review procedures in SRP-SLR Section 4.2.3.2.

Based on its review of the UFSAR supplement, the staff finds it meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the P-T limits TLAA as required by 10 CFR 54.21(d).

4.2.5.4 Conclusion

On the basis of its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(iii), that the P-T limits will be adequately managed during the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, 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, “Low Temperature Overpressure Protection,” summarizes Dominion Energy’s evaluation of the TLAA that assesses the low-temperature overpressure protection (LTOP) arming temperature and power-operated relief valves (PORVs) pressure setpoint applicable to NAPS for the subsequent period of extended operation. Dominion Energy determined the LTOP PORV pressure setpoints for 72 EFPY using the methodology in WCAP-14040 A, Revision 4, and stated that the corresponding values currently in the TS bound and establish the LTOP system values through 72 EFPY. Dominion Energy dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that it projected the LTOP arming temperature and PORV pressure setpoint to the end of the subsequent period of extended operation.

4.2.6.2 Staff Evaluation

The staff reviewed Dominion Energy’s TLAA on LTOP and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the acceptance criteria in SRP-SLR Sections 4.2.2.1.4.2, and the review procedures in SRP-SLR Section 4.2.3.1.4.2.

The LTOP system is required at NAPS by TS LCO 3.4.12.

The staff confirmed that the applicant projected the LTOP system enable temperatures and PORV pressure lift setpoints to 72 EFPY using the staff-approved methodology in Revision 4 of WCAP-14040-NP-A (ADAMS Accession No. ML050120209). The staff further confirmed that the maximum allowable LTOP system PORV setpoint was calculated to be less than or equal to 400 psig when any reactor coolant system (RCS) cold leg temperature is less than or equal to 180 °F, and less than or equal to 558 psig when any RCS cold leg temperature is less than or equal to 280 °F for Units 1 and 2 through 72 EFPY. These calculated values are lower than the corresponding current TS values, which are 375 psig when any RCS cold leg temperature is less than or equal to 180 °F, and 540 psig when any RCS cold leg temperature is less than or equal to 280 °F. These calculations demonstrate adequate margin to the maximum allowable settings calculated for 72 EFPY throughout the range of LTOP applicability. Thus, the staff confirmed that the applicant has projected the LTOP setpoints to the end of the subsequent period of extended operation to demonstrate continued validity of the LTOP system pressure lift setpoints established for the LTOP system in TS Section 3.4.12.

Therefore, based on its review, the staff finds Dominion Energy has projected, in accordance with 10 CFR 54.21(c)(1)(ii), the temperature enable and PORV pressure setpoints for the LTOP system to the end of the subsequent period of extended operation. Additionally, the analyses of the TLAA on LTOP meet the acceptance criteria in SRP-SLR Section 4.2.2.1.4.2 because: (a) the applicant has projected the LTOP system arming setpoints and pressure lift setpoints for NAPS to the end of the subsequent period of extended operation, and (b) the applicant has demonstrated that the existing TS Section 3.4.12 requirements for these setpoints remain valid for the subsequent period of extended operation.

4.2.6.3 UFSAR Supplement

SLRA Section A3.2.6, “Low Temperature Overpressure Protection,” provides the UFSAR supplement summarizing the LTOP TLAA. The staff reviewed SLRA Section A3.2.6 consistent with the review procedures in SRP-SLR Section 4.2.3.2.

Based on its review of the UFSAR supplement, the staff finds it meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the LTOP TLAA, as required by 10 CFR 54.21(d).

4.2.6.4 Conclusion

On the basis of its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(ii), that the LTOP system setpoints have been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3 Metal Fatigue

SLRA Section 4.3 states that fatigue analyses are required on components that are designed to ASME Code Section III, Class 1. Other codes require a fatigue analysis or assume a stated number of full range thermal and displacement transient cycles, such as ASME Code Section III, Class 2 and 3; USA Standard (USAS) B31.7 (currently known as American National Standards Institute or ANSI), “Nuclear Power Piping” Class 1; USAS (ANSI) B31.1, “Power Piping”; as allowed per USAS (ANSI) B31.7, Class 2 and 3; and ASME Code Section VIII, “Rules for Construction of Pressure Vessels,” Division 2.

The following are those that were identified as fatigue TLAAs or support a fatigue TLAA:

- “Transient Cycle Projections for 80 Years” (SLRA Section 4.3.1)
- “ASME Code Section III, Class 1 Fatigue Analyses” (SLRA Section 4.3.2)
- “USAS (ANSI) B31.1 Allowable Stress Analyses” (SLRA Section 4.3.3)
- “Environmentally-Assisted Fatigue” (SLRA Section 4.3.4)
- “Reactor Vessel Internals Fatigue Analyses” (SLRA Section 4.3.5)
- “High-Energy Line Break Analyses” (SLRA Section 4.3.6)

4.3.1 Transient Cycle Projections for 80 Years

4.3.1.1 Summary of Technical Information in the Application

In SLRA Section 4.3.1, Dominion Energy explained that fatigue analyses for Units 1 and 2 are based upon numbers and amplitudes of thermal and pressure transients, as provided in UFSAR Table 5.2-4 and UFSAR Section 18.4.2. The intent of the design basis transient definitions is to bound a wide range of possible events with varying ranges of severity in temperature and pressure. CLB fatigue analyses are based upon the original number of design cycles (40 years) and are postulated to bound 60 years of service life.

SLRA Section 4.3.1 describes Dominion Energy’s assessment and review of Fatigue Monitoring Program data to identify the number of cumulative cycles for each transient type that occurred at Units 1 and 2 up to November 8, 2017. These baseline cycle counts were projected to an 80-year operating life based on the actual accumulation history over the last 10 years (November 8, 2007–November 8, 2017) and presented in SLRA Table 4.3.1-1, “80-year Transient Cycle Projections.” Dominion Energy confirmed that these projections do not represent a revision of the design basis. As shown in SLRA Table 4.3.1-1, the projected cycles for 80 years of plant operation are less than the 40-year design cycles, or CLB cycles, used in the fatigue analyses.

4.3.1.2 Staff Evaluation

The staff reviewed the applicant's cycle projection methodologies against the acceptance criteria and review procedures defined in SRP-SLR Section 4.3. The staff noted that the applicant's methodologies for assessing and projecting design transient cycles to the end of the subsequent period of extended operation is not a TLAA because it does not involve an assessment of an applicable aging effect and does not meet Criterion 2 for defining TLAAs in 10 CFR 54.3(a). However, the staff noted that the methodology for projecting design transient cycles to the end of the subsequent period of extended operation supports the applicant's disposition of certain metal fatigue TLAAs.

During its audit, as documented in its audit report (ADAMS Accession No. ML21036A060), the staff reviewed the supporting calculations that support Dominion Energy's methodology for determining the 80-year projected cycles as shown in SLRA Table 4.3.1-1. The staff confirmed the following:

- A review of plant information/data (e.g., cycle count procedure/logs, operator interviews, licensee event reports, power history data) identified the number of cumulative cycles for each transient type that occurred at Units 1 and 2 up to November 8, 2017.
- Baseline cycle counts were, in general, projected to an 80-year operating life based on the actual accumulation history over the last 10 years (November 8, 2007–November 8, 2017), when appropriate.
- Certain transients (i.e., transients not applicable or fatigue insignificant as identified in SLRA Table 4.3.1-1) were assessed and conservative assumptions were made for 80-year projections.
- Fatigue analyses were not performed using 80-year cycle projections. Rather, cycle projections were only used to aid and inform the applicant's aging management approaches.

The staff finds it appropriate that Dominion Energy reviewed its plant-specific data and records (i.e., cycle count procedure/logs, operator interview, licensee event reports, power history data) to determine the baseline number of cycle counts. In addition, the staff finds it is reasonable that Dominion Energy used recent operating experience for transient occurrences to support its 80-year cycle projections because NAPS, Units 1 and 2, has experienced a declining trend of transient occurrences since the start of initial plant operation. Additionally, Dominion Energy confirmed, in its SLRA and during the staff's audit, that the 80-year cycle projections were not used to update any fatigue analyses and do not represent a revision to the design basis of Units 1 and 2. Thus, the staff noted that 80-year cycle projections were only used by Dominion Energy as an aid to inform its aging management approaches.

Based on its audit and review, the staff finds Dominion Energy's 80-year cycle projections and projection methodology to be reasonable because baseline cycle counts were reconciled by reviewing plant-specific sources, 80-year projections relied on recent operating experience to best reflect current plant operation, and there is margin between the 80-year projections and the CLB design limit.

The staff noted that the transients in UFSAR Table 5.2-4 are consistent with those identified in SLRA Table 4.3.1-1, and that TS Section 5.5 requires a program that "provides controls to track the UFSAR, Section 5.2, cyclic and transient occurrences to ensure that components are maintained within the design limits." Thus, as a measure of defense in depth, the staff finds that the TS requirements ensure that transient cycle counts do not exceed the CLB design limit.

Dominion Energy used these 80-year projected cycles and projection methodology, and/or the Fatigue Monitoring Program to support the disposition of its metal fatigue TLAAs in accordance with 10 CFR Part 54.21(c)(1)(i), (ii), or (iii), respectively. The staff's evaluation of these metal fatigue TLAAs is provided in the remaining subsections of SER Section 4.3. The staff's evaluation of the Fatigue Monitoring Program is documented in SER Section 3.0.3.2.24, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects.

4.3.1.3 UFSAR Supplement

SLRA Section A3.3.1 provides the UFSAR supplement summarizing Dominion Energy's 80-year cycle projection methodology even though the applicant does not identify the 80-year cycle projection assessment as a TLAA for the facility. Since the applicant provided a UFSAR supplement section for information in SLRA Section 4.3.1, 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 UFSAR supplement, the staff finds it meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the design transient cycle projections.

4.3.1.4 Conclusion

On the basis of its review, the staff concludes that Dominion Energy has provided an acceptable basis for projecting the number of cycles for evaluated transients to the end of the subsequent period of extended operation. The staff also concludes that the applicant has provided an adequate UFSAR supplement summary description of its design transient cycle projection basis, as described in SLRA Section A3.3.1.

4.3.2 ASME Code Section III, Class 1 Fatigue Analyses

SLRA Section 4.3.2 states that fatigue analyses are performed in accordance with ASME Code Section III. Each analysis must demonstrate that the cumulative usage factor (CUF) for the component will not exceed the ASME Code Section III design limit of 1.0 when the component is exposed to all postulated transients.

4.3.2.1 Control Rod Drive Mechanism

4.3.2.1.1 Summary of Technical Information in the Application

SLRA Section 4.3.2.1 describes Dominion Energy's TLAA for control rod drive mechanisms (CRDMs). Dominion Energy explained the original reactor vessel closure heads (RVCHs) have been replaced for each unit. The existing CRDMs were reused on the replacement RVCHs and the fatigue evaluations of the pressure-retaining portions of the CRDMs were performed to the requirements of ASME Code Section III. The SLRA states that the 40-year design cycles

(CLB cycles) are postulated to bound 80 years of plant operations. The CUF values will remain less than unity for the fatigue analyses of record during the subsequent period of extended operation. Therefore, the fatigue analyses for the CRDM components remain valid for the subsequent period of extended operation.

To ensure the design cycles remain bounding in the fatigue analyses for the CRDM components, the SLRA states that the Fatigue Monitoring Program will track cycles for significant fatigue transients listed in SLRA Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

Dominion Energy dispositioned the TLAA for the CRDM components in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of metal fatigue on the intended functions will be adequately managed by the Fatigue Monitoring Program for the subsequent period of extended operation.

4.3.2.1.2 Staff Evaluation

The staff reviewed Dominion Energy’s TLAAs for the CRDM components provided in SLRA Section 4.3.2.1, 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 and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3.

The SLRA states that fatigue for the CRDM components will be managed by the Fatigue Monitoring Program, which is described in SLRA Section B3.1. The staff’s evaluation of the Fatigue Monitoring Program is documented in SER Section 3.0.3.2.24, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects of fatigue. Based on the applicant’s implementation of the Fatigue Monitoring Program, the staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the control rod drive mechanism components will be adequately managed for the subsequent period of extended operation.

Additionally, the TLAAs meet the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3 because: (1) Dominion Energy’s use of the Fatigue Monitoring Program is consistent with the SRP-SLR, (2) this program continually monitors the occurrence of transient cycles and ensures the validity of this TLAA, and (3) this program will trigger corrective actions before analyses become invalid during the subsequent period of extended operation.

4.3.2.1.3 UFSAR Supplement

SLRA Section A3.3.2, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), provides the UFSAR supplement summarizing the fatigue TLAA for the CRDM components. 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, the staff finds that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is therefore acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the fatigue TLAA for the CRDM components, as required by 10 CFR 54.21(d).

4.3.2.1.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the CRDM components will be adequately managed by the Fatigue Monitoring Program for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.2 Pressurizer (including Nozzle Full Structural Weld Overlays [FSWOLs])

4.3.2.2.1 Summary of Technical Information in the Application

SLRA Section 4.3.2.2 describes Dominion Energy's TLAA for pressurizer (including nozzle full structural weld overlays (FSWOLs)). Dominion Energy explained that it performed fatigue evaluations of the pressurizer to the requirements of ASME Code Section III, which consider transient cycles that occur over the life of the plant. The SLRA stated that, to prevent loss of pressure boundary function as a result of primary water stress-corrosion cracking (PWSCC) and to ensure structural integrity of the pressurizer nozzle to pipe connections, Framatome performed preemptive FSWOLs on the pressurizer surge line, spray line, and safety and relief lines nozzles at Units 1 and 2 in 2007. The SLRA states that the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operation. The CUF values will remain less than unity for the fatigue analyses of record during the subsequent period of extended operation. Therefore, the fatigue analyses for the pressurizer components remain valid for the subsequent period of extended operation.

To ensure the design cycles remain bounding in the fatigue analyses for the pressurizer components (including nozzle FSWOLs), the SLRA states that the Fatigue Monitoring Program will track cycles for significant fatigue transients listed in SLRA Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

Dominion Energy dispositioned the TLAA for the pressurizer components (including nozzle FSWOLs) in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of metal fatigue on the intended functions will be adequately managed by the Fatigue Monitoring Program for the subsequent period of extended operation.

4.3.2.2.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAAs for the pressurizer components (including nozzle FSWOLs) provided in SLRA Section 4.3.2.2, 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 and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3.

The SLRA states that fatigue for the pressurizer components (including nozzle FSWOLs) will be managed by the Fatigue Monitoring Program, which is described in SLRA Section B3.1. The staff's evaluation of the Fatigue Monitoring Program is documented in SER Section 3.0.3.2.24, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects of fatigue. Based on the applicant's implementation of the Fatigue Monitoring Program, the staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the pressurizer components (including nozzle FSWOLs) will be adequately managed for the subsequent period of extended operation.

Additionally, the TLAAs meet the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3 because: (1) Dominion Energy's use of the Fatigue Monitoring Program is consistent with the SRP-SLR, (2) this program continually monitors the occurrence of transient cycles and ensures the validity of this TLAA, and (3) this program will trigger corrective actions before analyses become invalid during the subsequent period of extended operation.

4.3.2.2.3 UFSAR Supplement

SLRA Section A3.3.2 provides the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), to correct inadvertent discrepancies in dispositions between SLRA Section 4.3 and Appendix A, summarizing the fatigue TLAA for the pressurizer components (including nozzle FSWOLs). 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, the staff finds that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the fatigue TLAA for the pressurizer components (including nozzle FSWOLs), as required by 10 CFR 54.21(d).

4.3.2.2.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the pressurizer components (including nozzle FSWOLs) will be adequately managed by the Fatigue Monitoring Program for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.3 Reactor Coolant Pump

4.3.2.3.1 Summary of Technical Information in the Application

SLRA Section 4.3.2.2 describes Dominion Energy's TLAA for the reactor coolant pumps (RCPs). Dominion Energy explained that the RCPs are Westinghouse design, Model 93A, but were not designed to ASME Code Section III. However, fatigue evaluations of the reactor coolant pumps were performed to various editions of the ASME Code Section III and these analyses consider transient cycles that occur over the life of the plant. The SLRA states that the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operations. The CUF values will remain less than unity for the fatigue analyses of record during the subsequent period of extended operation. Therefore, the fatigue analyses for the RCP components remain valid for the subsequent period of extended operation.

To ensure the design cycles remain bounding in the fatigue analyses for the reactor coolant pumps, the SLRA states that the Fatigue Monitoring Program will track cycles for significant fatigue transients listed in SLRA Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

Dominion Energy dispositioned the TLAA for the RCP components in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of metal fatigue on the intended functions will be adequately managed by the Fatigue Monitoring Program for the subsequent period of extended operation.

4.3.2.3.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAAs for the RCP components provided in SLRA Section 4.3.2.3, 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 and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3.

The SLRA states that fatigue for the RCP components will be managed by the Fatigue Monitoring Program, which is described in SLRA Section B3.1. The staff's evaluation of the Fatigue Monitoring Program is documented in SER Section 3.0.3.2.24, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects of fatigue. Based on the applicant's implementation of the Fatigue Monitoring Program, the staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the RCP components will be adequately managed for the subsequent period of extended operation.

Additionally, the TLAAs meet the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3 because: (1) Dominion Energy's use of the Fatigue Monitoring Program is consistent with the SRP-SLR, (2) this program continually monitors the occurrence of transient cycles and ensures the validity of this TLAA, and (3) this program will trigger corrective actions before analyses become invalid during the subsequent period of extended operation.

4.3.2.3.3 UFSAR Supplement

SLRA Section A3.3.2, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), provides the UFSAR supplement summarizing the fatigue TLAA for the RCP components. 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, the staff finds that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the fatigue TLAA for the RCP components, as required by 10 CFR 54.21(d).

4.3.2.3.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the RCP components will be adequately managed by the Fatigue Monitoring Program for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), to correct the inadvertent discrepancies in dispositions between SLRA

Section 4.3 and Appendix A, contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.4 Reactor Vessel

4.3.2.4.1 Summary of Technical Information in the Application

SLRA Section 4.3.2.4 describes Dominion Energy's TLAA for the RV components. Dominion Energy explained that the fatigue evaluations for the RV components were performed to the requirements of ASME Code Section III, which consider transient cycles that occur over the life of the plant. The SLRA states that the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operations. The CUF values will remain less than unity for the fatigue analyses of record during the subsequent period of extended operation. Therefore, the fatigue analyses for the RV components remain valid for the subsequent period of extended operation.

To ensure the design cycles remain bounding in the fatigue analyses for the RV components, the SLRA states that the Fatigue Monitoring Program will track cycles for significant fatigue transients listed in SLRA Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

Dominion Energy dispositioned the TLAA for the RV components in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of metal fatigue on the intended functions will be adequately managed by the Fatigue Monitoring Program for the subsequent period of extended operation.

4.3.2.4.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAAs for the RV components provided in SLRA Section 4.3.2.4, 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 and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3.

The SLRA states that fatigue for the RV components will be managed by the Fatigue Monitoring Program, which is described in SLRA Section B3.1. The staff's evaluation of the Fatigue Monitoring Program is documented in SER Section 3.0.3.2.24, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects of fatigue. Based on the applicant's implementation of the Fatigue Monitoring Program, the staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the RV components will be adequately managed for the subsequent period of extended operation.

Additionally, the TLAAs meet the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3 because: (1) Dominion Energy's use of the Fatigue Monitoring Program is consistent with the SRP-SLR, (2) this program continually monitors the occurrence of transient cycles and ensures the validity of this TLAA, and (3) this program will trigger corrective actions before analyses become invalid during the subsequent period of extended operation.

4.3.2.4.3 UFSAR Supplement

SLRA Section A3.3.2, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), to correct the inadvertent discrepancies in dispositions between SLRA

Section 4.3 and Appendix A, provides the UFSAR supplement summarizing the fatigue TLAA for the RV components. 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, the staff finds that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the fatigue TLAA for the RV components, as required by 10 CFR 54.21(d).

4.3.2.4.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the RV components will be adequately managed by the Fatigue Monitoring Program for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.5 Steam Generators (including the Unit 1 Inlet Nozzle Structural Weld Overlay)

4.3.2.5.1 Summary of Technical Information in the Application

SLRA Section 4.3.2.5 describes Dominion Energy's TLAA for the SGs (including the Unit 1 inlet nozzle structural weld overlay (SWOL)). Dominion Energy explained that Units 1 and 2 SGs are a combination of replacement SG components and original SG components. Specifically, the resulting SGs consist of a lower shell and tube bundle of a Westinghouse Model F54 SG, and the modified feedwater and steam separation equipment of the original SG. Furthermore, Dominion Energy explained that all SG components, both original and replacement, were evaluated to the same loading conditions and were evaluated to the requirements of ASME Code Section III, which considers transient cycles that occur over the life of the plant. Dominion Energy stated that SWOLs were installed on the Unit 1 SG inlet nozzles in 2012 for mitigation of PWSCC and the fatigue evaluations were performed for the Unit 1 SG inlet nozzle SWOLs using the original design basis transients and qualified for the original design of 40 years of cyclic operation. The SLRA states that the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operations. The CUF values will remain less than unity for the fatigue analyses of record during the subsequent period of extended operation. Therefore, the fatigue analyses for the SG components remain valid for the subsequent period of extended operation.

To ensure the design cycles remain bounding in the fatigue analyses for the SG components (including the Unit 1 inlet nozzle SWOL), the SLRA states that the Fatigue Monitoring Program will track cycles for significant fatigue transients listed in SLRA Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

Dominion Energy dispositioned the TLAA for the SG components (including the Unit 1 inlet nozzle SWOL) in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of metal fatigue on the intended functions will be adequately managed by the Fatigue Monitoring Program for the subsequent period of extended operation.

4.3.2.5.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAAs for the SG components (including the Unit 1 inlet nozzle SWOL) provided in SLRA Section 4.3.2.5, 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 and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3.

The SLRA states that fatigue for the SG components (including the Unit 1 inlet nozzle SWOL) components will be managed by the Fatigue Monitoring Program, which is described in SLRA Section B3.1. The staff's evaluation of the Fatigue Monitoring Program is documented in SER Section 3.0.3.2.24, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects of fatigue. Based on the applicant's implementation of the Fatigue Monitoring Program, the staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the SG components (including the Unit 1 inlet nozzle SWOL) will be adequately managed for the subsequent period of extended operation.

Additionally, the TLAAs meet the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3 because: (1) Dominion Energy's use of the Fatigue Monitoring Program is consistent with the SRP-SLR, (2) this program continually monitors the occurrence of transient cycles and ensures the validity of this TLAA, and (3) this program will trigger corrective actions before analyses become invalid during the subsequent period of extended operation.

4.3.2.5.3 UFSAR Supplement

SLRA Section A3.3.2, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), to correct the inadvertent discrepancies in dispositions between SLRA Section 4.3 and Appendix A, provides the UFSAR supplement summarizing the fatigue TLAA for the SG components (including the Unit 1 inlet nozzle SWOL). 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, the staff finds that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the fatigue TLAA for the SG components (including the Unit 1 inlet nozzle SWOL), as required by 10 CFR 54.21(d).

4.3.2.5.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the SG components (including the Unit 1 inlet nozzle SWOL) will be adequately managed by the Fatigue Monitoring Program for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.6 Pressurizer Surge Line

4.3.2.6.1 Summary of Technical Information in the Application

SLRA Section 4.3.2.6 describes Dominion Energy's TLAA for the pressurizer surge line. Dominion Energy explained that NRC Bulletin 88-11, "Pressurizer Surge Line Thermal Stratification," dated December 20, 1988, required visual inspection of the surge line and demonstration that the design requirements of the surge line are satisfied, including the consideration of thermal stratification effects. The evaluation considered assumptions such as thermal and pressure transients and operating cycles for the licensed life of the plant.

