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

Safety Evaluation Report

Related to the Subsequent License Renewal of Turkey Point Generating Units 3 and 4

Docket Nos. 50-250 and 50-251

Florida Power & Light Company

Office of Nuclear Reactor Regulation

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ABSTRACT

This safety evaluation report (SER) documents the technical review of the Turkey Point Nuclear Generating Unit Nos. 3 and 4 subsequent license renewal application by the U.S. Nuclear Regulatory Commission (NRC) staff.

By letters dated January 30, 2018 (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML18037A812), February 9, 2018 (ADAMS Accession No. ML18044A653), February 16, 2018 (ADAMS Package Accession No. ML18053A123), and March 1, 2018 (ADAMS Package Accession No. ML18072A224), and April 10, 2018 (ADAMS Package Accession No. ML18113A132), Florida Power & Light Company (FPL) submitted and supplemented an application for subsequent license renewal. FPL requests renewal for a period of 20 years beyond the current expiration at midnight on July 19, 2032, for Unit 3 and April 10, 2033, for Unit 4.

Turkey Point Nuclear Generating Unit Nos. 3 and 4 are located in Miami-Dade County, east of Florida City, FL. Each unit consists of a Westinghouse pressurized-water reactor nuclear steam supply system with licensed thermal power of 2,644 megawatts thermal. The NRC issued the initial operating licenses on July 19, 1972, for Unit 3 and April 10, 1973, for Unit 4. The NRC issued the first renewed operating licenses on June 6, 2002.

This SER presents the status of the NRC staff's review of information submitted through June 4, 2019. The open item previously identified in the SER with open items, issued May 21, 2019, has been closed (see SER Section 1.5). On the basis of its review of the subsequent license renewal application, the NRC staff determines that FPL has met the requirements of Title 10 of the *Code of Federal Regulations* Section 54.29(a) (see SER Section 6).

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ABBREVIATIONS AND ACRONYMS

AI	applicant/licensee action item
AAC	all aluminum conductor
AC	alternating current
ACI	American Concrete Institute
ACRS	Advisory Committee on Reactor Safeguards
ACSR	aluminum conductor steel reinforced
ADAMS	Agencywide Document Access and Management System
AEA	Atomic Energy Act of 1954, as amended
AERM	aging effect requiring management
AFW	auxiliary feedwater
AHU	air handling unit
AISC	American Institute of Steel Construction
ALE	adverse localized environment
AMP	aging management program
AMR	aging management review
ANL	Argonne National Laboratory
ANSI	American National Standards Institute
ART	adjusted reference temperature
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	anticipated transient without scram
BAC	bounding analysis curves
BMI	bottom-mounted instrumentation
BPF	baseline predicted force
BTP	branch technical position
BWR	boiling-water reactor
°C	degrees Celsius
CAR	corrective action report
CASS	cast austenitic stainless steel
CCW	component cooling water
CCWST	component cooling water surge tanks
CF	chemistry factor
CFR	*Code of Federal Regulations*
CLB	current licensing basis
CMAA	Crane Manufacturers Association of America
CMTR	certified materials test report(s)
CRD	control rod drive

CRDM	control rod drive mechanism
CRGT	control rod guide tube
CRVS	control room ventilation system
CSS	containment spray system
Cu	copper
CUF	cumulative usage factor
CUF_{en}	environmentally adjusted cumulative usage factor
CVCS	chemical and volume control
DBA	design-basis accident
DBD	design basis document
DBE	design-basis event
DC	direct current
DM	degradation mechanism
DOE	U.S. Department of Energy
DOST	diesel oil storage tank
dpa	displacements per atom
dpa/sec	dpa per second
EAF	environmentally assisted fatigue
ECC	emergency containment cooling
ECCS	emergency core cooling system
ECT	eddy current testing
EDG	emergency diesel generator
EFPY	effective full-power year
EMA	equivalent margins analysis
EMDA	Expanded Materials Degradation Assessment
EOL	end-of-life
EPFM	elastic-plastic fracture mechanics
EPRI	Electric Power Research Institute
EPU	extended power uprate
EQ	environmental qualification
ESF	engineered safety features
EVND	ex-vessel neutron dosimetry
°F	degrees Fahrenheit
FAC	flow-accelerated corrosion
FCG	fatigue crack growth
F_{en}	environmental fatigue life correction factor
FMECA	failure modes, effects, and criticality analysis
FPL	Florida Power & Light