Dominion Energy dispositioned the TLAA for the pressurizer surge line in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of metal fatigue and thermal stratification on the intended functions will be adequately managed by the Fatigue Monitoring Program and the ASME Code Section XI Inservice Inspection Program, Subsections IWB, IWC, and IWD, respectively, for the subsequent period of extended operation.

4.3.2.6.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAA for the pressurizer surge line and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.3.3.1.1.3 and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3.

The SLRA states that fatigue for the pressurizer surge line will be managed by the Fatigue Monitoring Program, which is described in SLRA Section B3.1. The staff's evaluation of the Fatigue Monitoring Program is documented in SER Section 3.0.3.2.24, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects of fatigue. Based on the applicant's implementation of the Fatigue Monitoring Program, the staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the pressurizer surge line will be adequately managed for the subsequent period of extended operation.

The SLRA states that thermal stratification of the pressurizer surge line will be managed by the ASME Code Section XI Inservice Inspection Program, Subsections IWB, IWC, and IWD, which is described in SLRA Section B2.1.1. The staff's evaluation of the ASME Code Section XI Inservice Inspection, Program, Subsections IWB, IWC, and IWD, is documented in SER Section 3.0.3.2.24, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects of thermal stratification. Based on the applicant's implementation of the ASME Code Section XI Inservice Inspection Program, Subsections IWB, IWC, and IWD, the staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of thermal stratification on the intended functions of the pressurizer surge line will be adequately managed for the subsequent period of extended operation.

Additionally, the TLAAs meet the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3 because: (1) Dominion Energy's use of the Fatigue Monitoring Program is consistent with the SRP-SLR; (2) this program continually monitors the occurrence of transient cycles, ensures the validity of this TLAA, and will trigger corrective actions before analyses become invalid during the subsequent period of extended operation; and (3) Dominion Energy's use of the ASME Code Section XI Inservice Inspection Program, Subsections IWB, IWC, and IWD, will include periodic inspections to ensure the pressurizer surge line is managed for effects due to thermal stratification during the subsequent period of extended operation.

4.3.2.6.3 UFSAR Supplement

SLRA Section A3.3.2, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), to correct the inadvertent discrepancies in dispositions between SLRA Section 4.3 and Appendix A provides the UFSAR supplement summarizing the fatigue TLAA for the pressurizer surge line. 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, the staff finds that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the fatigue TLAA for the pressurizer surge line, as required by 10 CFR 54.21(d).

4.3.2.6.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the pressurizer surge line will be adequately managed by the Fatigue Monitoring Program and the effects of thermal stratification will be adequately managed by the ASME Code Section XI Inservice Inspection Program, Subsections IWB, IWC, and IWD, for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.7 Class 1, USAS (ANSI) B31.7 Piping

4.3.2.7.1 Summary of Technical Information in the Application

SLRA Section 4.3.2.7 describes Dominion Energy’s TLAA for reactor coolant pressure boundary (RCPB) piping, branch nozzles attached to the main reactor coolant loop piping, and the auxiliary line piping connected to the reactor coolant branch nozzles designed to Class 1, USAS (ANSI) B31.7. The SLRA states that the design for the RCPB piping, branch nozzles attached to the main reactor coolant loop piping, and the auxiliary line piping connected to the reactor coolant branch nozzles include detailed stress and fatigue evaluations in accordance with the methods of the ASME Code Section III. Dominion Energy explained that the CUF values for these components are less than the ASME Code Limit of 1.0 and indicated that the design transients of the Class 1, USAS (ANSI) B31.7 piping are the same as those in SLRA Table 4.3.1-1. Furthermore, Dominion Energy explained that the 40-year design cycles used in these fatigue analyses bound 80-year cycle projections; thus, the fatigue analyses for high-energy line break analyses remain valid for the subsequent period of extended operation.

Dominion Energy dispositioned the TLAA for Class 1, USAS (ANSI) B31.7 piping in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analyses remain valid for the subsequent period of extended operation.

4.3.2.7.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAA for piping designed to Class 1, USAS (ANSI) B31.7 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 and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.1.

The staff reviewed Dominion Energy's 80-year cycle projections and projection methodology, as documented in SER Section 4.3.1.2, and determined that they are reasonable because baseline cycle counts were reconciled by reviewing plant-specific sources, 80-year projections relied on recent operating experience to best reflect current plant operation, and there is margin between the 80-year projections and the CLB design limit. Therefore, the staff determined that the CUF values used for high energy line break analyses remain valid for the subsequent period of extended operation.

The staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(i), that the fatigue analyses for RCPB piping, branch nozzles attached to the main reactor coolant loop piping, and the auxiliary line piping connected to the reactor coolant branch nozzles designed to Class 1, USAS (ANSI) B31.7 remain valid for the subsequent period of extended operation.

Additionally, the analyses for piping designed to Class 1, USAS (ANSI) B31.7 meet the acceptance criteria in SRP-SLR Section 4.3.2.1.1.1 because: (a) the applicant determined the 80-year projected cycles based on an acceptable plant-specific methodology, and (b) the transient cycles are not projected to exceed the CLB design limit during the subsequent period of extended operation.

4.3.2.7.3 UFSAR Supplement

SLRA Section A3.3.2, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), to correct the inadvertent discrepancies in dispositions between SLRA Section 4.3 and Appendix A, provides the UFSAR supplement summarizing the fatigue TLAA for Class 1, USAS (ANSI) B31.7 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, the staff finds that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the fatigue TLAA for Class 1, USAS (ANSI) B31.7 piping, as required by 10 CFR 54.21(d).

4.3.2.7.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(i), that the analyses for piping designed to Class 1, USAS (ANSI) B31.7 remain valid for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.8 Loop Stop Isolation Valves

4.3.2.8.1 Summary of Technical Information in the Application

SLRA Section 4.3.2.8 describes Dominion Energy's TLAA for the loop stop isolation valves. Dominion Energy explained that it performed fatigue evaluations for several of the components for the loop stop isolation valves, which considered an increased number of SG tube rupture transient cycles. The updated fatigue evaluation, as part of the measurement uncertainty recapture (MUR) power uprate project, resulted in (1) confirmation that the increased number of cycles does not impact the fatigue waivers for the stop valve and (2) a set of slightly increased CUF values for the applicable stop valve components. SLRA Section 4.3.2.9 addresses fatigue waivers associated with the loop stop isolation valves. The SLRA states that the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operations. The CUF values will remain less than unity for the fatigue analyses of record during the subsequent period of extended operation. Therefore, the fatigue analyses for the loop stop isolation valve components remain valid for the subsequent period of extended operation.

To ensure the design cycles remain bounding in the fatigue analyses for the loop stop isolation valves, the SLRA states that the Fatigue Monitoring Program will track cycles for significant fatigue transients listed in SLRA Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

Dominion Energy dispositioned the TLAA for the loop stop isolation valves in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of metal fatigue on the intended functions will be adequately managed by the Fatigue Monitoring Program for the subsequent period of extended operation.

4.3.2.8.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAAs for the loop stop isolation valves provided in SLRA Section 4.3.2.8, 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 and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3.

The SLRA states that fatigue for the loop stop isolation valve components will be managed by the Fatigue Monitoring Program, which is described in SLRA Section B3.1. The staff's evaluation of the Fatigue Monitoring Program is documented in SER Section 3.0.3.2.24, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects of fatigue. Based on the applicant's implementation of the Fatigue Monitoring Program, the staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the loop stop isolation valves will be adequately managed for the subsequent period of extended operation.

Additionally, the TLAAs meet the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3 because: (1) Dominion Energy's use of the Fatigue Monitoring Program is consistent with the SRP-SLR, (2) this program continually monitors the occurrence of transient cycles and ensures the validity of this TLAA, and (3) this program will trigger corrective actions before analyses become invalid during the subsequent period of extended operation.

4.3.2.8.3 UFSAR Supplement

SLRA Section A3.3.2, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), to correct the inadvertent discrepancies in dispositions between SLRA Section 4.3 and Appendix A, provides the UFSAR supplement summarizing the fatigue TLAA for the loop stop isolation valves. 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, the staff finds that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the fatigue TLAA for the loop stop isolation valves, as required by 10 CFR 54.21(d).

4.3.2.8.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the loop stop isolation valves will be adequately managed by the Fatigue Monitoring Program for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.9 ASME Code Section III, Class 1 Component Fatigue Waivers

4.3.2.9.1 Summary of Technical Information in the Application

SLRA Section 4.3.2.9 describes Dominion Energy's TLAA for ASME Code Section III, Class 1 Component Fatigue Waivers. Dominion Energy explained that, in certain instances, a detailed fatigue evaluation is not required if components conform to the waiver of fatigue requirements of ASME Code Section III. These fatigue waivers consider transient cycles that occur over the life of the plant, and the following equipment has subcomponents that conform to the waiver of fatigue requirements in ASME Code Section III:

- CRDMs
  - upper joint—cap
  - upper joint—rod travel housing
- loop stop isolation valves
  - valve main body—shell/bonnet intersection
- RCPs
  - casing
  - main flange
  - seal housing
  - ring clamp
  - ring clamp bolts

– weir plate (discharge nozzle)
– casing feet

The SLRA states that the 40-year design cycles (CLB cycles) are postulated to bound 80 years of plant operation. Therefore, the fatigue waivers for Class 1 components remain valid for the subsequent period of extended operation.

To ensure the design cycles remain bounding in the fatigue analyses for the ASME Code Section III, Class 1 component fatigue waivers, the SLRA states that the Fatigue Monitoring Program will track cycles for significant fatigue transients listed in SLRA Table 4.3.1-1 and ensure corrective action is taken prior to potentially exceeding fatigue design limits.

Dominion Energy dispositioned the TLAA for ASME Code Section III, Class 1 component fatigue waivers in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of metal fatigue on the fatigue waivers will be adequately managed by the Fatigue Monitoring Program for the subsequent period of extended operation.

4.3.2.9.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAAs for ASME Code Section III, Class 1 component fatigue waivers provided in SLRA Section 4.3.2.9, 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 and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3.

The SLRA states that fatigue for the ASME Code Section III, Class 1 component fatigue waivers will be managed by the Fatigue Monitoring Program, which is described in SLRA Section B3.1. The staff's evaluation of the Fatigue Monitoring Program is documented in SER Section 3.0.3.2.24, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects of fatigue. Based on the applicant's implementation of the Fatigue Monitoring Program, the staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the ASME Code Section III, Class 1 component fatigue waivers will be adequately managed for the subsequent period of extended operation.

Additionally, the TLAAs meet the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3 because: (1) Dominion Energy's use of the Fatigue Monitoring Program is consistent with the SRP-SLR, (2) this program continually monitors the occurrence of transient cycles and ensures the validity of this TLAA, and (3) this program will trigger corrective actions before analyses become invalid during the subsequent period of extended operation.

4.3.2.9.3 UFSAR Supplement

SLRA Section A3.3.2, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), to correct the inadvertent discrepancies in dispositions between SLRA Section 4.3 and Appendix A, provides the UFSAR supplement summarizing the fatigue TLAA for ASME Code Section III, Class 1 component fatigue waivers. 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, the staff finds that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. Additionally, the staff finds that

Dominion Energy provided an adequate summary description of its actions to address the fatigue TLAA for ASME Code Section III, Class 1 component fatigue waivers, as required by 10 CFR 54.21(d).

4.3.2.9.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the ASME Code Section III, Class 1 component fatigue waivers will be adequately managed by the Fatigue Monitoring Program for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.3 USAS (ANSI) B31.1 Allowable Stress Analyses

4.3.3.1 Summary of Technical Information in the Application

SLRA Section 4.3.3 describes Dominion Energy's TLAA for USAS (ANSI) B31.1 allowable stress analyses. Dominion Energy explained that, for piping systems designed in accordance with USAS (ANSI) B31.1, explicit analyses of cumulative fatigue usage are not required; instead, cyclic loading is considered implicitly in a simplified manner in the design process. These implicit fatigue analyses are based on the number of fatigue cycles anticipated for the life of the component.

Dominion Energy dispositioned the TLAA for the USAS (ANSI) B31.1 allowable stress analyses in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analyses remain valid for the subsequent period of extended operation.

4.3.3.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAA for the USAS (ANSI) B31.1 allowable stress analyses 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 and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.1.

The SLRA states that USAS (ANSI) B31.1 systems are generally subject to continuous steady-state operation, and operating temperatures vary only during plant heatup and cooldown, plant transients, or periodic testing. Portions of piping systems that are attached to the RCS or other power-cycle-related systems are subject to a similar number or fewer cycles as the RCS (e.g., condensate, containment vacuum, extraction steam, feedwater, primary and secondary gas supply, main steam, reactor coolant, steam drains, and vacuum priming systems). Additionally, portions of some of these systems are normally isolated from the normal power cycle and would experience fewer cycles than those portions at the system boundary.

The staff reviewed Dominion Energy's 80-year cycle projections and projection methodology, as documented in SER Section 4.3.1.2, and determined that they are reasonable because baseline cycle counts were reconciled by reviewing plant-specific sources, 80-year projections relied on recent operating experience to best reflect current plant operation, and there is margin between the 80-year projections and the CLB design limit. Furthermore, the staff noted that the summation of all 80-year projected transients that impact the RCS is significantly less than the

7,000-cycle limit from USAS (ANSI) B31.1. Therefore, the staff determined that the USAS (ANSI) B31.1 allowable stress analyses for portions of piping systems attached to the RCS or other power-cycle-related systems remain valid for the subsequent period of extended operation.

The SLRA states that portions of certain systems (e.g., alternate alternating current (AC), auxiliary boilers, auxiliary steam, blowdown, chilled water, chemical and volume control, emergency diesel generator, high-radiation sampling, heating and ventilation, residual heat, security, and sampling systems) are affected by thermal and pressure transients that are different than the RCS transients discussed above. Dominion Energy stated that the basis for cycle projections for these systems were reviewed to validate that the projected cycles for 80 years remain less than 7,000 cycles and that the results are documented in SLRA Table 4.3.3-1. During its audit, as documented in its audit report (ADAMS Accession No. ML21036A060), the staff reviewed the evaluation that supports Dominion Energy's methodology for determining the 80-year projected cycles as shown in SLRA Table 4.3.3-1. The staff confirmed the following:

- The staff reviewed ETE-SLR-2020-2231 and confirmed that the projected cycles provided in SLRA Table 4.3.3-1, 80-Year "Transient Cycle Projections for USAS (ANSI) B31.1 Piping," are reasonable and are supported by operation logs, maintenance testing, surveillance, procedures and/or conservative assumptions.

Based on its audit and review, the staff finds the 80-year transient projections for those plant systems designed to USAS (ANSI) B31.1 that are affected by transients that are different than the RCS transients are significantly less than the 7,000-cycle limit from USAS (ANSI) B31.1. Therefore, the staff determined that the USAS (ANSI) B31.1 allowable stress analyses for portions of piping systems not affected by the RCS transients remain valid for the subsequent period of extended operation.

The staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(i), that the analyses for the USAS (ANSI) B31.1 allowable stress analyses remain valid for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.1 because the applicant determined the 80-year projected cycles, including transient severity, associated with USAS (ANSI) B31.1 allowable stress analyses are based on conservative projections, and transient cycles are not projected to exceed the 7,000-cycle threshold during the subsequent period of extended operation.

4.3.3.3 UFSAR Supplement

SLRA Section A3.3.3 provides the UFSAR supplement summarizing the fatigue TLAA for USAS (ANSI) B31.1 allowable stress analyses. 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, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the USAS (ANSI) B31.1 allowable stress analyses, as required by 10 CFR 54.21(d).

4.3.3.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(i), that the USAS (ANSI) B31.1 allowable stress analyses remain valid for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, 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 describes Dominion Energy's TLAA for environmentally-assisted fatigue. Dominion Energy explained that the effects of the reactor water environment on the fatigue CUF must be examined for a set of sample critical components for the plant. This sample set includes the locations identified in NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components," issued March 1995 (ADAMS Accession No. ML031480219), and additional plant-specific component locations in the RCPB if they might be more limiting than those considered in NUREG/CR-6260. Dominion Energy identified any additional limiting locations through an environmentally-assisted fatigue screening evaluation to determine the lead indicator (also referred to as sentinel) locations for environmentally-assisted fatigue.

Dominion Energy dispositioned the TLAA for environmentally-assisted fatigue of the ASME Code Section III components and USAS (ANSI) B31.7 Class 1 piping (with Appendix L evaluations) in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of environmentally-assisted fatigue on the intended functions will be adequately managed by the Fatigue Monitoring Program, the ASME Code Section XI Inservice Inspection Program, Subsections IWB, IWC, and IWD (for locations with ASME Section XI, Appendix L evaluations), and the Steam Generators Program (for SG tubing) for the subsequent period of extended operation.

4.3.4.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAA for environmentally-assisted fatigue and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.3.3.1.2.3 and the acceptance criteria in SRP-SLR Section 4.3.2.1.2.3. In accordance with SRP-SLR Section 4.3.3.1.2, the environmentally-assisted fatigue assessment should include the locations identified in NUREG/CR-6260 and additional plant-specific locations in the RCPB that may be more limiting.

SLRA Section 4.3.4 discusses the assessment performed for ASME Code Section III components and USAS (ANSI) B31.7, Class I piping to determine fatigue-sensitive locations for comparison and ranking. For both assessments, the applicant described the screening criteria used to select sentinel locations and how the applicable AMPs will be used to manage the effects of environmentally-assisted fatigue on these sentinel locations. As a result of Dominion Energy's assessment, other locations were found that could potentially be more limiting than the NUREG/CR-6260 locations. The sentinel locations are the component or piping locations, which have bounding environmentally-adjusted cumulative usage factor (CUF_{en}) values and that will be evaluated further for more detailed analysis, monitoring, inspection, or replacement.

ASME Code Section III Components

To select sentinel locations, the applicant first reviewed and categorized all applicable ASME Code Section III components with existing fatigue usage values that are susceptible to environmentally-assisted fatigue into transient sections (i.e., groups of components that are subject to the same thermal and pressure transients). In its next step, the applicant developed screening environmental fatigue correction factor (F_{en}) values, which were used to evaluate CUF_{en} for each component. The applicant applied NUREG/CR-6909, "Effect of LWR [light-water reactor] Coolant Environments on the Fatigue Life of Reactor Materials," for stainless steels; carbon and low-alloy steels; and nickel-based (Ni-Cr-Fe) alloys, to calculate and compare CUF_{en} values for each component. The staff noted that the F_{en} values for the initial screening process were calculated in accordance with NUREG/CR-6909, Revision 0 (ADAMS Accession No. ML070660620), for stainless and Ni-Cr-Fe alloy materials, and in accordance with NUREG/CR-6909, Revision 1 (ADAMS Accession No. ML16319A004), for carbon and low-alloy steels. The staff finds the use of Revision 0 and Revision 1 of NUREG/CR-6909, for the respective materials identified above, for the initial screening process to be acceptable and conservative because limiting F_{en} values for the materials were generated.

In calculating the F_{en} values, the applicant used conservative values for the sulfur content, service temperature, strain rate, and dissolved oxygen (DO). For the DO content, the applicant used periodic sampling results and discussed plant-specific operation activities used to control and monitor DO levels to justify that the DO content used in the calculations was conservative and bounding. Specifically, the applicant explained that DO is sampled in the RCS five times per week and is consistently less than 0.005 ppm. The staff notes that, although the applicant did not specifically credit the Water Chemistry Program to support the disposition of this TLAA, the Water Chemistry Program will monitor and control the chemical environment of the RCS consistent with Electric Power Research Institute (EPRI) Report 3002000505, "Pressurized Water Reactor Primary Water Chemistry Guidelines." The staff finds the applicant's input parameters for calculating F_{en} values acceptable because conservative values were used, and the applicant's program includes actions to monitor and control DO content levels and other parameters of the chemical environment of the RCS.

In its final step of the initial screening process, the applicant compared the calculated screening CUF_{en} values for the components in each transient section to determine the sentinel locations. The SLRA describes the criteria used to remove component locations for consideration as sentinel locations, including those locations that are not part of the RCPB, are not in contact with primary coolant, and have a CUF value of 0.0, or a screening CUF_{en} value of less than 1.0. The staff finds that the applicant's assessment of only components with ASME Code Section III, CUF values is appropriate because these components were designed to address fatigue as part of the CLB; therefore, they are considered TLAAs, as defined in 10 CFR 54.3. The staff also finds that the next steps in the applicant's assessment to determine whether these components are part of the RCPB and are exposed to the reactor coolant water environment are appropriate and consistent with the guidance identified in NUREG-2192, Revision 0 (SRP-SLR Section 4.3.2.1.2).

Dominion Energy also explained that, for those systems where the NUREG/CR-6260 locations do not have the highest screening CUF_{en}, or a NUREG/CR-6260 location does not exist, the locations within that system that have the highest screening CUF_{en} in excess of unity are the sentinel locations. The staff noted that Dominion Energy's environmentally-assisted fatigue screening approach for ASME Code Section III components is acceptable because the final set of sentinel locations supplement those already identified in NUREG/CR-6260, which results in a comprehensive list of plant-specific ASME Code Section III components sentinel locations for addressing environmentally-assisted fatigue.

Dominion Energy explained that sentinel locations for ASME Code Section III components were identified as follows:

- Components with a screening CUF_{en} of less than unity were removed.
- Stress basis analysis ranking, which is a consistent ranking approach to assess the level of technical rigor and qualification criteria for each component within the transient section, was assessed for each remaining component.
- The location with the maximum screening CUF_{en} in each transient section, for each applicable material type, was retained.
- Comparison of candidate-sentinel locations against any NUREG/CR-6260 locations within the system was completed. Components with a CUF_{en} less than the NUREG/CR-6260 location were removed from the final set of sentinel locations.

The staff finds the removal of components with a screening CUF_{en} of less than unity from further consideration of environmentally-assisted fatigue acceptable because this conservatively calculated usage factor of less than unity has demonstrated that there is reasonable assurance that a fatigue crack will not form during the subsequent period of extended operation. Furthermore, the staff finds the remaining criteria used by the applicant to identify sentinel ASME Code Section III components acceptable because the applicant's methodology compared the CUF_{en} values of the components on a consistent and appropriate basis and selected the locations with the limiting CUF_{en} values for each material within each transient section for comparison with the NUREG/CR-6260 locations.

USAS (ANSI) B31.7, Class I Piping

To select sentinel locations, the applicant first reviewed and categorized USAS (ANSI) B31.7 Class I piping with explicit fatigue evaluations and calculated (CUF) values that are susceptible to environmentally-assisted fatigue into CUF consolidated transient sections. The staff noted that the consolidated transient sections were defined by the nuclear steam supply system (NSSS) vendor and are described in SLRA Table 4.3.4-1, "Consolidated Safety Class 1 Piping Transient Sections." In its next step, the applicant developed screening F_{en} values. The applicant applied NUREG/CR-6909 for stainless steels, carbon and low-alloy steels, and Ni-Cr-Fe alloys for each component to calculate and compare the CUF_{en} values. Consistent with the initial screening process for ASME Code Section III components, the applicant calculated limiting F_{en} values in accordance with NUREG/CR-6909, Revision 0, for stainless steel and nickel-based (Ni-Cr-Fe) alloy materials, and in accordance with NUREG/CR-6909, Revision 1, for carbon and low-alloy steels. The staff finds the use of Revision 0 and Revision 1 of NUREG/CR-6909, for the respective materials identified above, for the initial screening process to be acceptable and conservative because limiting F_{en} values for the materials were used for all material types.

In calculating the F_{en} values, the applicant used conservative values for the sulfur content, service temperature, strain rate, and DO, consistent with the initial screening process discussed above for the ASME Code Section III components. The staff finds the applicant's input parameters for calculating F_{en} values acceptable because conservative values were used, and the applicant's program includes actions to monitor and control DO content and other parameters of the chemical environment of the RCS.

With fatigue usage calculated for piping locations, the applicant then removed piping locations from consideration as sentinel locations if the piping location was not part of the RCPB or had a CUF_{en} value of less than 0.8. The staff finds the removal of components with a screening CUF_{en} of less than 0.8 from further consideration of environmentally-assisted fatigue acceptable because this conservatively calculated usage factor of less than 0.8 has demonstrated that there is reasonable assurance that a fatigue crack will not form during the subsequent period of extended operation. The applicant then selected the sentinel locations for each material type in a thermal zone based on the following criteria:

- location with highest estimated or maximum CUF_{en} was selected
- location with the second highest CUF_{en} was selected if the value is greater than 50 percent of the CUF_{en} value of the component with the highest CUF_{en} in the thermal zone
- location with the third highest CUF_{en} was selected if the value is greater than 25 percent of the CUF_{en} value of the component with the highest CUF_{en} in the thermal zone

The staff noted that, as part of the applicant's methodology, when appropriate, the level of technical rigor and qualification criteria was assessed for the components within the transient section, which the staff finds to be acceptable because this approach ensures components were compared on a consistent and appropriate basis when identifying sentinel locations for comparison with the NUREG/CR-6260 locations. The staff noted that the applicant's methodology yielded a large number of initial potential environmentally-assisted fatigue sentinel locations for USAS (ANSI) B31.7 Class I piping. This initial set of locations was further refined by consolidating thermal zones into plant-specific transient sections (see SLRA Table 4.3.4-1) as defined by the NSSS vendor. The piping locations with the maximum screening CUF_{en} in each transient section, for each applicable material type, were then retained for further assessment by the applicant.

The staff finds this approach for refining the initial set of potential environmentally-assisted fatigue sentinel locations to be reasonable because, within a consolidated transient section, the applicant is able to assess the components on a consistent basis such that they are exposed to the same or similar transients, including transient severity. Finally, the applicant explained that it performed a comparison of candidate environmentally-assisted fatigue sentinel locations to any NUREG/CR-6260 locations within the system and the consolidated transient sections, and any piping locations with a CUF_{en} less than the NUREG/CR-6260 locations were removed from the final set of sentinel locations. The staff finds this removal of candidate environmentally-assisted fatigue sentinel locations acceptable because the applicant's methodology compared the CUF_{en} values of the components on a consistent and appropriate basis and selected the locations with the limiting CUF_{en} values for each material within each consolidated transient section.

Final Environmentally-Assisted Fatigue Sentinel Locations

SLRA Table 4.3.4-2 summarizes the results of the environmentally-assisted fatigue calculations for the sentinel locations. In addition to the CUF_{en} values, SLRA Table 4.3.4-2 shows the original analysis of record CUF, the reduced CUF developed for SLR, and a brief summary of the methods for refining the CUF.

During its audit and review of the final environmentally-assisted fatigue sentinel locations, the staff noted that the basis that the pressurizer surge nozzle weld overlay (nickel-based alloy) is bounded by the (a) replacement RVCH J-groove weld (nickel-based alloy) and (b) 14-inch hot leg surge nozzle (stainless steel) was not clear. Thus, the staff determined the need for additional information, which resulted in the issuance of an RAI. RAI 4.3-2 dated March 4, 2021, is documented in ADAMS Accession No. ML21063A540 and Dominion Energy's response dated April 1, 2021, is documented in ADAMS Accession No. ML21091A187. In its response, Dominion Energy indicated the following:

- A similar degree of rigor is used in development of the CUF and F_{en} values for the pressurizer surge nozzle weld overlay and RVCH J-groove weld.
- ASME Code Section III, NB-3200 rules were used in the analyses of the J-groove weld, pressurizer surge nozzle weld overlay, and the pressurizer surge line hot leg nozzle.
- The surge line hot leg nozzle is the limiting location associated with the pressurizer from a fatigue perspective for considering the effects of a reactor water environment (see the SER for license renewal to 60 years, NUREG-1766).
- The CUF and F_{en} values for the (1) J-groove weld (nickel-based alloy) are 0.238 and 3.93, respectively, and (2) pressurizer 14-inch hot leg surge nozzle (stainless steel) are 8.856 and 8.555, respectively. The CUF and F_{en} values for the pressurizer surge nozzle weld overlay are 0.174 and 3.746, respectively.

During its evaluation of Dominion Energy's response to RAI 4.3-2, the staff noted that the applicant proposed the aging management of two surrogate locations (hot leg surge nozzle and the RV CRDM sleeve (head adapters—J-groove weld)) to bound the pressurizer surge nozzle weld overlay. Further, the staff noted the pressurizer surge nozzle weld overlay location is in a high-radiation environment and the pressurizer heater cables can be damaged during an inspection requiring removal of the insulation. The staff noted that the applicant proposed to manage the effects of aging on the hot leg surge nozzle with the ASME Code Section XI Inservice Inspection Program, Subsections IWB, IWC, and IWD, and the RV CRDM sleeve (head adapters—J-groove weld) is inspected in accordance with the requirements in 10 CFR 50.55a(g)(6)(ii)(D).

Given the circumstances associated with inspection of the pressurizer surge nozzle weld overlay (i.e., high-radiation area and potential for damage to pressurizer cables), the staff finds the applicant's response and proposal of two surrogate locations (hot leg surge nozzle and the RV CRDM sleeve (head adapters—J-groove weld)) to be reasonable because:

- The fatigue analyses of the two surrogate locations, which have bounding values of CUF and F_{en} in comparison, were performed with similar rigor and/or technical qualification (i.e., ASME Code Section III, NB-3200) as the pressurizer surge nozzle weld overlay.

- The hot leg surge nozzle is the limiting location in the pressurizer surge line that will be periodically inspected by the ASME Code Section XI Inservice Inspection Program, Subsections IWB, IWC, and IWD (per the Appendix L evaluation).
- The RV CRDM sleeve (head adapters—J-groove weld) will also be periodically inspected in accordance with the requirements in 10 CFR 50.55a(g)(6)(ii)(D).

For the “SG tubes” environmentally-assisted fatigue sentinel location, the effects of fatigue will be managed by the Steam Generators Program during the subsequent period of extended operation with the use of eddy-current testing. The staff’s evaluation of the Steam Generators Program is documented in SER Section 3.0.3.1.5, which determined that the AMP will be adequate to manage the applicable aging effects, including fatigue crack growth.

For the “6-inch Branch Nozzle Safety Injection—Cold Leg” and “14-inch branch pressurizer surge line hot leg” environmentally-assisted fatigue sentinel locations, the effects of fatigue will be managed by the ASME Code Section XI Inservice Inspection Program, Subsections IWB, IWC, and IWD, during the subsequent period of extended operation, based on results of flaw tolerance evaluations conducted in accordance with ASME Code Section XI, Nonmandatory, Appendix L. The staff’s evaluation of the ASME Code Section XI Inservice Inspection Program, Subsections IWB, IWC, and IWD, is documented in SER Section 3.0.3.2.1, which determined that the AMP will be adequate to manage the applicable aging effects. SLRA Table 4.3.4-3 shows the results of the ASME Code Section XI, Appendix L evaluations. The staff reviewed this table and noted that the lowest allowable operating period was for the “14-inch branch pressurizer surge line hot leg” with a circumferential flaw configuration, which was determined to be 60 years. The applicant used the results of this evaluation to justify an inservice inspection frequency for these piping locations of once every 10 years. The staff finds this approach acceptable because a 10-year inspection interval is supported by the ASME Code Section XI, Appendix L evaluation, and the projected growth rate of a postulated crack would not challenge the structural integrity of these components before being detected during a scheduled inspection. Furthermore, the staff noted the Fatigue Monitoring Program, when enhanced, will require monitoring and tracking of transient cycles associated with the ASME Code Section XI, Appendix L fatigue-sensitive locations. Further, a surveillance limit will be established to initiate corrective actions before exceeding transient cycle assumptions in the ASME Code Section XI, Appendix L analyses. Thus, the staff finds the Fatigue Monitoring Program, when enhanced, provides a measure of defense in depth to ensure the effects of aging due to fatigue are adequately managed for these environmentally-assisted fatigue sentinel locations. The staff’s evaluation of the Fatigue Monitoring Program is documented in SER Section 3.0.3.2.24, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects.

For the “RV Shell Transition,” “RV Inlet and Outlet Nozzles,” “RV Support Pads,” and “PZR Spray Nozzle FSWOL (SS pipe to safe end weld)” environmentally-assisted fatigue sentinel locations, the effects of fatigue will be managed by the Fatigue Monitoring Program by ensuring cycle limits used in the fatigue analyses remain valid. The staff’s evaluation of the Fatigue Monitoring Program is documented in SER Section 3.0.3.2.24, which determined that the AMP, when enhanced, will be adequate to manage the applicable aging effects. For the “12 inch Branch Nozzle Accumulator Cold Leg,” and “3 inch Branch Nozzle Cold Leg” environmentally-assisted fatigue sentinel locations, the staff noted that a method of fatigue management is not necessary because the 80-year CUF_{en} for these two locations are less than 1.0; thus, environmentally-assisted fatigue has been adequately demonstrated through the subsequent period of extended operation. However, as discussed in SER Section 4.3.1.2, 80-year cycle projections were not used to update any fatigue analyses and do not represent a revision to the design basis of NAPS, Units 1 and 2. As such, the staff finds the TS requirements for a program that "provides controls to track the UFSAR, Section 5.2, cyclic and transient occurrences," is an additional measure of defense in depth for these environmentally-assisted fatigue sentinel locations that ensures that transient cycle counts do not exceed the CLB design limit, which were used in the environmentally-assisted fatigue analyses.

The staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the environmentally-assisted fatigue sentinel locations will be adequately managed for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.3.2.1.2.3 because the Fatigue Monitoring Program, the Steam Generators Program (for SG tubing), the ASME Section XI Inservice Inspection Program, Subsections IWB, IWC, and IWD (for locations with ASME Section XI, Appendix L evaluations), and TS requirements will manage the effects of fatigue for locations identified as susceptible to environmentally-assisted fatigue and ensure corrective actions are initiated before a loss of intended function of these components.

4.3.4.3 UFSAR Supplement

SLRA Section A3.3.4 provides the UFSAR supplement summarizing the fatigue TLAA associated with environmentally-assisted fatigue and the respective sentinel locations for NAPS, Units 1 and 2. The staff reviewed SLRA Section A3.3.4 consistent with the review procedures in SRP-SLR Section 4.3.3.2.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR Section 4.3.2.2, and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the effects of environmentally-assisted fatigue on the intended functions of the ASME Code Section III components and ANSI B31.7, Class 1 piping that contact reactor coolant, as required by 10 CFR 54.21(d).

4.3.4.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of environmentally-assisted fatigue on the intended functions of the ASME Code Section III components and ANSI B31.7 piping that contact reactor coolant will be adequately managed by the Fatigue Monitoring Program; the ASME Code Section XI Inservice Inspection Program, Subsections IWB, IWC, and IWD (for locations with ASME Code Section XI, Appendix L evaluations); and the Steam Generators Program (for SG tubing) for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.5 Reactor Vessel Internals Fatigue Analyses

4.3.5.1 Summary of Technical Information in the Application

SLRA Section 4.3.5 describes Dominion Energy's TLAA for reactor vessel internals (RVIs) and states that the RVIs were designed before ASME Code Section III, Division 1, Subsection NG, was established. Therefore, no CUF values were calculated as part of the original RVI design.

However, Dominion Energy explained that updated structural evaluations were performed for some RVIs as part of engineering evaluations to support Units 1 and 2 operations at measurement uncertainty recapture power uprate conditions. Specifically, structural evaluations of the upper and lower core plates were performed to the 1989 edition of ASME Code Section III, Division 1, Subsection NG, which considered transient cycles that occur over the life of the plant and are TLAAs.

Dominion Energy explained that the CUF values for these components are less than the ASME Code limit of 1.0 and are based on the design transients in SLRA Table 4.3.1-1. Furthermore, Dominion Energy explained that the 40-year design cycles used in these fatigue analyses bound 80-year cycle projections; thus, the fatigue analyses for the RVIs remain valid for the subsequent period of extended operation.

Dominion Energy dispositioned the TLAA for the RVIs in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analyses remain valid for the subsequent period of extended operation.

4.3.5.2 Staff Evaluation

The staff reviewed Dominion Energy’s TLAA for the RVIs 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 and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.1.

The staff reviewed Dominion Energy’s 80-year cycle projections and projection methodology, as documented in SER Section 4.3.1.2, and determined that they are reasonable because baseline cycle counts were reconciled by reviewing plant-specific sources, 80-year projections relied on recent operating experience to best reflect current plant operation, and there is margin between the 80-year projections and the CLB design limit. Therefore, the staff determined that the CUF values for the RVIs (i.e., upper and lower core plates), calculated as part of the measurement uncertainty recapture power uprate, remain valid for the subsequent period of extended operation.

The staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(i), that the fatigue analyses for the RVIs (i.e., upper and lower core plates) remain valid for the subsequent period of extended operation. Additionally, the fatigue analyses for the RVIs meet the acceptance criteria in SRPSLR Section 4.3.2.1.1.1 because: (a) the applicant determined the 80-year projected cycles based on an acceptable plant-specific methodology, and (b) the transient cycles are not projected to exceed the CLB design limit during the subsequent period of extended operation.

4.3.5.3 UFSAR Supplement

SLRA Section A3.3.5 provides the UFSAR supplement summarizing the fatigue TLAA for the RVIs. The staff reviewed SLRA Section A3.3.5 consistent with the review procedures in SRP-SLR Section 4.3.3.2.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address RVIs, as required by 10 CFR 54.21(d).

4.3.5.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(i), that the fatigue analyses for the RVIs remain valid for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.6 High-Energy Line Break Analyses

4.3.6.1 Summary of Technical Information in the Application

SLRA Section 4.3.6 describes Dominion Energy's TLAA for high-energy line break analyses. Dominion Energy explained that it postulated Class 1 pipe rupture locations in accordance with applicable regulatory guidance, based on a limiting stress criterion and on a CUF criterion. The CUF criterion applies to any intermediate locations between terminal ends where the cumulative usage factor, U, derived from the piping fatigue analysis under the loadings associated with specified seismic events and operational plant conditions exceeds 0.1.

The SLRA states that a high-energy line break is not required to be postulated at a given piping location if the design CUF value for that location is less than or equal to 0.1. Dominion Energy explained that the CUF values for Class 1 USAS (ANSI) B31.7 piping locations are based on the design transients in SLRA Table 4.3.1-1. Furthermore, Dominion Energy explained that the 40-year design cycles used in these fatigue analyses bound 80-year cycle projections; thus, the fatigue analyses for high-energy line break analyses remain valid for the subsequent period of extended operation.

Dominion Energy dispositioned the TLAA for the high-energy line break in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analyses remain valid for the subsequent period of extended operation.

4.3.6.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAA for high-energy line break 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 and the acceptance criteria in SRP-SLR Section 4.3.2.1.1.1.

The staff reviewed Dominion Energy's 80-year cycle projections and projection methodology, as documented in SER Section 4.3.1.2, and determined that they are reasonable because baseline cycle counts were reconciled by reviewing plant-specific sources, 80-year projections relied on recent operating experience to best reflect current plant operation, and there is margin between the 80-year projections and the CLB design limit. Therefore, the staff determined that the CUF values used for high-energy line break analyses remain valid for the subsequent period of extended operation.

The staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(i), that the fatigue analyses for high-energy line break remain valid for the subsequent period of extended operation. Additionally, the high-energy line break analyses meet the acceptance criteria in SRP-SLR Section 4.3.2.1.1.1 because: (a) the applicant determined the 80-year projected cycles were based on an acceptable plant-specific methodology, and (b) the transient cycles are not projected to exceed the CLB design limit during the subsequent period of extended operation.

4.3.6.3 UFSAR Supplement

SLRA Section A3.3.6, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), to correct the inadvertent discrepancies in dispositions between SLRA Section 4.3 and Appendix A, provides the UFSAR supplement summarizing the fatigue TLAA for high-energy line break. The staff reviewed SLRA Section A3.3.6 consistent with the review procedures in SRP-SLR Section 4.3.3.2.

Based on its review, the staff finds that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), meets the acceptance criteria in SRP-SLR Section 4.3.2.2, and is therefore acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address high-energy line break analyses, as required by 10 CFR 54.21(d).

4.3.6.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(i), that the analyses for high-energy line break remain valid for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement, as amended by letter dated April 1, 2021 (ADAMS Accession No. ML21091A187), contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.4 Environmental Qualification of Electric Equipment

4.4.1 Summary of Technical Information in the Application

SLRA Section 4.4 describes Dominion Energy'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, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants," requirements, have been identified as TLAAs.

Dominion Energy 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 "Environmental Qualification of Electric Equipment" AMP described in SLRA Section B3.3 for the period of extended operation.

4.4.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAA for the EQ of electric equipment and the corresponding disposition of 10 CFR 54.21(c)(1)(iii), consistent with the acceptance criteria in SRP SLR Section 4.4.2.1.3 and the review procedures in SRP-SLR Section 4.4.3.1.3. The latter states that, in accordance with 10 CFR 54.21(c)(1)(iii), an applicant must demonstrate that the effects of aging on the intended functions will be adequately managed for the period of extended operation.

The EQ requirements established by Criterion 4, “Environmental and Dynamic Effects Design Bases,” of Appendix A to 10 CFR Part 50 and by 10 CFR 50.49, require each applicant to establish a program to qualify electrical equipment so that such equipment, in its end of life condition, will meet its performance specifications during and following design basis accidents. A program to manage EQ of electric equipment important to safety, in accordance with the requirements of 10 CFR 50.49, is considered an adequate AMP for the purposes of license renewal. Electric components in Dominion Energy’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 staff reviewed SLRA Section 4.4 and the associated program basis documents to determine if Dominion Energy’s EQ Program meets the requirement of 10 CFR 54.21(c)(1). Dominion Energy’s EQ Program is implemented in accordance with the requirements of 10 CFR 54.21(c)(1)(iii) to show that components reviewed under Dominion Energy’s TLAA evaluation are adequately managed during the subsequent period of extended operation. The staff reviewed Dominion Energy’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 audit results, the staff concludes that Dominion Energy’s EQ Program elements are consistent with the GALL-SLR Report AMP X.E1. SER Section 3.0.3.1.23 documents the staff’s evaluation of Dominion Energy’s EQ of Electric Equipment AMP.

The staff also reviewed Dominion Energy’s EQ Program reanalysis attributes evaluation and concludes that it is consistent with SRP-SLR Section 4.4.3.1.3 and SRP-SLR Table 4.4-1. Reanalysis of an aging evaluation addresses attributes of analytical methods, data collection, and reduction method, underlying assumptions, acceptance criteria, ongoing qualification, and corrective action (if acceptance criteria are not met). Dominion Energy stated that environmentally qualified equipment must be refurbished, replaced, or have its qualification extended before reaching the aging limits established in the aging evaluation.

The staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of thermal, radiation, and cyclical aging on the intended functions of plant electrical and I&C components that are located in harsh environments and qualified to meet 10 CFR 50.49 requirements, will be adequately managed for the subsequent period of extended operation. Dominion Energy’s EQ Program manages the effects of thermal, radiation, and cyclic aging using an aging evaluation based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49(e)(5), EQ components are refurbished or replaced, or their qualification is extended before reaching the aging limit established in the evaluation.

Additionally, Dominion Energy’s TLAA for EQ of electric equipment meets the acceptance criteria in SRP-SLR Section 4.4.2.1.3 because the EQ Program is capable of programmatically managing the qualified life of components within the scope of the program for license renewal and that the continued implementation of the EQ Program provides assurance that the aging effects will be managed and that EQ electric components will continue to perform their intended functions for the subsequent period of extended operation consistent with the requirements of 10 CFR 54.21(c)(1)(iii).

4.4.3 UFSAR Supplement

SLRA Appendix A3.4 provides the UFSAR supplement summarizing the EQ of electric equipment. The staff reviewed SLRA Appendix A3.4 consistent with the review procedures in SRP-SLR Section 4.4.3.2. The staff also noted that Dominion Energy committed (Commitment No. 48) to ongoing implementation of the EQ of Electric Equipment AMP B3.3.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR Section 4.4.2.2 and is therefore acceptable. Additionally, the staff finds that Dominion Energy 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 Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of thermal, radiation, and cyclic aging on the intended functions of the EQ electric equipment will be adequately managed by the Environmental Qualification of Electric Equipment AMP for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.5 Concrete Containment Tendon Prestress

4.5.1 Summary of Technical Information in the Application

SLRA Section 4.5 describes Dominion Energy's disposition for the NAPS concrete containment tendon prestress. Dominion Energy stated that the NAPS containments use a reinforced concrete design without the use of prestressed tendons and that loss of prestress is not applicable for the NAPS containments. Therefore, there is no loss of prestress TLAA for the NAPS containments.

4.6 Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analysis

4.6.1 Containment Liner Plate

4.6.1.1 Summary of Technical Information in the Application

SLRA Section 4.6.1 describes Dominion Energy's TLAA for fatigue of the containment steel liner plate. Dominion Energy 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 Dominion Energy'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 UFSAR Section 3.8.2.1.4 and Table 3.8-7 and confirmed that the steel liner of the containment for each unit was evaluated for the cyclic loading effects of pressure (subatmospheric operating pressure and Type A tests), operating temperature, and design earthquake in accordance with the 1968 Edition of ASME Code Section III, Subarticle N-415.1, to determine the need for a detailed fatigue analysis. The staff noted from the SLRA that the design cycles have been conservatively extrapolated for 80 years of operation to 2,000 for operating pressure fluctuation cycles (1,500 cycles for Condition 1 atmospheric to operating pressure, which is still conservative), 8,000 for operating temperature cycles, and 40 for design earthquake (equivalent to operating-basis earthquake) cycles. The staff also noted, by extrapolation to 80 years of related pressure and temperature information in UFSAR Table 3.8-7 for 60 years of operation, that the corresponding expected cycles for 80 years of operation would be 200, 800, and 40 (for earthquake, the same as projected in SLRA Section 4.6.1), respectively. All of these expected cycle levels remain within the projected design cycles considered in the evaluation. During the audit, the staff reviewed calculation 11715-EA-14, Revision 0, Addendum 00D, “Reactor Containment Liner Analysis—Reactor Containment and Cold Penetrations Fatigue Evaluation for 80-Year Plant Life, North Anna Unit 1 and Unit 2.” This review confirmed that the six conditions for fatigue waiver in Subarticle N 415.1, “Vessels Not Requiring Analysis for Cyclic Operation,” of the ASME Code Section III, were evaluated and shown to be satisfied for the containment liner plate for an 80-year plant operating term.

The staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses for fatigue (e.g., fatigue waiver) of the containment liner plate have been projected to the end of the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.6.2.1.1.2 because the six fatigue waiver criteria in paragraph N 415.1 of the ASME Code Section III, 1968 Edition, were satisfied for the projected design cycles for 80 years of operation due to fluctuations in operating pressure, temperature, and design earthquake (equivalent to operating-basis earthquake) loads.

4.6.1.3 UFSAR Supplement

SLRA Section A3.6.1 provides the UFSAR 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 UFSAR 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

On the basis of its review, the staff concludes that Dominion Energy 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 UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6.2 Metal Containment

SLRA Section 4.6.2 states that each NAPS unit has a concrete containment with metal liner and not a metal containment; therefore, the topic of fatigue analysis of a metal containment is not applicable. The staff reviewed UFSAR Section 3.8.2 for the facility and confirmed that the UFSAR indicates that the containment structures for the units are made from concrete with internal steel liners. Therefore, the staff finds that the applicant does not need to evaluate a metal containment fatigue analysis as a TLAA in the SLRA because NAPS does not have a metal containment. The staff notes that the TLAA for containment liner plate is evaluated in SER Section 4.6.1.

4.6.3 Containment Penetrations Fatigue Analyses

SLRA Section 4.6.3 states that the CLB does not include fatigue analyses for the containment penetrations that would qualify as TLAAs in accordance with 10 CFR 54.3(a). The staff reviewed the UFSAR for the facility and confirmed that the UFSAR Section 3.8.2 does not identify fatigue analyses being performed for containment penetrations as part of the required design basis assessments. Therefore, the staff finds that the applicant does not need to evaluate fatigue analyses for containment penetrations as TLAAs in the SLRA because NAPS does not have fatigue analyses that are contained or incorporated by reference in the CLB and that will conform to Criterion 6 of the definition of TLAAs in 10 CFR 54.3(a).

4.7 Other Plant-Specific TLAAs

4.7.1 Crane Load Cycle Limits

4.7.1.1 Summary of Technical Information in the Application

SLRA Section 4.7.1 describes Dominion Energy's TLAAs for crane load cycle limits. Dominion Energy dispositioned the TLAAs for the containment polar cranes, fuel building movable platform, fuel building trolley, reactor containment annulus hoists, and auxiliary building monorails in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analyses remain valid for the subsequent period of extended operation.

4.7.1.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAA for the containment polar cranes, fuel building movable platform, fuel building trolley, reactor containment annulus hoists, and auxiliary building monorails 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 4.7.3.1.1 and the acceptance criteria in SRP-SLR Section 4.7.2.1.1.

Method of Evaluation—Scope

The staff reviewed UFSAR Section 9.6.3 and confirmed that the containment polar cranes, fuel building movable platform, fuel building trolley, reactor containment annulus hoists, and auxiliary building monorails and residual heat removal (RHR) pump monorails are within the scope of NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants: Resolution of Generic Technical Activity A-36," issued July 1980 (ADAMS Accession No. ML070250180), as noted in SLRA Table 4.7.1-1.

Although the RHR pump monorails are within the scope of NUREG-0612, SLRA Table 4.7.1-1 states that they were "re-designed in 1989 to ANSI B30.11-1980 (cites SLRA References 4.8-52 and 4.8-60) which does not include requirements for cyclical loads. Therefore, the RHR pump monorails are not identified as having a TLAA requiring evaluation for

SLR." The staff reviewed "ASME/ANSI B30.11-1980 Interpretations – Interpretation No.1, Replies to Technical Inquiries 1986-1988," and noted that the ASME Code states:

> The Manual of Steel Construction specifies the parameters for the design, fabrication, and erection of structural steel for buildings. The Specifications for Underhung Cranes and Monorail Systems includes considerations for crane and monorail equipment only. It does not include consideration for the design of the supporting structure. The self-supporting structure should, therefore, conform to the design parameters of the Manual of Steel Construction, AISC [American Institute of Steel Construction], 8th Edition, 1980.

The staff notes that AISC-360 "Specifications for Structural Steel Buildings," does not require fatigue design for structures experiencing less than 20,000 load (lift) cycles. The staff confirmed, as noted in the audit review (ADAMS Accession No. ML21036A060), that RHR pump monorail lift cycles are far less than those required for fatigue analyses. The bounding limits for TLAA consideration are discussed in the "Methodology of Analysis—Acceptance Criteria," below. A review of TLAAs for the in-scope cranes follows.

<u>Methodology of Analysis—Acceptance Criteria</u>

The staff reviewed Section 9.6.4.7 of the UFSAR and confirmed that Section 5.1.1(7) of NUREG-0612 requires "the cranes be designed to meet the applicable criteria and guidelines of Chapter 2-1 of ANSI B30.2-1976, "Overhead and Gantry Cranes," and of Crane Manufacturers Association of America, Inc. Specification #70 (CMAA-70), "Specifications for Electric Overhead Traveling Cranes." The staff also reviewed Section 18.3.5.1 of the UFSAR, which states that "[t]he crane load cycles provided in CMAA-70 has been identified as a TLAA, with the most limiting number of loading cycles being 100,000." The staff then reviewed Table 3.3.3.1.3-1, of CMAA-70, for fatigue considerations and confirmed that the range of the most limiting number of loading cycles (lifts) for electric overhead traveling cranes is designated as Class A with 20,000–100,000 allowable lifts. The staff also confirmed that the Specifications to CMAA-70 state that they supersede Electric Overhead Crane Institute's (EOCI)'s), "Specification for Electric Overhead Traveling Cranes" (EOCI-61, Service Class A). The staff then confirmed remarks made in the Franklin Research Institute's technical evaluation report (TER) to the NRC, "Control of Heavy Loads (C-10) for VEPCO NAPS Units 1 and 2," revised May 14, 1984, TER-C5500-372/373 (ADAMS Accession No. ML19280E585), that the reactor containment polar crane and turbine room cranes are designed to EOCI-61 and that the design of the cranes is consistent with the guidelines of NUREG-0612, specifically to Specification CMAA-70. As noted in the TER, Specification CMAA-70 allows crane designs to include better grade steel and hence lighter crane bridge steel girders, but in no case should it result in increased conservatism in the design.

<u>Reactor Containment Polar Crane Evaluation</u>

A staff review of Section 9.1.4.4.13 of the UFSAR confirmed that each polar crane is ANSI B30.2.0, "Safety Code for Overhead and Gantry Cranes," and EOCI compliant with a rated load capacity to lift the RV head. The staff's review of UFSAR Table 9.6-1 also confirmed that most polar crane lifts listed in SLRA Table 4.7.1-2 are considerably less than 85 to 100 percent of crane rated lift capacity with ten or more lifts per hour for normal to heavy lifting as defined in ANSI B30.2.0. The staff then noted that a one-third increase of the 25,000 estimated lift cycles for the cranes that are most frequently used during 60 years of plant operation (to account for plant operation from 60 to 80 years), discussed in UFSAR

Section 18.3.5.1, is reasonable, because there are no expected changes in plant use of cranes during the subsequent period of extended operation. The one-third increase accounts for the difference between 60 and 80 years of operation and yields approximately 33,000 lift cycles. This confirms Dominion Energy's estimation that polar crane lifts calculated to be in the order of 32,000 lifts remain below the 100,000 most limiting lifts of CMAA-70 for the subsequent period of extended operation.

Fuel Building Movable Platform Evaluation

The staff reviewed the TER and noted compliance of the fuel building movable platform crane design for control of heavy loads to CMAA-70, consistent with guideline 5.1.1(7) of NUREG-0612. The staff also reviewed UFSAR Sections 9.1.4 and 18.3.5.1 and Table 9.6-1 and noted that the fuel building movable platform crane hoists, each rated at 2 tons, are estimated to perform 50,000 lifts of fuel assemblies and spent fuel cavity gates in 60 years. The staff noted that a one-third increase of the estimated 60-year lifts (to account for plant operation from 60 to 80 years) confirms that the projected 80-year total number of 66,700 lifts, as reported in SLRA Section 4.7.1, remains below the 100,000 most limiting lifts of CMAA-70 for the subsequent period of extended operation.

Fuel Building Trolley Evaluation

The staff reviewed Section 9.1.4.4.12 of the UFSAR and confirmed that the trolley is rated for 125 tons and is used to handle spent fuel casks. The staff also confirmed that the fuel building trolley was designed as a Seismic Class I component and was built in accordance with ANSI B30.2.0-1967 and EOCI-61 Class A Service. The staff noted that, consistent with the TER, the fuel building crane was originally compliant to NUREG-0612; however, because of limitations listed in UFSAR Section 9.6.3, the new fuel building crane is not. Since the fuel building trolley was part of Dominion Energy's original fuel building crane design, it remains a TLAA as outlined in SLRA Table 4.7.1-1 and continues to be consistent with guideline 5.1.1(7) of NUREG-0612, noted in UFSAR Section 9.6.3. The staff reviewed UFSAR Section 18.3.5.1, which states that the most frequently used cranes experience 25,000 lift cycles during 60 years of plant operation. A one-third increase of 25,000 lifts (to account for plant operation from 60 to 80 years), conservatively assuming that these lifts are at the trolley rated capacity, would result in the bounding limits for the trolley of 33,333 lift cycles through the end of the subsequent period of extended operation. Although the bounding limits exceed the 26,700 trolley lift cycles stated in SLRA Section 4.7.1, they are far less than the most limiting number of 100,000 lifts of CMAA-70 for the subsequent period of extended operation.

Reactor Containment Annulus Hoist Evaluation

The staff reviewed UFSAR Section 6.2.1.2.13 and confirmed that the NAPS containment annulus hoists for Units 1 and 2 are used to maneuver equipment during shutdown. A review of the TER confirms their rated capacity is 5 tons as listed in Table 4.7.1-5 of the SLRA and that they are designed and built consistent with guideline 5.1.1(7) of NUREG-0612. Hence, they are subject to a TLAA review. As in the case of the shared fuel building movable platform TLAA evaluation, the staff's review of UFSAR Section 18.5.3.1 results in a similar finding for each unit's reactor containment annulus hoist, that the estimated 66,700 lifts, as reported in SLRA Section 4.7.1, remain below the most limiting number of 100,000 lifts of CMAA-70 for the subsequent period of extended operation.

Auxiliary Building Monorail Evaluations

The staff reviewed the TER and UFSAR Section 9.6.3 and confirmed that the auxiliary building material handling monorails are designed and built in accordance with guideline 5.1.1(7) of NUREG-0612 and hence subject to a TLAA review. The staff's review of UFSAR Section 18.5.3.1 also resulted in confirmation of similar lift cycle results as those noted for the review of the fuel building trolley, namely a one-third increase of the 60-year 25,000 lifts (to account for plant operation from 60 to 80 years) yields the bounding 33,333 lift cycles during the subsequent period of extended operation. Although this number of lifts is higher than the 14,145 lifts stated in SLRA Section 4.7.1, it is far less than the most limiting number of 100,000 lifts of CMAA-70 for the subsequent period of extended operation.

The staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(i), that the analyses for the load cycles of the containment polar cranes, fuel building movable platform, fuel building trolley, reactor containment annulus hoists, and auxiliary building monorails remain valid for the subsequent period of extended operation. Additionally, they meet the acceptance criteria in SRP-SLR Section 4.7.2.1.1 because Dominion Energy has demonstrated that the crane load cycle analyses remain below the bounds of the CMAA-70 allowable load cycles and, therefore, are valid through the subsequent period of extended operation.

4.7.1.3 UFSAR Supplement

SLRA Section A3.7.1 provides the UFSAR supplement summarizing the cranes' (lifting machines) full-capacity of lifts that far exceed the number of expected lifts for the period of extended operation. The staff reviewed SLRA Section A3.7.1 consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review of the UFSAR supplement, the staff finds it meets the acceptance criteria in SRP-SLR Section 4.7.2.2, and, therefore, is acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the cranes (lifting machines) load cycle limits, as required by 10 CFR 54.21(d).

4.7.1.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(i), that the analyses for the crane load cycle limits remain valid for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.2 Reactor Coolant Pump Flywheel Fatigue Crack Growth Analysis

4.7.2.1 Summary of Technical Information in the Application

SLRA Section 4.7.2 describes Dominion Energy's TLAA for the RCP flywheel fatigue crack growth analyses. Dominion Energy dispositioned the TLAA for the RCP flywheel fatigue crack growth analyses in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that the analysis remains valid through the subsequent period of extended operation.

4.7.2.2 Staff Evaluation

The staff reviewed Dominion Energy'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 and the acceptance criteria in SRP-SLR Section 4.7.2.1.1. The staff reviewed Dominion Energy's analysis by verifying that its implementation of the methodology in NRC-approved topical report PWROG-17011-NP-A, "Update for Subsequent License Renewal: WCAP-14535A, 'Topical Report on Reactor Coolant Pump Flywheel Inspection Elimination,' and WCAP-15666-A, 'Extension of Reactor Coolant Pump Motor Flywheel Examination,'" Revision 2, (ADAMS Accession No. ML19318D189) is acceptable for demonstrating that the CLB analyses of the RCP flywheel remain valid for the subsequent period of extended operation.

Topical report PWROG-17011-NP-A, Revision 2, provides generic deterministic and risk-informed analyses for Westinghouse RCP flywheels that are applicable to 80-year operating periods. PWROG-17011-NP-A, Revision 2, extends the applicability of NRC-approved methodologies in WCAP-14535-A (ADAMS Accession No. ML18312A151) and WCAP-15666-A (ADAMS Accession No. ML18303A413) to the subsequent period of extended operation. These analyses form the basis for performing inservice inspections of the RCP flywheels on a 20-year inspection interval basis, as required by the provisions in TS Section 5.5.6, "Reactor Coolant Pump Flywheel Inspection Program."

Topical report PWROG-17011-NP-A, Revision 2, is an NRC-approved report and is acceptable for generic implementation in SLR TLAAs to support the continuation of 20-year RCP flywheel inspection intervals for 80-year operating periods, as documented in the staff's SE (ADAMS Accession No. ML19198A050) in the report. The staff's SE specifies that applications for implementing this methodology should confirm that 6,000 RCP start and stop cycles, which is the total number of cycles assumed for the generic fatigue crack growth calculation supporting WCAP-15666-A, "Extension of Reactor Coolant Pump Motor Flywheel Examination," remain bounding on a plant-specific basis for 80 years of operation.

SLRA Table 4.7.2 1 provides 1,200 cycles as the total projected RCP start and stop cycles for 80 years. Dominion Energy stated that this was calculated from the 200 heatup and cooldown cycles from SLRA Table 4.3.1-1. The staff noted that 200 cycles are the CLB design cycles for heatup and cooldown, which bound the projected 80-year cycles of heatup and cooldown (99 maximum for Unit 1 and 113 maximum for Unit 2), as shown in SLRA Table 4.3.1-1. The staff verified and found acceptable the calculation of the projected RCP start and stop cycles for the subsequent period of extended operation. The staff notes that there is significant margin between the projected 1,200 RCP start and stop cycles and the 6,000 cycles assumed in the PWROG-17011-NP-A, Revision 2, methodology. Because Dominion Energy used the 200 heatup and cooldown cycles that bound the 80-year projected cycles and the RCP start and stop cycles of the RCP flywheels of NAPS, Units 1 and 2 have significant margin from the cycles used in the analyses in PWROG-17011-NP-A, Revision 2, the staff finds that Dominion Energy has adequately implemented the PWROG-17011-NP-A, Revision 2, methodology to support continuation of 20-year RCP flywheel inspection intervals for an 80-year operating period. The staff also finds that that Dominion Energy's TLAA supports continued validity of the provisions of TS Section 5.5.6 for the subsequent period of extended operation.

The staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(i), that the analysis for the RCP flywheel remains valid for the subsequent period of extended operation. Additionally, the analysis meets the acceptance criteria in SRP-SLR

Section 4.7.2.1.1 because, as described above, Dominion Energy demonstrated that the existing RCP flywheel fatigue crack growth analysis to support the current inspection interval remains bounded for the subsequent period of extended operation.

4.7.2.3 UFSAR Supplement

SLRA Section A3.7.2 provides the UFSAR supplement summarizing the RCP flywheel fatigue crack growth analysis. 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 the UFSAR supplement meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the RCP flywheel fatigue crack growth analysis, as required by 10 CFR 54.21(d).

4.7.2.4 Conclusion

On the basis of its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(i), that the RCP flywheel fatigue crack growth analysis remains valid for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.3 Leak-Before-Break Analysis

4.7.3.1 Summary of Technical Information in the Application

SLRA Section 4.7.3, as supplemented by letters dated February 4, 2021, and April 1, 2021 (ADAMS Accession Nos. ML21035A303 and ML21091A186), describes Dominion Energy's TLAA on the leak-before-break (LBB) methodology for the RCS primary loop piping. WCAP-11163, Revision 0 (August 1986) and its Supplement 1 (January 1988) demonstrated that the dynamic effects of postulated ruptures in the primary loop piping can be excluded from the design basis for Units 1 and 2. Subsequently, additional LBB evaluations were performed to maintain an updated analysis of record. These evaluations considered the replacement SG project, RCP support modification project, initial license renewal project (60-year operation), 2 percent power uprate project, measurement uncertainty recapture power uprate project, and full structural weld overlay and inlay project.

The updated LBB analysis for 80 years of operation is documented in WCAP-11163, Revision 2, "Technical Justification for Eliminating, Large Primary Loop Pipe Rupture as the Structural Design Basis for North Anna Units 1 and 2 Nuclear Power Plants for the Subsequent License Renewal Program (80 Years) Leak-Before-Break Evaluation" (January 2020). Since the piping systems include cast austenitic stainless steel (CASS), fracture toughness properties considering thermal aging were determined for each heat of material in accordance with NUREG/CR-4513, Revision 2, "Estimation of Fracture Toughness of Cast Stainless Steels during Thermal Aging in LWR Systems," issued May 2016 (ADAMS Accession No. ML16145A082), in the 80-year LBB analysis. A fatigue crack growth analysis was performed as a defense-in-depth evaluation to demonstrate that postulated small surface cracks do not become through-wall cracks for 80 years of operation.

Dominion Energy dispositioned the LBB TLAA for the RCS primary loop piping in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the TLAA has been projected to the end of the subsequent period of extended operation.

4.7.3.2 Staff Evaluation

The staff reviewed Dominion Energy's LBB TLAA for the RCS primary loop piping and the corresponding disposition of 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.7.3.1.2 and the acceptance criteria in SRP-SLR Section 4.7.2.1.2. These SRP-SLR sections provide the general guidance for plant-specific TLAAs. In addition, Standard Review Plan (SRP; NUREG-0800) Section 3.6.3, Revision 1, provides detailed guidance for LBB analyses and the 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. As addressed in SRP Section 3.6.3, LBB analyses should consider the effects of thermal aging on material fracture toughness.

The staff's review focused on the potential piping degradation, changes or updates to the existing LBB analysis, time-dependent material properties and their effects on the LBB analysis.

The pipes are fabricated with A351-CF8A CASS (centrifugal casting) and the elbows are fabricated with A351-CF8M CASS (static casting). For the fracture mechanical analysis (J-integral analysis), the applicant followed the guidance in NUREG/CR-4513, Revision 2, to calculate the saturated fracture toughness values of the CASS materials for pipes and elbows. The fracture toughness calculations are based on the known compositions of the CASS materials. Since Revision 1 of NUREG/CR-4513 is referenced as a guidance document for estimating fracture toughness of CASS materials in GALL Report-SLR AMP XI.M12, the staff needed to confirm that the use of the guidance in NUREG/CR-4513, Revision 2, would not lead to a less conservative crack stability analysis in comparison with the analysis using the guidance in NUREG/CR-4513, Revision 1.

With respect to the CF8M CASS materials for elbows, the staff noted that the fracture toughness estimated in Revision 2 of NUREG/CR-4513, is less than that estimated in Revision 1 of NUREG/CR-4513 for each critical location. The staff finds that the use of the lower fracture toughness values is a conservative approach and, therefore, use of NUREG/CR-4513, Revision 2, to project the fracture toughness for CF8M CASS materials is acceptable.

With respect to the CF8A CASS materials for pipes, the staff noted that the fracture toughness estimated in Revision 2 of NUREG/CR-4513 is slightly greater than that estimated in Revision 1 of NUREG/CR-4513 for each critical location. However, the staff noted that both of the fracture toughness values in Revisions 1 and 2 of NUREG/CR-4513 are high enough to ensure crack stability for the pipes. Therefore, the staff finds that the use of Revision 2 of NUREG/CR-4513 to project the fracture toughness for CF8A CASS materials is acceptable.

WCAP-11163, Revision 2, includes a fracture mechanics analysis (J-integral analysis) for the critical locations because these locations are fabricated with CASS materials that are susceptible to thermal aging embrittlement. The fracture mechanics analysis considers the material's resistance to unstable crack propagation. The fracture mechanics analysis evaluates the potential crack instability due to a local failure mechanism.

The results of the facture mechanics analysis are provided in Tables 7-1 and 7-2 of WCAP-11163, Revision 2, for Units 1 and 2, respectively. The staff finds that the analysis has adequately demonstrated that the critical locations meet either of the following acceptance criteria for crack stability and, therefore, is acceptable: (1) the applied J-integral (J_{app}) value is less than the fracture toughness (J_{Ic}) of the material so that the crack will not initiate crack advance; or (2) if J_{app} is greater than or equal to J_{Ic}, the applied tearing modulus is less than material's tearing modulus and J_{app} is less than the maximum fracture toughness of the material (J_{max}) so that crack advance will be arrested and will not result in pipe rupture. The staff also finds that the fracture mechanics analysis confirms that there is a minimum margin of two between the critical crack size and leak crack size at each critical location, consistent with SRP-SLR Section 3.6.3, subparagraph III.11.C.iv, and therefore is acceptable.

SLRA Section 4.7.3 considered the effects of high and low cycle fatigue crack growth. WCAP-11163, Revision 2, also stated that the environmental effects of reactor coolant on the fatigue crack growth were considered. Dominion Energy stated that the crack growth is very small, regardless of the evaluated material.

In the fatigue analysis, Dominion Energy used the normal, upset and test transients and their cycles that remain applicable for 80 years of operation. Dominion Energy also postulated circumferential semielliptical surface cracks and various initial crack depths that are detectable by inservice inspections. The staff further notes that the fatigue analysis approach is consistent with that of the existing fatigue crack growth analysis associated with the LBB analysis in the CLB (WCAP-11163, Revision 0). In its review, the staff noted that the 80-year fatigue crack growth of the postulated flaws is insignificant. Therefore, the staff finds that the analysis results provide reasonable assurance that the potential fatigue crack growth would not affect the integrity of the primary coolant loop piping and the crack stability determined in the LBB analysis.

<u>LBB Evaluation of Alloy 82/182 Welds</u>

As summarized in Table ES-1 and Section 7.3 of WCAP-11163, Revision 2, the NAPS RCS has alloy 82/182 welds at the SG inlet and outlet nozzles. The Unit 1 SG inlet nozzle welds have full structural weld overlays, as described below. The Unit 1 SG outlet nozzle welds have not been mitigated with weld overlays or inlays. The evaluation of these welds is described below.

For Unit 2, the SG inlet and outlet nozzle welds are fabricated with alloy 82/182 that have been mitigated with alloy 52/152 inlays. The staff finds that the mitigation of alloy 82/182 dissimilar metal welds with alloy 52/152 inlays is consistent with the guidance for mitigation of alloy 82/182 described in Regulatory Issue Summary (RIS) 2010-07, "Regulatory Requirements for Application of Weld Overlays and Other Mitigation Techniques in Piping Systems Approved for Leak-Before-Break" (ADAMS Accession No. ML101380231), and, therefore, acceptable to mitigate PWSCC. Accordingly, the staff finds that the applicant's LBB analysis for the RCS primary loop piping is not affected by the mitigated alloy 82/182 welds of Unit 2 SG nozzles and remains valid.

For the Unit 1 SG inlet nozzle welds, the full structural weld overlays were previously approved in the staff's SEs dated January 27, 2012 and March 13, 2012 (ADAMS Accession Nos. ML11348A219 and ML12067A133). These weld overlays are fabricated with alloy 52/52M, which provides acceptable mitigation of PWSCC as discussed in RIS 2010-07.

WCAP-11163, Revision 2, states that the updated LBB evaluation for the Unit 1 SG inlet nozzle welds with the structural weld overlays demonstrates acceptable LBB behavior for the period of SLR (80 years of operation), as documented in Structural Integrity Associates (SIA) Calculation 1100226.303, Revision 3.

In its review, the staff found that the updated LBB analysis for the Unit 1 SG inlet nozzle welds with weld overlays is acceptable because: (1) the application of the structural weld overlay is an effective mitigation approach for alloy 82/182, consistent with the guidance in RIS 2010-07, (2) the leakage crack size is determined by accounting for the presence of the structural weld overlay, (3) the estimation of the leakage crack considers potential PWSCC in the alloy 82/182 welds and its effects on the leakage rate (e.g., PWSCC crack morphology characteristics, such as crack surface roughness, and their effects on the leakage rate), (4) the leakage crack size is based on 10 gallons-per-minute (gpm), which is 10 times the leakage detection capability (1 gpm), and (5) the critical crack size, which is determined in the limit load analysis, meets a minimum margin of two compared to the leakage crack size, consistent with the guidance in SRP Section 3.6.3.

Dominion Energy also stated that the Unit 1 SG outlet nozzle alloy 82/182 welds have not been mitigated with weld overlays or inlays. In its supplement dated April 1, 2021 (ADAMS Accession No. ML21091A186), Dominion Energy explained that PWSCC in these nickel-alloy welds is managed by performing inspections in accordance with ASME Code Case N-770 as incorporated by reference in 10 CFR 50.55a, "Codes and Standards." Dominion Energy also explained that these mandatory inspections are included in the AMP described in SLRA Section 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 staff finds that the mandatory inspections of ASME Code Case N-770, as incorporated in 10 CFR 50.55a, are adequate to ensure the structural integrity of the unmitigated SG outlet nozzle welds. The staff also notes that these SG outlet nozzle welds are exposed to the cold leg temperature (556 °F) during normal operation and therefore the potential and severity of PWSCC in these welds are significantly less than those in the SG inlet welds exposed to the hot-leg temperature (622 °F). This finding is also consistent with the statement in RIS 2010-07 that the staff has not identified any violations of the regulations with respect to LBB analyses for unmitigated welds.

Dominion Energy also described the critical crack size and leakage crack size of the Unit 1 SG outlet nozzle welds in Table 7-5 of WCAP-11163, Revision 2. Dominion Energy indicated that the critical crack size was determined in the limit load analysis by using the tensile properties of alloy 82/182 welds. In the calculation of the leakage crack size, Dominion Energy used a conservative factor of 1.69 and further explained that the use of the conservative factor is consistent with the staff-approved LBB analyses of alloy 82/182 welds for other plants (ADAMS Accession Nos. ML14209A027 and ML110410119). The conservative factor increases the leakage crack size by 69 percent to account for the effects of PWSCC crack morphology characteristics (e.g., surface roughness and number of turns) on the leakage rate and leakage crack size.

In its review, the staff finds that the conservative factor, which considers the effects of PWSCC crack surface characteristics on the leakage crack size, is acceptable because the factor (1.69) is consistent with the previous staff-approved LBB evaluations for alloy 82/182 welds and the LBB evaluation approach in the following reference: "Impact of PWSCC and Current Leak Detection on Leak-Before-Break," NUREG/CP-0191, "Proceedings of Conference on Vessel

Head Penetration, Inspection, Cracking and Repair, Volume 2, Part 1, Session III, September 29 to October 2, 2003" (ADAMS Accession No. ML053630277).

In its supplement dated April 1, 2021, Dominion Energy also explained that Table 7-1 of EPRI Technical Report 1011808, "Materials Reliability Program: Leak-Before-Break Evaluation for PWR Alloy 82/182 Welds (MRP-140)," shows long periods of time for PWSCC growth for nickel-based alloy material in relation to LBB analyses. Dominion Energy further stated that TS 3.4.13 specifies actions that require a reactor shutdown in the event of RCPB through-wall leakage. Considering the long periods of time for crack growth from a leakage crack size to a critical crack size and TS-required action for RCPB through-wall leakage, Dominion Energy determined that sufficient time is available for the flaw to be identified and for the reactor to be shut down.

The staff finds that the applicant's clarification discussed above is acceptable because the fatigue crack growth analyses in WCAP-11163, Revision 2, and the PWSCC growth analyses in EPRI MRP-140 support the statement that crack growth due to fatigue and PWSCC from a leakage crack to a critical crack in the primary loop piping takes a significantly longer time than the time period needed to detect leakage and safely shut down a reactor (years of crack growth to the critical crack size compared to several days for leakage detection and reactor showdown).

<u>Summary</u>

As discussed above, the staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(ii), that the LBB analysis for the RCS primary loop piping has been projected to the end of the subsequent period of extended operation. Additionally, the LBB TLAA meets the acceptance criteria in SRP-SLR Section 4.7.2.1.2 because it demonstrates acceptable results for the subsequent period of extended operation.

4.7.3.3 UFSAR Supplement

SLRA Section A3.7.3 provides the UFSAR supplement, as amended by letter dated February 4, 2021 (ADAMS Accession No. ML21035A303), summarizing the LBB TLAA for the RCS primary loop piping. The staff reviewed SLRA Section A4.7.3, consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review of the UFSAR supplement, as amended by letter dated February 4, 2021 (ADAMS Accession No. ML21035A303), the staff finds that it meets the acceptance criteria in SRP-SLR Section 4.7.2.2, and is, therefore, acceptable. The staff also finds that Dominion Energy provided an adequate summary description to address the LBB TLAA for the RCS primary loop piping, as required by 10 CFR 54.21(d).

4.7.3.4 Conclusion

On the basis of its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(ii), that the LBB TLAA for the RCS primary loop piping has been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement, as amended by letter dated February 4, 2021 (ADAMS Accession No. ML21035A303), contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.4 Spent Fuel Pool Liner Fatigue Analysis

4.7.4.1 Summary of Technical Information in the Application

SLRA Section 4.7.4 describes Dominion Energy's TLAA for spent fuel pool (SFP) liner fatigue. Dominion Energy dispositioned the TLAA for the SFP liner in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the period of extended operation.

4.7.4.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAA for the SFP liner fatigue analysis 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.

The staff noted that the projected thermal cycles for 80 years of operation for the three design conditions (normal core offload, abnormal core offload, faulted) of the SFP liner stated in the SLRA were 108, 11 and 1, respectively. The staff reviewed UFSAR Section 9.1.3.1 and confirmed that the fuel pit temperatures are the same as those noted in the SLRA and used in thermal cyclic loading calculations. The staff noted that, since the faulted Condition 3 is an extreme case with a very low likelihood of occurrence, it was not increased for the subsequent period of extended operation. The staff further noted that considering the most conservative case of fatigue effects, in the reevaluated fatigue liner calculations in accordance with ASME Code Section III (2010 edition), for 80 years of operation, the maximum allowable number of cycles estimated for the controlling component (plate-stiffener weld) remains at 1,200, 20, and 9, respectively, for the three design conditions stated in the SLRA. The staff verified, as confirmed by Dominion Energy by letter dated March 24, 2021 (ADAMS Accession No. ML21084A182, Request for Confirmatory Information (RCI) No. TLAA 4.7.4-A), and the audit review (ADAMS Accession No. ML21036A060) of Calculation 11715-NMB-282-FC, Revision 0, Addendum 00B, "Thermal Stress Analysis of Fuel Pool Liner—Fuel Pool Liner Fatigue Evaluation for 80 Years Plant Life, NAPS Units 1 & 2," and supporting referenced Calculation CE-1272, Revision 0, "Analysis of NAPS Fuel Pool Liner at 212 Degrees Fahrenheit," that Dominion Energy calculated the limiting cumulative damage (or CUF) due to fatigue effects of thermal cyclic loadings for the controlling component (i.e., plate-stiffener weld) of the SFP liner from the three design conditions described in the SLRA to be 0.75. This is less than the acceptance criterion for CUF of 1.0 stated in NB-3222.4(e) of ASME Code Section III, 2010 edition.

The staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(ii), that the analysis for the SFP liner fatigue has been projected to the end of the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.7.2.1.2 because the cumulative fatigue damage due to fatigue effects from projected thermal cyclic loading conditions for 80 years of operation were recalculated and shown to be less than the allowable fatigue usage factor limit of 1.0.

4.7.4.3 UFSAR Supplement

SLRA Section A3.7.4 provides the UFSAR supplement summarizing the SFP liner fatigue analysis. The staff reviewed SLRA Section A3.7.4 consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review of the UFSAR supplement, the staff finds it meets the acceptance criteria in SRP-SLR Section 4.7.2.2, and, therefore, is acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the SFP fatigue analysis, as required by 10 CFR 54.21(d).

4.7.4.4 Conclusion

On the basis of its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(ii), that the analysis for the SFP liner has been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.5 Piping Subsurface Flaw Evaluations

4.7.5.1 Summary of Technical Information in the Application

SLRA Section 4.7.5 describes Dominion Energy's TLAAs for flaw evaluations performed on previously detected piping subsurface indications. The calculations were assessed for 80 years of operation. Dominion Energy dispositioned the TLAAs for subsurface indications in the Unit 1 safety injection piping, the Unit 1 main steam piping, the feedwater piping of both units, and the seismic Category 1 piping for both units 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.

4.7.5.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAAs for the safety injection piping, main steam and feedwater piping, and the seismic Category 1 piping, as well as the corresponding disposition of the TLAAs in accordance with 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.

Section 5.2 of WCAP-18503-P, (Proprietary), Revision 1, "Resolution of North Anna Power Station Units 1 & 2 Time-Limited Aging Analyses for Subsequent License Renewal," July 2020, discusses the main inputs to the fracture mechanics assessment that were re-evaluated based on 80 years of operation. Specifically, Section 5.2.3 discusses how the stresses, stress intensity factor equations, and fatigue crack growth (FCG) rates for the subsequent period of extended operation compare to those used in the initial fracture mechanics assessment. The calculations were performed in accordance with ASME Code Section XI, Nonmandatory Appendices A and C. Based on these current revised inputs and methodologies, the number of allowable cycles was recalculated for each piping line, as identified in Table 4.7.5-1 of the application. The staff compared the calculated number of cycles assumed in the current analyses to the projected number of cycles the components would experience for 80 years of operation. The subject piping components are conservatively expected to experience 200 full-stress cycles during the 80-year period, which is consistent with the number of plant heatup and cooldown cycles identified in SLRA Table 4.3.1-1. The number of allowed cycles in SLRA Table 4.7.5-1 calculated for the components range from 2,327 to 42,508 cycles, more than 10 times greater than the number of estimated cycles. Therefore, the staff confirmed that the number of allowable cycles provides significant margin for these piping subsurface indications for 80 years of operation.

Based on the large margin, the staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.7.2.1.2 because the projected number of cycles is significantly lower than the cycles required to grow the flaws to an unacceptable size, consistent with 10 CFR 54.21(c)(1)(ii).

4.7.5.3 UFSAR Supplement

SLRA Section A3.7.5 provides the UFSAR supplement summarizing the fatigue analyses of the piping subsurface flaws. The staff reviewed SLRA Section A3.7.5 consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the fatigue analyses of the piping subsurface flaws, as required by 10 CFR 54.21(d).

4.7.5.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(ii), that the analyses for piping subsurface flaws in the Unit 1 safety injection piping, the Unit 1 main steam piping, the feedwater piping for both units, and the seismic Category 1 piping for both units have been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.6 Reactor Coolant Pump Code Case N-481

4.7.6.1 Summary of Technical Information in the Application

SLRA Section 4.7.6 describes the applicant’s TLAA for the RCP casing as related to ASME Code Case N-481. The TLAA aspects of the analysis are the thermal aging of CASS and fatigue crack growth. Dominion Energy dispositioned the TLAA in accordance with 10 CFR 54.21(c)(1)(i) by demonstrating that its analyses related to Code Case N-481 remain valid for the subsequent period of extended operation.

4.7.6.2 Staff Evaluation

The staff reviewed Dominion Energy’s TLAA for the RCP casing integrity and the corresponding disposition of 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR Section 4.7.3.1.1 and the acceptance criteria in SRP-SLR Section 4.7.2.1.1.

The staff focused its review on the validity of the crack stability analysis and FCG analysis of the RCP casings at NAPS, Units 1 and 2, through the subsequent period of extended operation.

In March 1990, the ASME Code Committees approved Code Case N-481 to provide an alternative to the volumetric inspection of the RCP casing. The NRC accepted Code Case N-481 in RG 1.147, “Inservice Inspection Code Case Acceptability ASME Section XI Division 1, Revision 9,” April 1992. ASME Code Case N-481 allowed the elimination of the volumetric examination of the RCP casing with a fracture mechanics-based integrity evaluation supplemented by specific visual inspections. In March 2004, ASME annulled the Code Case and incorporated its provisions into the 2008 addenda of ASME Code Section XI.

In September 1991, Westinghouse published WCAP-13045, "Compliance to ASME Code Case N-481 of the Primary Loop Pump Casings of Westinghouse Type Nuclear Steam Supply System," which presented the structural integrity evaluation of the RCP casing to demonstrate compliance with ASME Code Case N-481, item (d). WCAP-13045 was based on structural integrity evaluations for a 40-year service life.

In 2001, Dominion Energy submitted for NRC review and approval the license renewal application for Units 1 and 2. To validate the acceptability of Code Case N-481 for the RCP casings during the subsequent period of extended operation, a site-specific evaluation was performed and documented in WCAP-15555, "A Demonstration of Applicability of ASME Code Case N-481 to the Primary Loop Pump Casings of the North Anna and Surry Units 1 and 2 for the License Renewal Program," in August 2000. By letter dated December 31, 2002, the staff approved the renewed licenses for NAPS, Units 1 and 2 (ADAMS Accession No. ML030160853).

By letter dated June 14, 2018 (ADAMS Accession No. ML18170A113), PWROG submitted PWROG-17033, Revision 1, "Update for Subsequent License Renewal: WCAP-13045, 'Compliance to ASME Code Case N-481 of the Primary Loop Pump Casings of Westinghouse Type Nuclear Steam Supply Systems,'" for NRC review and generic approval. The staff determined that PWROG-17033, Revision 1, demonstrated structural integrity of the Westinghouse-designed RCP casings for the subsequent period of extended operation (80 years) based on the crack stability and FCG analyses. The NRC staff concluded that PWROG-17033, Revision 1, is acceptable for generic use to address the TLAA of the RCP casing integrity to satisfy the requirements of 10 CFR 54.21(c)(1). In addition, the staff concluded that an applicant that uses PWROG-17033, Revision 1, in its SLRA, must satisfy the four conditions that the staff imposed as specified in the SE dated November 30, 2019 (ADAMS Accession No. ML19319A188). To demonstrate that visual inspections, in lieu of volumetric inspections, will continue to ensure the structural integrity of the RCP casings for the duration of the subsequent period of extended operation, the Dominion Energy SLRA referenced PWROG-17033, Revision 1, as being applicable to this TLAA for Units 1 and 2.

Condition 1 in the SE for PWROG-17033, Revision 1, requires that the applicant confirm that its RCPs are Westinghouse-designed models. Condition 2 requires that the applicant confirm that the Westinghouse-designed RCP is either a Model 63, Model 70, Model 93, Model 93A, Model 93A-1, Model 93D, Model 100A, or Model 100D, and was fabricated with SA-351 CF8 or CF8M material. SLRA Section 4.7.6 and WCAP-15555 specify that the RCPs pump casings at NAPS are Westinghouse Model 93A, which consist of SA-351 CF8 (Grade CF-8) cast stainless steel. Therefore, the staff finds that Dominion Energy has satisfied Conditions 1 and 2 because the RCP pump design and fabrication materials are consistent with those addressed in PWROG-17033, Revision 1.

Condition 3 requires that:

> for the crack stability analysis, the applicant must confirm that the screening loadings (forces, moments, J_{app}, and T_{app}) used in WCAP-13045 bound the plant-specific loadings. The applicant must also confirm the limiting material fracture toughness values (J_{Ic}, T_{mat}, and J_{max}) used in WCAP-13045 and PWROG-17033, Revision 1, bound the plant-specific fracture toughness values.

> If the screening loadings or material fracture toughness values in the WCAP-13045 and PWROG-17033 reports do not bound plant-specific values, the licensee needs to submit a plant-specific crack stability analysis to demonstrate structural integrity of the RCP casing as part of the subsequent license renewal application.

WCAP-18503, “Resolution of North Anna Power Station Units 1 & 2 Time-Limited Aging Analyses for Subsequent License Renewal,” summarizes all TLAAs performed or dispositioned as part of the NAPS SLRA. Sections 5.4.2.1 and 5.4.2.2 of WCAP-18503 provide the screening and plant-specific loadings and stability calculations, respectively, that are applicable to this TLAA. The plant-specific screening loadings were calculated and reported in WCAP-11163-P, “Technical Justification for Eliminating, Large Primary Loop Pipe Rupture as the Structural Design Basis for North Anna Units 1 and 2 Nuclear Power Plants for the Subsequent License Renewal Program (80 Years) Leak-Before-Break Evaluation.” Table 5-11 of WCAP-18503 shows that the plant-specific screening loadings from WCAP-11163-P are all bounded by those in WCAP-13045, except for the RCP outlet nozzle force. The staff finds that the RCP outlet nozzle force is acceptable in this specific instance because the load values are calculated conservatively and do not greatly exceed the screening level loads. In response to RCI 4.7.6-A (ADAMS Accession No. ML21258A354), the applicant confirmed that the appropriate reference for WCAP-18503 in the SLRA is Revision 2 of WCAP-18503. WCAP-18503, Revision 2, shows that the plant-specific screening loadings from WCAP-11163-P are all bounded by those in WCAP-13045, except for the RCP outlet nozzle force. A clarification provided in WCAP-18503, Revision 2, states that, for the RCP outlet nozzle, the slightly larger (less than 2 percent) calculated force is offset by the similarly slightly lower moment on the nozzle. In addition, WCAP-18503, Revision 2, shows a large margin in the stability results for the RCP pump casing. Based on these results, the staff finds that the slightly high RCP outlet nozzle force is acceptable in this specific instance because the applicant has demonstrated that the lower moment provides compensation for this force difference, and the stability analyses show a large margin.

Table 5-14 of WCAP-18503 contains the stability results for the Model 93A pump casings at NAPS and confirms that the fracture toughness values used in WCAP-13045 and PWROG-17033, Revision 1, bound the plant-specific fracture toughness values. Therefore, the staff finds that Dominion Energy has satisfied Condition 3 because the plant-specific screening loads and fracture toughness values for NAPS, Units 1 and 2, are bounded by or only slightly exceed those used in WCAP-13045 and PWROG-17033, Revision 1.

Condition 4 requires that:

> for the FCG analysis, the applicant must confirm that the transient cycles specified in the WCAP-13045 or PWROG-17033 report bound the plant-specific transient cycles for 80 years of operation. The applicant must confirm that the loadings used in the FCG analysis in WCAP-13045 bound the plant-specific applied loadings, considering potential increase in applied loading caused by plant-specific system operational changes, power uprate or piping modifications. If the FCG analysis inputs in WCAP-13045 bound the plant-specific conditions, the applicant must discuss how they are bounding in the subsequent license renewal application.

Section 5.4.2 of WCAP-18503 states that the design transients implemented in the generic FCG analysis for the RCP casing remain applicable for the subsequent period of extended operation.

The staff reviewed Tables 5-9 and 5-10 of WCAP-18503, which contain the significant thermal transients and other transients reviewed for the Model 93A Design FCG analysis for NAPS and confirmed that the projected number of cycles for 80 years of plant operation remain bounded by the FCG analysis as documented in WCAP-15555 and WCAP-13045. The staff also reviewed Section 3 of WCAP-18503, which discusses the 80-year transient cycle evaluations, taking into account the current configuration and operational characteristics of North Anna, and found that the transient definitions considered in PWROG-17033 continue to apply to NAPS. The full list of 80-year projected transient cycles are shown in Tables 3-1 through 3-5 of WCAP-18503. Based on the PWROG-17033 assessment of the FCG evaluation, the FCG rate for stainless steel in water, based on ASME Section XI, compared to the rates used in WCAP-13045, are comparable such that there will be no significant impact on the crack growth analysis. Additionally, the generic stresses in the FCG analysis envelope the various pump designs, and the stress intensity factors are consistent with current industry standards for similar FCG evaluations. There is such significant margin between the final crack growth and the flaw size used for stability that the 40-year transient cycles could be doubled and the final flaw size would still be less than the stability flaw size, 1/4T flaw depth, for the stability analysis in WCAP-13045. Therefore, the loading used in the FCG analysis in WCAP-13045 continues to bound the plant-specific loadings for the RCP casings at NAPS. The staff finds that Dominion Energy has appropriately addressed Condition 4 because it confirmed that the FCG information in PWROG-17033, Revision 1; WCAP-15555; and WCAP-13045, bounds the plant-specific FCG for 80 years of operation at NAPS, Units 1 and 2.

Therefore, the staff concludes that SLRA Section 4.7.6 has satisfied the four conditions imposed on users of PWROG-17033, Revision 1, as specified in the SE dated November 30, 2019 (ADAMS Accession No. ML19319A188).

Based on its review, the staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(i), that the analyses for the RCP casing remain valid for the subsequent period of extended operation.

Additionally, the analyses for the RCP casing meet the acceptance criteria in SRP-SLR Section 4.7.2.1.1 because the crack stability and FCG analyses remain valid for the subsequent period of extended operation, consistent with 10 CFR 54.21(c)(1)(i).

4.7.6.3 UFSAR Supplement

SLRA Section A3.7.6 provides the UFSAR supplement summarizing the RCP casing integrity analysis TLAA. The staff reviewed SLRA Section A3.7.6 consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review of the UFSAR supplement, the staff finds it meets the acceptance criteria in SRP-SLR Section 4.7.2.2, and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the RCP casing integrity analysis TLAA, as required by 10 CFR 54.21(d).

4.7.6.4 Conclusion

On the basis of its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(i), that the analyses for the RCP casing remain valid for the subsequent period of extended operation. The staff also concludes that the

UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.7 Cracking Associated with Weld Deposited Cladding

4.7.7.1 Summary of Technical Information in the Application

SLRA Section 4.7.7 describes Dominion Energy's TLAA for cracking associated with weld deposited cladding, referred to as "underclad cracking TLAA." Dominion Energy dispositioned the underclad cracking TLAA in accordance with 10 CFR 54.21(c)(1)(ii) by demonstrating that the analysis has been projected to the end of the subsequent period of extended operation.

4.7.7.2 Staff Evaluation

The staff reviewed Dominion Energy's underclad cracking TLAA and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.7.3.1.2 and the acceptance criteria in SRP-SLR Section 4.7.2.1.2. The staff reviewed the applicant's analysis by verifying that its implementation of the methodology in NRC-approved topical report PWROG-17031-NP-A, "Update for Subsequent License Renewal: WCAP-15338-A, 'A Review of Cracking Associated with Weld Deposited Cladding in Operating PWR Plants,'" Revision 1 (ADAMS Accession No. ML20132A221), is acceptable for demonstrating that the flaw tolerance analysis for the RPV underclad cracks has been projected to the end of the subsequent period of extended operation.

Topical report PWROG-17031-NP-A, Revision 1, provides generic fracture mechanics analyses that are applicable to 80-year operating periods. PWROG-17031-NP-A, Revision 1, extends the applicability of NRC-approved methodologies in WCAP-15338-A to the subsequent period of extended operation. The NRC staff approved the PWROG-17031-NP-A, Revision 1, methodology as a generic topical report and found it to be acceptable for implementation in SLR TLAAs to support the applicability of the analyses in WCAP-15338-A, which included FCG analysis and ASME Code Section XI, allowable flaw size evaluations, to the subsequent period of extended operation. The staff's SE (ADAMS Accession No. ML20085F669) in PWROG-17031-NP-A, Revision 1, states that SLR applicants that implement the report are to verify three items, specified as TLAA Action Items 1 to 3 in the SE, as part of their TLAA evaluation.

TLAA Action Item 1 states that SLR applicants are to confirm that the generic transient types and number of transient cycles in the Schrader letter (ADAMS Accession No. ML19253B327) used for the FCG analysis bound the projected number of cycles for the applicable transients for the subsequent period of extended operation. Dominion Energy stated the transient types and number of cycles in the Schrader letter bound those shown in SLRA Table 4.3.1-1. The staff reviewed Dominion Energy's confirmation by verifying that the transient types and cycles in the Schrader letter bound those in SLRA Table 4.3.1-1. Therefore, the staff finds Dominion Energy's confirmation of TLAA Action Item 1 acceptable.

TLAA Action Item 2 states that, to ensure the continued validity of 200 ksi√in toughness (KIC) value for RPV beltline forgings, based on an adjusted RT_{NDT} less than or equal to 270 °F for the high fluid temperature transients addressed in the Schrader letter, SLR applicants are to confirm that their limiting SA508, Class 2 or Class 3, RPV beltline forgings meet the PTS screening criterion of 270 °F in 10 CFR 50.61. Dominion Energy stated that the limiting SA508, Class 2 or

Class 3, RPV beltline forgings meet the PTS screening criterion of 270 °F as noted in SLRA Section 4.2.3, “Pressurized Thermal Shock,” and that, therefore, the continued validity of the KIC value of 200 ksi√in, and thus the IWB-3610 allowable flaw depths, would remain the same for the subsequent period of extended operation. The staff reviewed Dominion Energy’s confirmation by verifying that the materials listed in SLRA Tables 4.2.3-1 and 4.2.3-2 that are made of SA508, Class 2 or Class 3 (through cross-referencing with UFSAR Tables 5.2-26 and 5.2-27 for the material designation), meet the PTS screening criterion of 270 °F in 10 CFR 50.61. Therefore, the staff finds Dominion Energy’s confirmation of TLAA Action Item 2 acceptable.

TLAA Action Item 3 states that, to ensure that the large loss-of-coolant accident (LOCA) may be eliminated from consideration in the flaw evaluation in PWROG-17031-NP-A, Revision 1, based on plant-specific implementation of the LBB analysis, SLR applicants are to confirm their implementation of the LBB analyses for primary loop piping as part of their SLR applications. Dominion Energy stated it implemented LBB analyses for primary loop piping for the subsequent period of operation as noted in SLRA Section 4.7.3, “Leak-Before-Break,” and that therefore, the large loss-of-coolant (LOCA) may be eliminated from consideration in the flaw evaluation in PWROG-17031-NP-A, Revision 1. The staff reviewed Dominion Energy’s confirmation by verifying that the LBB analysis described in SLRA Section 4.7.3 is for the primary loop piping. Therefore, the staff finds Dominion Energy’s confirmation of TLAA Action Item 3 acceptable.

Based on the discussion above, the staff finds that Dominion Energy has adequately confirmed TLAA Action Items 1 to 3 in the staff’s SE in PWROG-17031-NP-A, Revision 1. As such, the staff finds Dominion Energy’s implementation of PWROG-17031-NP-A, Revision 1, as the basis for the underclad cracking TLAA to be acceptable. Accordingly, the staff finds that, in accordance with 10 CFR 54.21(c)(1)(ii), Dominion Energy has adequately projected the underclad cracking TLAA though the subsequent period of extended operation.

Additionally, the applicant’s basis for dispositioning the TLAA in accordance with 10 CFR 54.21(c)(1)(ii) meets the acceptance criteria in SRP-SLR Section 4.7.2.1.2 because: (a) Dominion Energy has projected the number of cycles for design transients associated with the TLAA to the end of the subsequent period of extended operation, and (b) Dominion Energy has demonstrated that the analysis in WCAP-15338-A remains acceptable for the subsequent period of extended operation through adequate implementation of PWROG-17031-NP-A, Revision 1.

4.7.7.3 UFSAR Supplement

SLRA Section A3.7.7 provides the UFSAR supplement summarizing the underclad cracking TLAA. The staff reviewed SLRA Section A3.7.7 consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review of the UFSAR supplement, the staff finds it meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address the underclad cracking TLAA, as required by 10 CFR 54.21(d).

4.7.7.4 Conclusion

On the basis of its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(ii), that the underclad cracking TLAA has been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.8 Steam Generator Tube Wear Evaluation

4.7.8.1 Summary of Technical Information in the Application

SLRA Section 4.7.8 describes Dominion Energy's TLAA for the evaluation of SG tube wear. The applicant previously evaluated tube wear as part of a MUR power uprate, as documented in CN-SGDA-02-23, "The Effect of an Uprate to 2,968 MWt NSSS Power for NAPS Units 1 and 2 on Steam Generator Tube Wear." This evaluation showed that less than 12 mils of wear was expected over 60 years of SG operation, when considering changes in secondary side fluid velocity and density related to the power uprate conditions. After 80 years of plant operation, the replacement SGs will have been in operation for 65 years, with 48 years of operation in the uprated condition for Unit 1 and 50 years in the uprated condition for Unit 2. The applicant concluded that extrapolation of tube wear from 60 to 80 years of plant operation will not result in unacceptably large rates of tube wear.

The SLRA states that the steam generator tube wear will be managed by the Steam Generators Program using the existing steam generator eddy current inspection consistent with NEI 97-06, "Steam Generator Program Guidelines."

Dominion Energy dispositioned the TLAA for the Units 1 and 2 SGs in accordance with 10 CFR 54.21(c)(1)(iii) by demonstrating that the effects of tube wear on the intended functions of the SGs will be adequately managed by the SG Program for the subsequent period of extended operation.

4.7.8.2 Staff Evaluation

The staff reviewed Dominion Energy's TLAA for SG tube wear and the corresponding disposition of the TLAA, in accordance with 10 CFR 54.21(c)(iii), consistent with the review procedures in SRP-SLR Section 4.7.3.1.3 and the acceptance criteria in SRP-SLR Section 4.7.2.1.3.

The staff reviewed Westinghouse Electric document CN-SGDA-02-23, "The Effect of an Uprate to 2,968 MWt NSSS Power for NAPS Units 1 and 2 on Steam Generator Tube Wear." This document addressed the effects of an MUR power uprate on the Units 1 and 2 SG tube wear. As stated in Section 4.7.8 of the SLRA, the calculations performed for the MUR power uprate determined that the amount of wear from 60 years of steam generator operation, including conservatively accounting for the time with uprate conditions, would result in less than 12 mils of new wear. Although the applicant does not rely on projecting the wear at 60 years of plant operation to 80 years of plant operation, the applicant stated that the calculated wear through 60 years of plant operation demonstrates there will not be unacceptably large rates of tube wear if extended to 80 years of plant operation. The applicant based this conclusion, in part, on the amount of new wear projected through 60 years of plant operation being less than the percentage of tube wear that would cause a tube to be removed from service. Although the staff understands the technical basis for the applicant's statement that low SG tube wear rates calculated through 60 years provide support for operation through 80 years, the staff did not reach any conclusions on that statement since the applicant is relying on periodic inspections via the SG Program to manage tube wear. Therefore, the staff review focused on the applicant's disposition of SG tube wear through management by the SG Program.

Units 1 and 2 TS require the licensee to verify that SG tube integrity is maintained in accordance with the SG Program. NEI 97-06, "Steam Generator Program Guidelines" (ADAMS Accession No. ML111310708) and its referenced EPRI Guidelines, establish the content of the SG Program. Use of the SG Program ensures that the inspections are consistent with accepted industry practices and determines the scope and methods used to determine whether the tubes contain flaws that require tube plugging. The SG tube inspection frequency is determined by projecting tube degradation until the next scheduled inspection by using existing degradation and growth rates, which provides reasonable assurance that the tubing will meet the SG performance criteria at the next scheduled inspection.

The staff's evaluation of the Steam Generators Program is documented in SER Section 3.0.3.1.5, which determined that the AMP will be adequate to manage the applicable aging effects for SG tubes, including tube wear.

The staff reviewed the most recent SG tube inspection reports submitted by North Anna in accordance with its TS. These SG inspection reports (ADAMS Accession Nos. ML18255A061 and ML19179A075) are from the 2018 and 2019 refueling outages for Units 1 and 2, respectively. The tube inspection results detailed in these reports demonstrate the licensee's capability to manage tube wear in the SGs by detection and tracking of wear indications. The reports indicate that the condition monitoring requirements for SG tube integrity were satisfied. No tubes were required to be plugged due to tube degradation in the most recent Units 1 and 2 SG inspections.

The staff is also familiar with the EPRI Guidelines and eddy current inspection practices that are implemented by the licensee as part of its SG Program. Inspection procedures are qualified through industry guidelines for different tube locations and degradation mechanisms. Tube wear at support plates and antivibration bars is readily detected by the inspection procedures used by the licensee. In addition, the eddy current probes, inspection personnel, inspection techniques, data analysis, and reporting criteria are all managed by the SG Program and qualified accordingly. Tube wear at support locations is typically slow growing and readily managed by periodic inspections. Therefore, for the reasons stated in this staff evaluation section, the staff concludes the applicant's SG Program is acceptable for managing tube wear.

The staff finds Dominion Energy has demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of tube wear on the intended functions of the SGs will be adequately managed for the subsequent period of extended operation.

Additionally, the SG tube wear TLAA meets the acceptance criteria in SRP-SLR Section 4.7.2.1.3 because the SG Program will adequately manage SG tube wear and ensure corrective actions are initiated before a loss of intended function of the SG tubes.

4.7.8.3 UFSAR Supplement

SLRA Section A3.7.8 provides the UFSAR supplement summarizing the SG tube wear evaluation. The staff reviewed SLRA Section A3.7.8 consistent with the review procedures in SRP-SLR Section 4.7.3.2.

Based on its review, the staff finds that the UFSAR supplement meets the acceptance criteria in SRP-SLR Section 4.7.2.2, and is, therefore, acceptable. Additionally, the staff finds that Dominion Energy provided an adequate summary description of its actions to address SG tube wear, as required by 10 CFR 54.21(d).

4.7.8.4 Conclusion

Based on its review, the staff concludes that Dominion Energy has provided an acceptable demonstration, in accordance with 10 CFR 54.21(c)(1)(iii), that the effects of tube wear on the intended functions of the SG will be adequately managed by the SG Program for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.8 <u>Conclusion for TLAAs</u>

The staff reviewed SLRA Section 4, "Time-Limited Aging Analyses." Based on its review, the staff concludes that Dominion Energy has provided a sufficient list of TLAAs, as defined in 10 CFR 54.3, and that Dominion Energy has 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 intended function(s) will be adequately managed during the subsequent period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff also reviewed the UFSAR supplement for the TLAAs and finds that it contains descriptions of the TLAAs sufficient to satisfy the requirements of 10 CFR 54.21(d). In addition, the staff concludes, as required by 10 CFR 54.21(c)(2), that no plant-specific, TLAA-based exemptions are in effect.

With regard to these matters, the staff concludes that there is reasonable assurance that Dominion Energy will continue to conduct the activities authorized by the renewed licenses in accordance with the CLB, and that any changes made to the CLB, to comply with 10 CFR 54.29 (a), are in accordance with the Atomic Energy Act of 1954, as amended, and NRC regulations.

SECTION 5 REVIEW BY THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

In accordance with Title 10 of the *Code of Federal Regulations* Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants,” the Advisory Committee on Reactor Safeguards (ACRS) reviews the subsequent license renewal application (SLRA) for North Anna Power Station, Units 1 and 2 (NAPS). The ACRS full committee also reviews the U.S. Nuclear Regulatory Commission staff’s safety evaluation report (SER) for the SLRA. The applicant and the NRC staff will attend the ACRS full committee meeting to discuss issues associated with the SLRA. After the ACRS completes its review of the SLRA and the SER, the ACRS full committee issues a report discussing the results of its review.

SECTION 6 CONCLUSION

The staff of the U.S. Nuclear Regulatory Commission (NRC) reviewed the subsequent license renewal application (SLRA) for North Anna Power Station, Units 1 and 2 (NAPS) 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). Title 10 of the *Code of Federal Regulations* Section 54.29, “Standards for Issuance of a Renewed License” (10 CFR 54.29), sets the standards for issuance of a renewed license. In accordance with 10 CFR 54.29, the Commission may issue a renewed license if it finds, among other things, that: (a) actions have been identified and have been or will be taken, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis (CLB); and (b) the applicable requirements of Subpart A of 10 CFR Part 51 (addressing environmental review) have been satisfied.

On the basis of its review of the NAPS license renewal application, the staff determined that the applicant has met the requirements of 10 CFR 54.29(a). Specifically, actions have been identified and have been taken or will be taken with respect to: (1) managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21(a)(1), and (2) time-limited analyses that have been identified to require review under 10 CFR 54.21(c).

Concerning 54.29(b), the staff’s review of environmental impacts under the requirements of 10 CFR Part 51, Subpart A, “National Environmental Policy Act—Regulations Implementing Section 102(2),” will be documented in NUREG-1437, “Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 7, Second Renewal, Regarding Subsequent License Renewal for North Anna Power Station, Units 1 and 2.”

APPENDIX A

LICENSE RENEWAL COMMITMENTS

A. License Renewal Commitments

During the review of the North Anna Power Station, Units 1 and 2 (NAPS) subsequent license renewal application by the staff of the U.S. Nuclear Regulatory Commission (NRC or the staff), Virginia Electric and Power Company (Dominion Energy or the applicant) made commitments related to the aging management programs (AMPs) used to manage aging effects for structures and components. The following table lists these commitments along with the implementation schedules and sources for each commitment. The subsequent period of extended operation for NAPS begins on May 25, 2032, for Unit 1, and January 29, 2033, for Unit 2.

Table A.1-1 NAPS License Renewal Commitments

No.	Program/Topic	NUREG-2191 SECTION	Commitment	Application Section	Implementation Schedule	Source
1	*ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD* program	XI.M1	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 inspections be performed for the following: a. Welds associated with sentinel locations assessed under ASME Code, Section XI, Appendix L include the safety injection 6-inch diameter RCS cold leg nozzles. One safety injection cold leg nozzle is to be inspected once per 10 years for either Unit 1 or Unit 2. b. The pressurizer spray nozzle stainless steel-to-safe-end weld is to be inspected once per 10 years for each unit. 2. Procedures will be revised to require periodic volumetric inspections of the steam generator feedwater nozzle thermal sleeves.	B2.1.1	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
2	*Water Chemistry* program	XI.M2	The *Water Chemistry* program is an existing preventive program that is credited.	B2.1.2	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
3	*Reactor Head Closure Stud Bolting* program	XI.M3	The *Reactor Head Closure Stud Bolting* program is an existing condition monitoring program that is credited.	B2.1.3	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
4	*Boric Acid Corrosion* program	XI.M10	The *Boric Acid Corrosion* program is an existing condition monitoring program that is credited.	B2.1.4	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
5	*Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components* program	XI.M11B	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.	B2.1.5	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703

No.	Program/Topic	NUREG-2191 SECTION	Commitment	Application Section	Implementation Schedule	Source
6	*Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)* program	XI.M12	The *Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)* program is an existing condition monitoring program that is credited.	B2.1.6	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
7	*PWR Vessel Internals* program	XI.M16A	The PWR Vessel Internals program is an existing condition monitoring program that will be enhanced as follows: 1. Procedures will be revised to provide guidance for inspections of the following reactor vessel internal components in accordance with the referenced report for each item: a. Control rod guide tube (CRGT) lower flange weld (MRP-227, Revision 1-A, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines") b. CRGT guide plates (cards) and the lower guide tube continuous Section sheaths and C-tubes (WCAP-17451-P, Revision 2, "Reactor Internals Guide Tube Wear - Westinghouse Domestic Fleet Operational Projections") (Revised – Supplement 1) c. Core barrel upper flange weld (UFW) (MRP-227, Revision 1-A) d. Core barrel lower girth weld (LGW) (MRP-227, Revision 1-A) e. Core barrel middle axial weld (MAW) and lower axial weld (LAW) (MRP-227, Revision 1-A) f. Core barrel upper axial weld (UAW) (MRP-227, Revision 1-A)	B2.1.7	Program, accounting for the impacts of a gap analysis, will be implemented 6 months prior to the subsequent period of extended operation, or alternatively, a plant-specific program may be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703 Supplement 1, Feb. 4, 2021, Dom-20-416, ML21035A303

No.	Program/Topic	NUREG-2191 SECTION	Commitment	Application Section	Implementation Schedule	Source
			g. Core barrel upper girth weld (UGW) (MRP-227, Revision 1-A) h. Core barrel lower flange weld (LFW) (MRP-227, Revision 1-A) i. Baffle-edge bolts (MRP-227, Revision 1-A) j. Baffle plates (MRP-227, Revision 1-A) k. Baffle-former bolts (MRP-227, Revision 1-A) l. Barrel-former bolts (MRP-227, Revision 1-A) m. Bottom-mounted instrumentation column bodies (MRP-227, Revision 1-A) n. Lower support column bodies (MRP-227, Revision 1-A) o. Lower support column bolts (MRP-227, Revision 1-A) p. Clevis insert bolts (MRP 2018-022, “Transmittal of MRP-191 Screening, Ranking, and Categorization Results and Interim Guidance in Support of Subsequent License Renewal at U.S. PWR Plants”) q. Clevis insert dowels (MRP 2018-022) r. Stellite™ wear surface on radial support keys (MRP 2018-022) s. Stellite™ wear surface on clevis inserts (MRP 2018-022) t. Fuel alignment pins for lower core plate (MRP 2018-022)			

No.	Program/Topic	NUREG-2191 SECTION	Commitment	Application Section	Implementation Schedule	Source
			u. Fuel alignment pins for upper core plate (MRP 2018-022) 2. (Deleted - Supplement 1) 2. Procedures will be revised to provide acceptance criteria for inspection results for the following reactor vessel internal components in accordance with MRP-227, Revision 1-A: a. Thermal shield flexures b. Lower support forging c. Upper core plate 3. Procedures will be revised to provide guidance for one-time inspections of the core barrel MAW and LAW in accordance with MRP 2019-009, “Transmittal of NEI 03-08 ‘Good Practice’ Interim Guidance Regarding MRP-227-A and MRP-227, Revision 1, PWR Core Barrel and Core Support Barrel Inspection Requirements”.			
8	*Flow-Accelerated Corrosion* program	XI.M17	The *Flow-Accelerated Corrosion* program is an existing condition monitoring program that is credited. (Updated - RAI Set 2)	B2.1.8	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug, 24, 2020, Dom-20-115, ML20246G703 RAI Set 2 Response, Apr. 29, 2021, Dom 21-134, ML21119A287
9	*Bolting Integrity* program	XI.M18	The *Bolting Integrity* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedure(s) will be enhanced to: a. Include inspections of pressure-retaining bolting in inaccessible areas when they become accessible by means such as	B2.1.9	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703

No.	Program/Topic	NUREG-2191 SECTION	Commitment	Application Section	Implementation Schedule	Source
			excavation, dewatering, or shielding/barrier removal, and b. Include a requirement during opportunistic maintenance activities to document the condition of bolt heads and threads. 2. Procedure(s) will be developed and/or revised to provide instructions for performing inspections of pressure boundary bolting for plant 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, for each unit, a representative sample of bolt heads and threads is inspected up to a maximum of 19 bolts for each material and environment combination. If opportunistic maintenance activities will not provide access to 20% of the population (for a material/environment combination) up to a maximum of 19 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			

No.	Program/Topic	NUREG-2191 SECTION	Commitment	Application Section	Implementation Schedule	Source
			each 10-year period during the subsequent period of extended operation, for each unit, a representative sample of bolt heads and threads is inspected up to a maximum of 19 bolts for each material and environment combination. If opportunistic maintenance activities will not provide access to 20% of the population (for a material/environment combination) up to a maximum of 19 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, for each unit, a representative sample of bolt heads and threads is inspected up to a maximum of 19 bolts for each material and environment combination. 3. Procedure(s) will be developed and/or 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 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			

No.	Program/Topic	NUREG-2191 SECTION	Commitment	Application Section	Implementation Schedule	Source
			of the inspections does not meet acceptance criteria. The number of increased inspections is determined in accordance with the site's corrective action process; however, there are no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20% of each applicable material 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 is conducted to determine the further extent of inspections. Additional samples are inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. The additional inspections include inspections of components with the same material and environment combination for each unit and are completed within the 10-year inspection interval in which the original inspection was conducted.			
10	*Steam Generators* program	XI.M19	The *Steam Generators* program is an existing condition monitoring program that is credited.	B2.1.10	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
11	*Open-Cycle Cooling Water* program	XI.M20	The *Open-Cycle Cooling Water* program is an existing condition monitoring program that is credited.	B2.1.11	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
12	*Closed Treated Water Systems* program	XI.M21A	The *Closed Treated Water Systems* program is an existing condition monitoring program that will be enhanced as follows: 1. A new procedure will be developed to specify that 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, 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	B2.1.12	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703

No.	Program/Topic	NUREG-2191 SECTION	Commitment	Application Section	Implementation Schedule	Source
			representative sample of 20% of the population (defined as components having the same material, water treatment program, and aging effect combination) or a maximum of nineteen components per population at each unit 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. 2. A new procedure will be developed 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. 3. A new procedure will be developed 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% 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 at			

No.	Program/Topic	NUREG-2191 SECTION	Commitment	Application Section	Implementation Schedule	Source
			both Unit 1 and Unit 2. 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	XI.M23	The *Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems* program is an existing condition monitoring program that is credited.	B2.1.13	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
14	*Compressed Air Monitoring* program	XI.M24	The *Compressed Air Monitoring* program is an existing condition monitoring program that is credited.	B2.1.13	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
15	*Fire Protection* program	XI.M26	The Fire Protection program is an existing condition monitoring program that will be enhanced as follows: 1. Procedures for fire barrier penetration seals, fire barriers, fire damper assemblies, and fire doors will be revised to require, where practical, identified degradation to be projected until the next scheduled inspection. For sampling-based inspections, results are evaluated against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) will maintain the components' intended functions throughout the subsequent period of extended operation based on the projected rate and extent of degradation. 2. Procedures will be revised to require that if degradation is detected within the inspection sample of penetration seals, the scope of the inspection is expanded to include additional seals in accordance with the Corrective Action Program. Additional inspections would be 20% of each applicable inspection sample; however, additional inspections would not exceed five. If any projected inspection results	B2.1.15	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703

No.	Program/Topic	NUREG-2191 SECTION	Commitment	Application Section	Implementation Schedule	Source
			will not meet acceptance criteria prior to the next scheduled inspection, inspection frequencies are adjusted as determined by the Corrective Action Program.			
16	*Fire Water System* program	XI.M27	The *Fire Water System* program is an existing condition monitoring and performance monitoring program that will be enhanced as follows: 1. Procedures will be developed or revised to specify: a. Standpipe and system flow tests for hose stations at the hydraulically most limiting locations for each zone of the system on a five-year interval to demonstrate the capability to provide the design pressure at required flow b. Wet pipe main drain testing will be performed on 20% of the standpipes and risers every 18 months on a refueling cycle basis. Acceptance criteria will be based upon monitoring flowing pressures from test to test to determine if there is a 10% reduction in full flow pressure when compared to previously performed tests. The Corrective Action Program will determine the cause and necessary corrective action. c. If a flow test or a main drain test does not meet acceptance criteria due to current or projected degradation additional tests are conducted. The number of increased tests is determined in accordance with the corrective action process; however, there are no fewer than two additional tests for each test that did not meet acceptance criteria. The additional inspections are completed within the interval in which the original test was conducted. If subsequent tests do not meet acceptance criteria, an extent of condition and extent of	B2.1.16	Program will be implemented and inspections or tests 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 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.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703 Supplement 1, Feb. 4, 2021, Dom-20-416, ML21035A303 Supplement 1, Dom-21-075 Mar. 17, 2021, ML21076B025 RAI Set 4 Response and Supplement 3, Dom-21-213, Jul. 29, 2021, ML21210A396

No.	Program/Topic	NUREG-2191 SECTION	Commitment	Application Section	Implementation Schedule	Source
			cause analysis is conducted to determine the further extent of tests. The additional tests include at least one test at the other unit with the same material, environment, and aging effect combination. d. Main drains for the standpipes associated with hose stations within the scope of subsequent license renewal will also be added to main drain testing procedures. 2. Procedures will be revised to perform internal visual inspections of sprinkler and deluge system piping to identify internal corrosion, foreign material, and obstructions to flow. 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% of the wet pipe sprinkler systems in scope for subsequent license renewal will have visual internal inspections of piping by removing a hydraulically remote sprinkler, performed every five years, consistent with NFPA 25, 2011 Edition, Section 14.2. During the next five-year inspection period, the alternate systems previously not inspected shall be inspected.			

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			b. Pre-action sprinkler systems - pre-action sprinkler systems in scope for subsequent license renewal will have visual internal inspections of piping by removing a hydraulically remote nozzle, 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 visual internal inspections of piping by removing a hydraulically remote nozzle, performed every five years, consistent with NFPA 25, 2011 Edition, Section 14.2. 3. Procedures will be revised to perform system flow testing at five-year intervals with flows representative of those expected during a fire. A flow resistance factor (C-factor) will be calculated to compare and trend the friction loss characteristics to the results from previous flow tests. 4. Procedures 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. In addition to the pipe wall thickness examination, the performance of opportunistic visual inspections of the fire protection system will be required whenever the fire water system is opened for maintenance. The piping age, time in service, and susceptibility to corrosion should be considered in determining sample location priorities.			

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			~~5. The activity of the jockey pump (*i .e.,* an increase in the number of pump starts or run time of the pump) will be monitored consistent with the "detection of aging effects" program element of NUREG-2191, Section XI.M41 . (Relocated from original Commitment 6 - Supplement 2)~~ (Deleted – Supplement 3) 5. The Unit 2 lube oil purification piping will have the piping pitch adjusted to improve drainage. A drain valve will be installed on the Unit 2 hydrogen seal oil fire protection piping to drain the line after system testing or initiation. As part of the drainage reconfiguration, visual inspections and wall thickness measurements will be performed to identify unexpected degradation. Piping with unexpected degradation will be replaced. (Revised – Supplement 1) (Renumbered - Supplement 2) 6. (Relocated to new Commitment 5 – Supplement 2) 6. Procedures will be revised for wet pipe sprinkler systems, a one-time test of sprinklers that have been exposed to water including the sample size, sample selection criteria, and minimum time in service of tested sprinklers will be performed. At each unit, a sample of 3% or a maximum of ten sprinklers with no more than four sprinklers per structure shall be tested. Testing is based on a minimum time in service of fifty years and severity of operating conditions for each population. (Revised - Supplement 1) (Completed – Supplement 2) 7. Procedures will be revised to perform a visual inspection of the fire protection pump			

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			suction strainers for loss of material on a 12-year frequency. (Added - Supplement 3)			
17	*Outdoor and Large Atmospheric Metallic Storage Tanks* program	XI.M29	The *Outdoor and Large Atmospheric Metallic Storage Tanks* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedures will be revised to require periodic visual inspections of the RWSTs and CCTs be performed at each refueling outage to confirm that the mastic sealant at the RWSTs and CCTs insulation and concrete foundation interface is intact. The visual inspections of the sealant will be supplemented with physical manipulation to detect any degradation. If there are any identified flaws, the mastic sealant will be repaired or replaced, and follow-up examination of the tank's surfaces will be conducted if deemed appropriate. An inspection of the caulk at the tank and concrete foundation interface will be included in the sample when the RWSTs and CCTs external insulation is removed and the caulk will be sampled for external surface visual examinations ten years before the subsequent period of extended operation. Results will be forwarded to Engineering for evaluation and the need for additional inspections will be determined based on projected corrosion rates. 2. Procedures will be revised to require the caulking at the ECST vent and vacuum breaker penetration-concrete missile barrier interface be inspected on an 18-month frequency to confirm that the caulking is intact. The visual inspections will be supplemented with physical manipulation to detect any degradation. If there are any identified flaws.	B2.1.17	Program will be implemented and inspections or tests 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 refueling outage prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703 Supplement 1, Feb. 4, 2021, Dom-20-416, ML21035A303 Supplement 4, Dom-21-280, Aug. 26, 2021, ML21238A297

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			the caulking will be repaired or replaced. (Added - Supplement 4} 3. Procedures will be revised to require visual and surface examination of the exterior surfaces of the RWSTs, CATs, and CCTs be performed to identify any loss of material or cracking. A minimum of either 25 one-square foot sections or 20% of the surface area of insulation will be required to be removed to permit inspection of the exterior surface of each tank. The procedure will specify that sample inspection points be distributed in such a way that inspections occur near the bottoms, at points where structural supports, pipe, or instrument nozzles penetrate the insulation, and where water could collect such as on top of stiffening rings. If no unacceptable loss of material or cracking is observed, subsequent external surface examinations of insulated tanks will inspect for indications of damage to the jacketing, evidence of water intrusion through the insulation, or evidence of damage to the moisture barrier of tightly adhering insulation. (Renumbered - Supplement 4) 4. Unit 1 ECST: Procedures will be revised to require one-time thickness measurements of a sample of the Unit 1 ECSTs interior wall and tank bottom prior to the subsequent period of extended operation to assess potential degradation due to leakage identified from the missile shield into the pipe penetration area in the Auxiliary Feedwater Pump House. The samples will examine the ECSTs interior vertical steel shell region from the bottom of the tank along the pipe penetration area, extending six feet vertically up from the tank, as this is a region potentially most susceptible to external surface degradation. Tank bottom thickness measurements will also be performed. The inspection results will be			

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			projected to the end of the subsequent period of extended operation to confirm the Unit 1 ECSTs intended functions will be maintained throughout the subsequent period of extended operation based on the projected rate of degradation. Any degradation not meeting acceptance criteria will require periodic 10-year thickness measurements and a sample expansion along the leakage path consistent with the observed degradation. Unit 2 ECST: The Unit 2 ECST external vertical wall degradation projections to the end of the subsequent period of extended operation that exceed less than 0.1-inch wall thickness will be repaired prior to entering the subsequent period of extended operation. Periodic inspections of a minimum of five locations with the lowest wall thickness readings will be performed on a ten-year inspection frequency. Inspection results projected to the end of the subsequent period of extended operation that do not meet acceptance criteria will require an extent of condition and extent of cause to determine the further extent of inspection and corrective actions. Tank bottom thickness measurements will also be performed. (Revised – Supplement 1) (Renumbered - Supplement 4) 5. Procedures will be revised to require volumetric examination thickness measurements of the bottom of the RWSTs and CCTs be performed each 10-year period during the subsequent period of extended operation starting ten years before the subsequent period of extended operation. Results will be forwarded to Engineering for evaluation and the need for additional inspections will be determined based on projected corrosion rates. (Renumbered – Supplement 4)			

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			6. A new procedure will be developed to specify that additional inspections be performed consistent with NUREG-2191. If any inspections do not meet the acceptance criteria, additional inspections are conducted if one of the inspections does not meet acceptance criteria due to current or projected degradation (i.e., trending). (Renumbered – Supplement 4) a. For inspections where only one tank of a material, environment, and aging effect was inspected, all tanks in that grouping are inspected. b. For other sampling-based inspections there will be no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20% of each applicable material, environment, and aging effect combination inspected, whichever is less. 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 at the other unit. The additional inspections will be completed within the interval (i.e., 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 first half of the next inspection interval. These additional inspections conducted in the next inspection interval cannot also be credited towards the number of inspections in the latter interval. If any projected inspection results will not meet			

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			acceptance criteria prior to the next scheduled inspection, inspection frequencies are adjusted as determined by the Corrective Action Program. However, for one-time inspections that do not meet acceptance criteria, inspections are subsequently conducted at least at 10-year inspection intervals.			
18	*Fuel Oil Chemistry* program	XI.M30	The *Fuel Oil Chemistry* program is an existing condition monitoring program that will be enhanced as follows: 1. The Fuel Oil Chemistry program scope will be revised to include the security diesel generator fuel oil day tank. (Completed - Supplement 1) 2. Procedure(s) will be revised or developed to drain, clean internally to the extent practical, visually inspect internal surfaces (if physically possible), and perform tank bottom thickness measurements of the following tanks: (Revised - Supplement 1) • Emergency diesel generator fuel oil day tanks (procedures are currently available to drain and clean on demand) • SBO diesel generator fuel oil day tank (new procedure needed) • Diesel-driven fire pump 2 fuel oil storage tank (new procedure needed) • Security diesel generator fuel oil day tank (new procedure needed), • Underground fuel oil storage tanks (procedures are currently available). 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	B2.1.18	Program will be implemented and inspections 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.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703 Supplement 1, Feb. 4, 2021, Dom-20-416, ML21035A303

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			the subsequent period of extended operation and at least once every 10 years during the subsequent period of operation. Procedure(s) will be revised or developed as needed 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 is 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. Procedures will be revised or developed to perform a one-time draining, cleaning and internal visual inspection of the security diesel generator fuel oil supply tank between 30 and 40 years of service. Any degradation found during the internal visual inspection will be addressed by the Corrective Action Program. If degradation is observed, volumetric measurements will be performed. 4. Procedures will be updated to clarify the need to specifically monitor and trend water and biological activity in addition to particulates. (Completed - Supplement 1)			
19	*Reactor Vessel Material Surveillance* program	X1.M31	The *Reactor Vessel Material Surveillance* program is an existing condition monitoring program that is credited.	B2.1.19	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
20	*One-Time Inspection* program	XI.M32	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	B2.1.20	Program will be implemented and inspections begin 10 years before the	Application, Aug. 24, 2020, Dom-20-115, ML20246G703

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			AMP 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. The *One-Time inspection program* will perform a magnetic particle test inspection of the continuous circumferential transition cone closure weld and the accessible portions of the upper shell-to-transition cone girth weld on each steam generator (essentially. 100% examination coverage of each weld) prior to the subsequent period of extended operation. (Updated - Supplement 2) Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.		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.	Supplement 1, Dom-21-075 Mar. 17, 2021, ML21076B025
21	*Selective Leaching* program	XI.M33	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 since 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.	B2.1.21	Program will be implemented and inspections 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	Application, Aug. 24, 2020, Dom-20-115, ML20246G703

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			Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.		period of extended operation.	
22	ASME Code Class 1 *Small-Bore Piping* program	XI.M35	The *ASME Code Class 1 Small-Bore Piping* program is a new condition monitoring program that augments the existing ASME Code, Section XI requirements and is applicable to ASME Code Class 1 small-bore piping and systems with a NPS diameter less than 4 inches and greater than or equal to 1 inch. This program provides for volumetric examination of a sample of full penetration (butt) welds and partial penetration (socket) welds in Class 1 piping to manage cracking due to stress corrosion cracking or thermal or vibratory fatigue loading. Volumetric examinations will employ techniques that have been demonstrated to be capable of detecting flaws and discontinuities in the examination volume of interest. The extent and schedule for volumetric examination is based on plant-specific operating experience and whether actions have been implemented that effectively mitigate the cause(s) of any past cracking. The program provides for a one-time inspection of a sample of the population of welds (butt welds or socket welds) for plants that have not experienced cracking or have experienced cracking but have implemented corrective actions, such as a design change, to effectively mitigate the cause(s) of the cracking. The program provides for periodic inspection of a sample of the population of welds (butt welds or socket welds) that have experienced cracking and have not implemented corrective actions to effectively mitigate the cause(s) of the cracking.	B2.1.22	Program will be implemented and inspections are 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 to extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703

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			Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.			
23	*External Surfaces Monitoring of Mechanical Components* program	XI.M36	The *External Surfaces Monitoring of Mechanical Components* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedures will be revised to specify 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 ensure the components' intended functions are maintained. 2. Procedures will be revised to specify that visual inspections of elastomers and flexible polymers will cover 100% of accessible component surfaces. The minimum surface area for tactile inspections of elastomers and flexible polymers will be at least 10% of the accessible surface area. 3. A new procedure will be developed to specify the following to manage cracking of stainless steel, nickel-alloy, and copper alloy (>15% 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. Inspections for cracking will be performed from each of the stainless steel, nickel-alloy, and copper alloy (>15% Zn) component	B2.1.23	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703

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			populations every 10 years. Examinations are conducted on 20% 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. In addition, for each unit, both the inner and outer nickel-alloy reactor vessel flange leakage monitor tubes will be inspected every 10 years. For insulated outdoor components and indoor components exposed to condensation, following insulation removal, a minimum of 20% of the in-scope piping length, or 20% of the surface area for components whose configuration does not conform to a 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 stainless steel, nickel-alloy, and copper alloy (>15% 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% 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			

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			be inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. The additional inspections will include inspections of components with the same material, environment, and aging effect combination at both Unit 1 and Unit 2. 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. Procedures 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. Procedures 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	XI.M37	The *Flux Thimble Tube Inspection* program is an existing condition monitoring program that is credited.	B2.1.24	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
25	*Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* program	XI.M38	The *Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components* program is an existing condition monitoring program that will be enhanced as follows:	B2.1.25	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703 RAI Set 3 Response, Dom-21-184, May 27, 2021, ML21147A293

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			1. Procedures will be revised to require inspection of elastomeric and flexible polymeric components for the following: • Surface crazing, scuffing, loss of sealing, blistering, and dimensional change (e.g., “ballooning” and “necking”) • Loss of wall thickness • Exposure of internal reinforcement (e.g., reinforcing fibers, mesh, or underlying metal) for reinforced elastomers 2. Procedures will be revised to specify that visual inspection of elastomeric and flexible polymeric components is supplemented by tactile inspection to detect hardening or loss of suppleness. The minimum surface area for tactile inspections will be at least 10% of the accessible surface area. 3. Procedures will be revised to specify that follow-up volumetric examinations are performed where irregularities that could be indicative of an unexpected level of degradation are detected for steel components exposed to raw water, raw water (potable), or waste water. 4. Procedure(s) will be revised or developed 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% of the population (defined as components having the same material, environment, and aging effect			

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			combination) or a maximum of 19 components per population at each unit 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. (Deleted duplicate text - RAI Set 3) 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% of each applicable material, environment, and aging effect combination are 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 at both Unit 1 and Unit 2. The additional inspections will be completed within the interval (e.g., refueling outage interval, 10-year inspection interval) in which the			

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			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. 5. The existing inspections of the Unit 1 and Unit 2 bearing cooling system, performed under the Corrective Action Program, will be enhanced to require performance of a minimum of 10 piping wall thickness measurements at each Unit with a frequency not to exceed two refueling cycle intervals. Locations with a wall thickness of less than 50% will be selected and augmented as necessary considering prior inspection results, extent of degradation, rate of degradation, and timing of the next inspection. (Renumbered - RAI Set 3) 6. Procedure(s) will be revised or developed 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 (Renumbered - RAI Set 3)			
26	*Lubricating Oil Analysis* program	XI.M39	The *Lubricating Oil Analysis* program is an existing preventive program that is credited.	B2.1.26	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
27	*Buried and Underground Piping and Tanks* program	XI.M41	The Buried and Underground Piping and Tanks program is an existing condition monitoring program that will be enhanced as follows:	B2.1.27	Program will be implemented and inspections begin 10 years before the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703 Supplement 1, Feb. 4, 2021, Dom-20-416, ML21035A303

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			1. Procedures will be revised to obtain pipe-to-soil potential measurements for piping in the scope of SLR during the next soil survey within 10 years prior to entering the subsequent period of operation. 2. The following service water CP subsystems will be refurbished and reconnected before the last five years of the inspection period prior to entering the subsequent period of extended operation: a. The service water ‘D’ CP subsystem b. The service water ‘C’ CP subsystem associated with the buried carbon steel piping of the fuel oil system for the emergency electrical power system 3. The following buried piping materials will be replaced before the last five years of the inspection period prior to entering the subsequent period of extended operation. (Added - Supplement 1) a. The buried copper piping between the fire protection jockey pump and the hydropneumatic tank will be replaced with carbon steel. b. The buried carbon steel fill line piping for the security diesel fuel oil tank will be replaced with corrosion resistant material that does not require inspection (e.g., titanium alloy, super austenitic, or nickel alloy materials). 4. Procedures will be revised to specify that cathodic protection surveys use the -850 mV polarized potential, instant off criterion specified in NACE SP0169-2007 for steel piping acceptance criteria unless a suitable alternative polarization criteria can be		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.	RAI Set 4 Response and Supplement 3, Dom-21-213, Jul. 29, 2021, ML21210A396 Supplement 4, Dom-21-280, Aug. 26, 2021, ML21238A297

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			demonstrated. Alternatives will include the -100 mV polarization criteria, -750 mV criterion (soil resistivity is greater than 10,000 ohm-cm to less than 100,000 ohm-cm), -650 mV criterion (soil resistivity is greater than 100,000 ohm-cm), or verification of less than 1 mpy loss of material rate. a. The external loss of material rate is verified: • Every year when verifying the effectiveness of the cathodic protection system by measuring the loss of material rate. • Every 2 years when using the 100 mV minimum polarization. • Every 5 years when using the -750 or -650 mV criteria associated with higher resistivity soils. The soil resistivity is verified every 5 years. b. As an alternative to verifying the effectiveness of the cathodic protection system every five years, soil resistivity testing is conducted annually during a period of time when the soil resistivity would be expected to be at its lowest value (e.g., maximum rainfall periods). Upon completion of ten annual consecutive soil samples, soil resistivity testing can be extended to every five years if the results of the soil sample tests consistently have verified that the resistivity did not fall outside of the range being credited (e.g., for the -750 mV relative to a CSE, instant off criterion, measured soil resistivity values were greater than 10,000 ohm-cm). c. When using the electrical resistance corrosion rate probes: • The individual determining the installation of the probes and method of use will be qualified to NACE CP4, “Cathodic Protection Specialist” or similar • The impact of significant site features and local soil conditions will be factored into placement of the probes and use of the data		Program will be implemented and inspections 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	

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			5. Procedures will be revised to require a minimum of six excavations be conducted at each unit to inspect for loss of material due to selective leaching in ~~and five of the inspections at each unit destructively examine the~~ buried gray cast iron fire protection piping and piping components. The inspections will be conducted in the 10-year period prior to the subsequent period of extended operation and in each 10-year period during the subsequent period of extended operation. A ten-foot pipe length will be excavated for each buried grey cast iron fire protection piping sample and the external surfaces inspected for blistering, cracking, hardening or loss of strength, and loss of material. Additionally NUREG-2191 Section XI.M33 Selective Leaching program destructive examinations will be conducted on a one-foot length of fire protection system piping or a different component type from each discrete inspection location (six/unit) ~~on a one foot length (minimum) piping section from each discrete excavation location (five/unit)~~ to inspect for loss of material due to selective leaching. Five of the inspections will be conducted on a one-foot length of fire protection piping and the sixth inspection will be conducted on either a one-foot length of piping from the fire protection system or a different component type (e.g., hydrant) from the fire protection system. The selection of inspection locations for buried gray cast iron fire protection piping and piping components will consider the following criteria: (Added – Supplement 3)(Revised Supplement 4) • Older piping segments (i.e., not previously replaced) • Piping and piping components found to be continuously wetted due to leaking piping/valves or in soil with high corrosivity ratings as determined by EPRI Report 3002005294, Soil Sampling and Testing		no later than the last refueling outage prior to the subsequent period of extended operation.	

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			Methods to Evaluate the Corrosivity of the Environment for Buried Piping and Tanks at Nuclear Power Plants • Piping and piping components not cathodically protected • Piping and piping components with significant coating degradation or unexpected backfill • Consequence of failure (i.e., proximity to safety-related piping and piping components) • Locations with potentially high stress and/or cyclic loading conditions such as piping adjacent to locations that were replaced due to cracking/rupture, locations subject to settlement, or locations subject to heavy load traffic 6. Procedures will be revised to require five excavated piping samples at each unit be inspected (internally and externally) for cracking due to cyclic loading. The inspections will be conducted in the 10-year period prior to the subsequent period of extended operation (SPEO) and in each 10-year period during the SPEO as follows: (Added - Supplement 4) a. A 10-foot piping length of buried gray iron fire protection piping will be excavated for each inspection. b. Visual (VT) and magnetic particle (MT) examinations will be conducted on the 10-foot buried gray cast iron fire protection piping samples. The radiographic (RT) nondestructive examination (NDE) method will be applied to areas that have potential surface cracking identified using the MT method. c. Examination results will be evaluated by a Level II or III examiner qualified to ASME Code, Section XI and the following performed, as applicable: • If there is no cracking identified using the NDE techniques, then a one-foot axial piece of the fire protection piping sample will still be			

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			removed and destructively examined to inspect for the loss of material due to selective leaching as required by NUREG-2191 Section XI.M33 Selective Leaching program (see Enhancement 5). • If cracking is identified then a bounding one-foot axial section of the fire protection piping sample will be selected based on the crack size and characterization determined by a qualified NDE Level II or III examiner and further destructive examination conducted to identify cracking due to cyclic loading. The destructive examination of the one-foot axial section will also be inspected for the loss of material due to selective leaching (see Enhancement 5). d. If results of the destructive examination inspections determine the cracking is due to cyclic loading, then Engineering will perform a crack growth evaluation and a flaw stability evaluation based on the predicted crack lengths at the end of the SPEO. e. If results of the evaluations indicate the depth or extent of cracking of the bases metal is projected to cause loss of intended function prior to the end of the SPEO. Engineering will perform an evaluation to determine the extent of condition, extent of cause and the need for further follow-on actions through the Corrective Action Program (e.g., additional inspections).			
28	*Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* program	XI.M42	The *Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedures will be revised to require baseline inspections (100% of accessible coatings/linings) of the following tanks, piping, and miscellaneous components within the scope of subsequent license renewal and	B2.1.28	Program will be implemented and inspections 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	Application, Aug. 24, 2020, Dom-20-115, ML20246G703 Supplement 1, Feb. 4, 2021, Dom-20-416, ML21035A303

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			inspection intervals will not exceed those specified in NUREG-2191 Table XI.M42-1, Inspection Intervals for Internal Coatings/Linings for Tanks, Piping, Piping Components, and Heat Exchangers: (Revised - Supplement 1) • Condensate polishing Powdex tanks • Pressurizer relief tanks • Chilled water mechanical chiller cooler (channel head) • Circulating water inlet and outlet waterbox distributors • Fire protection isolation valve • Drains - bldg. services piping 2. Procedures will be revised to include as an alternative to repair, rework, or removal, internal coatings/linings exhibiting indications of peeling and delamination. The component may be returned to service if: a. Physical testing is conducted to ensure that the remaining coating is tightly bonded to the base metal, b. the potential for further degradation of the coating is minimized, (i.e., any loose coating is removed, the edge of the remaining coating is feathered), c. adhesion testing using ASTM International Standards endorsed in RG 1.54 (e.g., pull-off testing, knife adhesion testing) is conducted at a minimum of three sample points adjacent to the defective area, d. an evaluation is conducted of the potential impact on the system, including degraded performance of downstream components due to flow blockage and loss of material or cracking of the coated component, and		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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			e. follow-up visual inspections of the degraded coating are conducted within two years from detection of the degraded condition, with a re-inspection within an additional two years, or until the degraded coating is repaired or replaced. 3. Procedures will be revised to require additional inspections be conducted if one of the inspections does not meet acceptance criteria due to current or projected degradation (i.e., trending) unless the cause of the aging effect for each applicable material and environment is corrected by repair or replacement of components constructed of the same material and exposed to the same environment. The number of increased inspections will be determined in accordance with the Corrective Action Program. However, there are no fewer than five additional inspections for each inspection that did not meet acceptance criteria, or 20% of each applicable material, environment, and aging effect combination inspected, whichever is less. When inspections are based on the percentage of piping length, an additional 5% of the total length will be inspected. The timing of the additional inspections will be based on the severity of the degradation identified and will be commensurate with the potential for loss of intended function. However, in all cases, the additional inspections will be completed within the interval in which the original inspection was conducted, or if identified in the latter half of the current inspection interval, within the next refueling outage interval. These additional inspections conducted in the next inspection interval cannot also be credited towards the number of inspections in the latter interval. If subsequent inspections do not meet acceptance criteria, an extent of condition and extent of cause			

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			analysis will be conducted to determine the further extent of inspections. Additional samples will be inspected for any recurring degradation to provide reasonable assurance that corrective actions appropriately address the associated causes. The additional inspections will include inspections with the same material, environment, and aging effect combination at Unit 1 and Unit 2. 4. Procedures will be revised to require inspection frequencies for internal coatings/linings of in-scope piping and piping components are performed on a frequency consistent with Table XI.M42-1, various frequencies from 4-12 years.			
29	*ASME Section XI, Subsection IWE* program	XI.S1	The *ASME Section XI, Subsection IWE* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedures will be revised to augment visual examinations with surface examinations (or other applicable technique, (e.g., EVT-1) to manage cracking in the Containment pressure retaining portions of the fuel transfer tube, fuel transfer tube enclosure, fuel transfer tube blind flange, dissimilar metal weld penetrations, and high-temperature piping penetrations. Surface examinations will be performed once during each 10-year interval. (Revised – Supplement 1) 2. Procedures will be revised to perform a one-time volumetric examination of metal liner surfaces that are inaccessible from one side at both units if triggered by plant-specific operating experience. The trigger for this supplemental examination is plant-specific occurrence or recurrence of measurable metal liner corrosion (base metal material loss exceeding 10% of nominal plate thickness) at	B2.1.29	Program enhancements are 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	Application, Aug. 24, 2020, Dom-20-115, ML20246G703 Supplement 1, Feb. 4, 2021, Dom-20-416, ML21035A303

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			either unit initiated on the inaccessible side or areas, identified since the date of issuance of the first renewed license. This supplemental volumetric examination consists 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. The supplemental volumetric examinations for each unit will occur within two refueling outages after identifying the trigger for the examination. Any identified degradation is 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 this one-time set of volumetric examinations should be determined on a plant-specific basis to demonstrate statistically with 95% confidence that 95% of the accessible portion of the containment liner is not experiencing corrosion degradation with greater than 10% loss of nominal thickness. There has been no triggering plant-specific operating experience at either unit since the date of issuance of the first renewed licenses. (Revised - Supplement 1) 3. Plant procedures will be revised to specify that successive inspections will 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 inservice examinations and evaluated for acceptance in accordance with ASME Code, Section XI, Subsection IWE, Article IWE-3120.		refueling outage prior to the subsequent period of extended operation.	
30	*ASME Section XI, Subsection IWL* program	XI.S2	The *ASME Section XI, Subsection IWL* program is an existing condition monitoring program that is credited.	B2.1.30	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703

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31	*ASME Section XI, Subsection IWF* program	XI.S3	The *ASME Section XI, Subsection IWF* program is an existing condition monitoring program that will be enhanced as follows: 1. Procedures 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. 2. Procedures will be revised to specify that, for high-strength bolting greater than one inch nominal diameter within the scope of the ASME Section XI, Subsection IWF program, volumetric examination comparable to that of ASME Code, Section XI, Table IWB-2500-1, Examination Category B-G-1 will be performed to detect cracking in addition to the VT-3 examination. In each 10-year period during the subsequent period of extended operation, a representative sample of 20% of the population or a maximum of 19 high-strength bolts per unit will be inspected for IWF supports located in an “air” environment. 3. Procedures 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. 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. 4. Procedures 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 is	B2.1.31	Program will be implemented and a one-time inspection of an additional 5% of the sample size specified in Table IWF-2500-1 for Class 1, 2, and 3 piping supports is conducted within 5 years prior to the subsequent period of extended operation and 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.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703 Supplement 1, Feb. 4, 2021, Dom-20-416, ML21035A303 RAI Set 1 Response, Dom-21-074, Apr. 1, 2021, ML21091A187

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			increased or modified to include another support that is representative of the remaining population of supports that were not repaired. (Completed - Supplement 1)			
32	*10 CFR 50, Appendix J* program	XI.S4	The *10 CFR 50, Appendix J* program is an existing condition monitoring program that is credited.	B2.1.32	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
33	*Masonry Walls* program	XI.S5	The *Masonry Walls* program is an existing condition monitoring program that is credited.	B2.1.33	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
34	*Structures Monitoring* program	XI.S6	The *Structures Monitoring program* Is an existing condition monitoring program that will be enhanced as follows: 1. Procedures will be revised to include inspection of the following structures that are within the scope of subsequent license renewal: Administration Building (aka Office Building), Decontamination Building, Domestic Water Treatment Building, Heater Boiler Room, Maintenance Building, New Fuel Receiving Building, Waste Disposal (Clarifier) Building, Waste Solids Building, 17-ton Carbon Dioxide tank foundation, and Backup 34.5 kV Circuit Power Poles (Switchyard to the Reserve Station Service Transformers). Baseline inspections for the added structures will be performed under the enhanced program in order to establish quantitative inspection data prior to conduct of periodic inspections in the subsequent period of extended operation. The baseline inspections will include baseline inspections of the masonry walls in the Administration Building, Decontamination Building, Domestic Water Treatment Building, and the Maintenance Building. 2. Procedures will be revised to specify that structural components inspected include structural bolting, anchor bolts and embedments, component support members, pipe whip restraints and jet impingement	B2.1.34	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703 RAI Set 1 Response, Dom-21-074, Apr. 1, 2021, ML21091A187

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			shields, transmission towers, panels and other enclosures, racks, sliding surfaces, sump and pool liners, electrical cable trays and conduits, tube tracks, trash racks associated with water-control structures, electrical duct banks, manholes, doors, penetration seals, seismic joint filler and other elastomeric materials. 3. Procedures will be revised to specify that aluminum and stainless steel structural components such as louvers, cable trays, conduits, and structural supports will be monitored for loss of material and cracking due to SCC that could lead to the reduction or loss of their intended function. (Revised - RAI Set 1) 4. Procedures will be revised to specify that elastomeric vibration isolators, structural sealants, and seismic joint fillers will be monitored for cracking, loss of material, and hardening that could lead to the reduction or loss of their intended function. Visual inspection of elastomeric elements is supplemented by tactile inspection to detect hardening if the intended function is suspect. 5. Procedures will be revised to specify that the carbon fiber reinforced polymer (CFRP) wrap of the concrete poles for the reserve station service transformer (RSST) tube bus will be monitored for hardening or loss of strength, loss of material, cracking or blistering that could lead to the reduction or loss of intended function. (Added - RAI Set 1) 6. Procedures will be revised to specify that accessible sliding surfaces will be monitored for indications of excessive loss of material due to corrosion or wear and debris or dirt that could restrict or prevent sliding of the surfaces. (Renumbered - RAI Set 1)			

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			7. Procedures will be enhanced to specify that evaluations of neutron shield tank findings consider its structural support function for the reactor pressure vessel. (Renumbered - RAI Set 1)			
35	*Inspection of Water-Control Structures Associated with Nuclear Power Plants* program	XI.S7	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. Procedures will be revised to include the Circulating Water Intake Tunnel Header and the Discharge Tunnel Seal Pit within the scope of the program. 2. Procedures will be revised to specify underwater inspections or dewatering to permit visual inspections for submerged structures, on a frequency not to exceed five years.	B2.1.35	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
36	*Protective Coating Monitoring and Maintenance* program	XI.S8	The *Protective Coating Monitoring and Maintenance* program is an existing mitigative and condition monitoring program that is credited.	B2.1.36	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
37	*Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program	XI.E1	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. Procedures 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.)	B2.1.37	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703

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			2. Procedures will be revised to add a list of structures/areas to perform/conduct the visual inspections of cables and connections. 3. Procedures 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. Procedures 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% 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. 5. Procedures will be revised to add the requirement that if anomalies are found during the visual inspection process, they will be addressed through the Corrective Action Program.			

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			6. Procedures will be revised to add the requirement to verify that the test results for electrical cable and connection insulation material are to be within the acceptance criteria, as identified in the procedures. 7. Procedures 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).			
38	*Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits* program	XI.E2	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 condition monitoring program that will be enhanced as follows: 1. A new procedure will be developed to add testing of the post-accident neutron monitoring system cables and connections external to Containment to the Program. The procedure will evaluate reduced electrical insulation resistance by measuring cable resistance and capacitance.	B2.1.38	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703

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			2. The Nuclear Instrumentation test procedures will be enhanced to specify the acceptance criteria. 3. Procedures will be enhanced to include corrective actions and a requirement for performance of an Engineering evaluation when cable system test results do not meet the acceptance criteria. Results of the Engineering evaluation will determine if the test frequency needs to be increased.			
39	*Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program	XI.E3A	The *Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirement*s program is an existing condition monitoring program that will be enhanced as follows: 1. Procedures 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. Procedures will be revised to add a step stating that automatic or passive drainage features of manholes are operating properly. (Completed - Supplement 1) 3. Procedures will be revised to add a step that includes a requirement for testing medium-voltage cables that are exposed to significant moisture to determine the condition of the electrical insulation. (Completed - Supplement 1) 4. Procedures will be revised to add cables from RSST `B' and `C' to Bus 1G and Bus 2G, and associated handholes, to the scope of the program and perform inspections, dewatering,	B2.1.39	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703 Supplement 1, Feb. 4, 2021, Dom-20-416, ML21035A303

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			and testing with the first inspection scheduled prior to the subsequent period of extended operation. (Completed - Supplement 1) 5. Procedures will be revised to add a step to evaluate adjusting the inspection frequency of manholes based on plant-specific operating experience over time with water collection. (Completed - Supplement 1) 6. A plant-specific inaccessible medium-voltage cable test matrix will be created that documents inspection methods, test methods, and acceptance criteria for the in-scope inaccessible medium-voltage power cables based on OE. Testing will be conducted at least every six years. (Completed - Supplement 1) 7. Procedures will be revised to include a requirement to review visual inspection and physical test results that are trendable and repeatable to provide additional information on the rate of cable or connection insulation degradation. (Completed - Supplement 1)			
40	*Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program	XI.E.3B	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, exposed to significant moisture. Industry and plant-specific operating experience will be evaluated in the	B2.1.40	Program will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703

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			development and implementation of this program.			
41	*Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program	XI.E3C	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 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), low-voltage power cables (operating voltage less than 2 kV), exposed to significant moisture. Industry and plant-specific operating experience will be evaluated in the development and implementation of this program.	B2.1.41	Program will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
42	*Metal-Enclosed Bus* program	XI.E4	The *Metal-Enclosed Bus* program is an existing condition monitoring program that will be enhanced as follows: 1. A new procedure will be created to add the MEB connecting ‘A’ Reserve Station Service Transformer to Bus 1G and Bus 2G to the scope of the program and perform inspections and testing on a ten year frequency with the first inspection scheduled prior to the subsequent period of extended operation. 2. Procedures will be revised to add a step for inaccessible sections of bus duct that requires engineering to provide guidance for performance of electrical testing of connections using an ohmmeter and for performance of visual inspection of the bus duct using a borescope.	B2.1.42	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703

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			3. Inspection procedures will be revised to add a note stating that 20% of the accessible bolted connection population, with a maximum of 25, is a representative sample for increased resistance of connection inspections. 4. Procedures will be revised to require the transmittal of bus connection resistance values to engineering for trending to provide information on the rate of connection degradation.			
43	*Fuse Holders* program	XI.E5	The *Fuse Holders* program is an existing condition monitoring program that is credited.	B2.1.43	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
44	*Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements* program	XI.E6	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 electrical connections tested prior to the subsequent period of extended operation. 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 and implementation of this program.	B2.1.44	Program will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
45	*High-Voltage Insulators* program	XI.E7	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 two 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 five years. Industry and plant-specific operating experience will be evaluated in the	B2.1.45	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 are completed 6 months prior to the subsequent period of extended operation or no later	Application, Aug. 24, 2020, Dom-20-115, ML20246G703

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			development and implementation of this program.		than the last refueling outage prior to the subsequent period of extended operation.	
46	*Fatigue Monitoring* program	X.M1	The *Fatigue Monitoring* program is an existing preventive program that will be enhanced as follows: 1. Procedures will be revised to require monitoring and tracking of transient cycles associated with the ASME Code, Section XI, Appendix L fatigue sensitive locations to be performed each inspection interval. Consistent with the existing cycle counting program, a surveillance limit will be established to initiate corrective actions prior to exceeding transient cycle assumptions in the ASME Code, Section XI, Appendix L analyses. 2. Procedures will be revised to expand existing corrective action guidance associated with exceeding a cycle counting surveillance limit to recommend consideration of component repair, component replacement, performance of a more rigorous analysis, performance of an ASME Code, Section XI, Appendix L flaw tolerance analysis, or scope expansion to consider other locations with the highest expected CUF_{en} values. 3. Procedures will be revised to require that when a cycle counting action limit is reached, action will be taken to ensure that the analytical bases of the High-Energy Line Break (HELB) locations are maintained.	B3.1	Program enhancements for SLR will be implemented 6 months prior to the subsequent period of extended operation.	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
47	*Neutron Fluence Monitoring* program	X.M2	The *Neutron Fluence Monitoring* program is an existing condition monitoring program that is credited.	B3.2	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703
48	*Environmental Qualification of*	X.E1	The *Environmental Qualification of Electric Equipment program is an existing condition monitoring* program that is credited.	B3.3	Ongoing	Application, Aug. 24, 2020, Dom-20-115, ML20246G703

No.	Program/Topic	NUREG-2191 SECTION	Commitment	Application Section	Implementation Schedule	Source
	Electric Equipment program					
49	N/A		Procedures will be developed to replace the diesel-driven fire pump engine heat exchanger tube bundle on a 20-year frequency ~~and require the heat exchanger tube bundle for the spare engine to be replaced prior to being placed in-service with the diesel-driven fire pump~~ (Added - RAI Set 1) (Revised - Supplement 3)		Procedures to replace the diesel-driven fire pump heat exchanger tube bundle will be in place ~~5 years prior to the heat exchanger tube bundle achieving 20 years of active service.bu~~ by 12/31/2021. Initial replacement of the tube bundle for engine #10277066 or replacement of that engine with the spare engine will be completed by 12/31/2025.(Added RAI Set 1) (Revised – Supplement 3)	RAI Set 1 Response, Dom-21-074, Apr. 1, 2021, ML21091A186 RAI Set 4 Response and Supplement 3, Dom-21-213, Jul. 29, 2021, ML21210A396

APPENDIX B

CHRONOLOGY

B. Chronology

This appendix lists chronologically the routine licensing correspondence between the staff of the U.S. Nuclear Regulatory Commission (NRC or the staff) and Virginia Electric and Power Company (Dominion Energy or the applicant). This appendix also lists other correspondence under North Anna Power Station, Units 1 and 2 (NAPS, North Anna, or applicant) Docket Nos. 50-338 and 50-339 related to the staff's review of the NAPS subsequent license renewal application (SLRA).

Table B.1-1 Chronology

Date	Accession No.	Subject
8/24/2020	ML20246G703	North Anna Power Station, Units 1 and 2 - Application for Subsequent Renewed Operating Licenses
9/15/2020	ML20224A103	North Anna - Receipt and Availability Letter and FRN
9/30/2020	ML20281A622	Acceptance of SLR Application
10/6/2020	ML20269A465	North Anna SLRA - Portal Letter
10/9/2020	ML20276A192	North Anna Subsequent License Renewal Aging Management Audit Plan
10/13/2020	ML20267A340	North Anna SLRA - Acceptance and Opportunity for Hearing Letter
2/4/2021	ML21035A303	North Anna Power Station (NAPS), Units 1 and 2 - Update to Subsequent License Renewal Application (SLRA) Supplement 1
3/4/2021	ML21063A552	Final Request for Additional Information Set 1 - North Anna SLRA Safety Review (EPID L-2020-SLR-0000) - email
3/8/2021	ML21067A504	FINAL Request for Confirmation of Information (RCI) Set 1 - North Anna SLRA Safety Review (EPID No. L-2020-SLR-0000) - email.
3/17/2021	ML21076B025	North Anna Power Station Units 1 And 2 - Update to Subsequent License Renewal Application, Supplement 2
3/25/2021	ML21084A182	North Anna Power Station, Units 1 and 2, Subsequent License Renewal Application Response to NRC Requests for Confirmation of Information for the Safety Review - Set 1
4/1/2021	ML21091A186	North Anna Power Station, Units 1 & 2, Response to NRC Request For Additional Information Regarding Safety Review - Set 1 & Clarification to Aging Management of Fire Protection System Lined Ductile Iron Valves.
4/8/2021	ML21036A060	North Anna Power Station, Units 1 and 2 - Report for the Aging Management Audit Regarding the Subsequent License Renewal Application Review (EPID No. L-2020-SLR-0000)
4/14/2021	ML21097A027	North Anna Power Station, Units 1 and 2 - Request for Withholding from Public Disclosure Regarding Subsequent License Renewal Application (EPID No. L-2020-SLR-0000)

Date	Accession No.	Subject
4/15/2021	ML21104A037	North Anna Power Station, Units 1 and 2 - Request for Withholding from Public Disclosure Regarding Subsequent License Renewal Application (EPID No. L-2020-SLR-0000)
4/29/2021	ML21119A287	North Anna Power Station (NAPS), Unit 1 and 2 - Subsequent License Renewal Application (SLRA) Response to NRC Request for Additional Information Safety Review - Set 2 and Flow Accelerated Corrosion Program Enhancement Completion
5/12/2021	ML21132A287	05/13/2021 Discussion of Dominion's Response to Select Staff RAIs on North Anna Subsequent License Renewal Application
5/27/2021	ML21147A293	North Anna Power Station (NAPS), Units 1 and 2 Subsequent License Renewal Application (SLRA) Response to NRC Request for Additional Information Safety Review - Set 3 and Administrative Change to SLRA Table A4.0-1, Item 25
6/9/2021	ML21145A211	North Anna Power Station, Units 1 and 2 - Meeting Summary: Discussion of Dominion's Response to Select Staff Requests for Additional Information on Subsequent License Renewal Application (EPID No. L-2020-SLR-0000)
7/29/2021	ML21210A396	North Anna Power Station (NAPS), Units 1 and 2 - Subsequent License Renewal Application (SLRA) Response to NRC Request for Additional Information Safety Review - Set 4 and Supplement 3
8/5/2021	ML21217A187	North Anna Power Station (NAPS), Units 1 and 2 - Subsequent License Renewal Application First 10 CFR 54.21 (b) Annual Amendment
8/10/2021	ML21221A129	North Anna Power Station, Units 1 and 2 - 05/27/2021 Meeting Summary: Discussion of Dominion's Response to Select Staff Requests for Additional Information on Subsequent License Renewal Application (EPID No. L-2020-SLR-0000)
8/26/2021	ML21221A024	North Anna Power Station, Units 1 and 2 - 06/17/2021 Meeting Summary: Discussion of Dominion's Response to Select Staff Requests for Additional Information on Subsequent License Renewal Application (EPID No. L-2020-SLR-0000)
8/26/2021	ML21238A297	North Anna, Units 1 and 2, Subsequent License Renewal Application Supplement 4
8/27/2021	ML21236A049	North Anna Power Station, Units 1 and 2 - August 16, 2021, Meeting Summary: Discussion of Aging Management of Cyclic Fatigue in the Subsequent License Renewal Application (EPID No. L-2020-SLR-0000)
9/2/2021	ML21239A046	NAPS, Units 1 and 2 - August 27, 2021, Summary: Discussion between NRC and Dominion regarding the NAPS Subsequent License Renewal - an inconsistency in documentation regarding RCP Code Case N-481 (EPID No. L-2020-SLR-0000)
9/13/2021	ML21256A033	Final Request for Confirmation of Information Set 2 - North Anna SLRA Safety Review (EPID No. L-2020-SLR-0000)
9/15/2021	ML21258A354	North Anna Power Station (NAPS), Units 1 and 2 - Subsequent License Renewal Application (SLRA) Response to NRC Request for Confirmation of Information Set 2 Safety Review

APPENDIX C

PRINCIPAL CONTRIBUTORS

C. Principal Contributors

This appendix lists the principal contributors for the development of this safety evaluation report (SER) and their areas of responsibility.

Table C.1-1 Principal Contributors

Name	Responsibility
Allik, Brian	Reviewer—Aging Management—Mechanical and Materials
Benson, Michael	Reviewer—Aging Management—Mechanical and Materials
Bloom, Steve	Management Oversight
Colaccino, Joseph	Management Oversight
Curran, Gordon	Reviewer—Scoping and Screening—Mechanical and Materials
Dijamco, David	Reviewer—Aging Management—Mechanical and Materials
Fairbanks, Carolyn	Reviewer—Aging Management—Mechanical and Materials
Fu, Bart	Reviewer—Aging Management—Mechanical and Materials
Gardner, William (Tony)	Reviewer—Aging Management—Mechanical and Materials
Gavula, James	Reviewer—Aging Management—Mechanical and Materials
Gibson, Lauren	Management Oversight
Hernandez, Raul	Reviewer—Scoping and Screening—Mechanical and Materials
Hiser, Allen	Reviewer—Aging Management—Mechanical and Materials
Iqbal, Naeem	Reviewer—Scoping and Screening—Fire Protection
James, Lois	Project Manager
Johnson, Andrew	Reviewer—Aging Management—Mechanical and Materials
Johnston, Jeanne	Management Oversight
Jones, Steve	Reviewer—Scoping and Screening—Mechanical and Materials
Kalikian, Roger	Reviewer—Aging Management—Mechanical and Materials
Krepel, Scott	Management Oversight
Lehman, Bryce	Reviewer—Aging Management—Structural Reviewer—Scoping and Screening—Structural
Lopez, Juan	Reviewer—Aging Management—Structural
Makar, Gregory	Reviewer—Aging Management—Mechanical and Materials
Medoff, James	Reviewer—Aging Management—Vessel Internals
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Sydnor, Christopher	Reviewer—Aging Management—Vessel Internals
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Name	Responsibility
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Yoder, Matthew	Reviewer—Aging Management—Mechanical and Materials
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APPENDIX D

REFERENCES

D. References

This appendix lists the references used throughout this safety evaluation report (SER) for review of the North Anna Power Station, Units 1 and 2 (NAPS) subsequent license renewal application (SLRA).

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Westinghouse

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