FR	*Federal Register*
ft-lb	foot-pound
GALL-SLR	Generic Aging Lessons-Learned for Subsequent License Renewal (NUREG–2191)
GDC	general design criteria or general design criterion
GEIS	Generic Environmental Impact Statement (NUREG-1437)
GL	generic letter
gpm	gallon(s) per minute
GSI	generic safety issue
GTA	guide tube assembly
GTAW	gas tungsten arc weld
HAZ	heat affected zone
HDS	hold-down springs
HFIR	high-flux isotope reactor
H-V	high voltage
HVAC	heating, ventilation, and air conditioning
IAEA	International Atomic Energy Commission
I&C	instrumentation and controls
I&E	inspection and evaluation
IAS	inadvertent auxiliary spray
IASCC	irradiation-assisted stress corrosion cracking
ICW	intake cooling water
IE	irradiation embrittlement
IESRC	irradiation-enhanced stress relaxation and creep
IGSCC	intergranular stress corrosion cracking
ILRT	integrated leak rate testing
IN	information notice
INPO	Institute of Nuclear Power Operations
IPA	integrated plant assessment
ISFSI	independent spent fuel storage installation
ISG	interim staff guidance
ISI	inservice inspection
ISR	irradiation-enhanced stress relaxation
J	Joule
ksi	kilopound-force per square inch
KV or kV	kilo-volt

LAS	low-alloy steel
LCB	lower core barrel
LBB	leak before break
LCO	limiting conditions for operation
LEFM	linear elastic fracture mechanics
LEFT	low-frequency electromagnetic testing
LLRT	local leakage rate test
LOCA	loss-of-coolant accident
LRA	license renewal application
LRSS	lower radial support structure
LSC	lower support column
LST	lowest service temperature
LTOP	low-temperature overpressure protection
MEB	metal enclosed bus
MIC	microbiologically influenced corrosion
MH	manhole
MRP	Materials Reliability Program
MRV	minimum required value
MTB	maximum tolerance brand
n/cm^2	neutrons per square centimeter
NDTT	nil ductility transition temperature
NAM	no additional measures
NCVS	normal containment ventilation system
NEA	Nuclear Energy Agency
NEI	Nuclear Energy Institute
NEPA	National Environmental Policy Act of 1969, as amended
NESC	National Electrical Safety Code
NNS	non-nuclear safety
NFPA	National Fire Protection Association
NOP	normal operating loads
NRC	U.S. Nuclear Regulatory Commission
NSCA	nuclear safety capability statement
NSPC	nuclear safety performance criteria
OBE	operating basis earthquake
OCCW	open-cycle cooling water
OECD	Organisation for Economic Co-operation and Development
OI	open item

ORNL	Oak Ridge National Laboratory
PFM	probabilistic fracture mechanics
pH	potential of hydrogen
PLL	predicted lower limit
PORV	power-operated relief valve
ppm	parts per million
psi	pound-force per square inch
P-T	pressure-temperature
PTS	pressurized thermal shock
PWM	primary water makeup
PVC	polyvinyl chloride
PWR	pressurized-water reactor
PWROG	PWR Owners Group
PWSCC	primary water stress corrosion cracking
PWST	primary water storage tank
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
RES	NRC's Office of Regulatory Research
RFO	refueling outage
RG	regulatory guide
RHR	residual heat removal
RIS	regulatory information summary
RIVE	Radiation-Induced Volumetric Expansion
RPV	reactor pressure vessel
RT_{NDT}	reference temperature nil ductility transition
RT_{PTS}	reference temperature for pressurized thermal shock
RV	reactor vessel
RVCH	reactor vessel closure head
RVI	reactor vessel internal
SAM	seismic anchor motion
SAW	submerged arc weld
SBO	station blackout
SC	structure and component

SCC	stress corrosion cracking
SE	safety evaluation
SER	safety evaluation report
SFPC	spent fuel pit/pool cooling, spent fuel pit and cooling
SG	steam generator
SIA	Structural Integrity Associates
SI	safety injection
SLR	subsequent license renewal
SLRA	subsequent license renewal application
SMAW	shielded metal arc
SOC	statement of consideration
SR	surveillance requirement
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)
SSC	system, structure, and component
SS	stainless steel
SSE	safe shutdown earthquake
SY	yield strength
TE	thermal embrittlement
TIG	tungsten inert gas
TLAA	time-limited aging analysis
TPCW	turbine plant cooling water
TR	topical report
TS	technical specifications
T/TS	tube-to-tubesheet
UFSAR	updated final safety analysis report
USC	upper support column
USE	upper-shelf energy
UT	ultrasonic testing
VS	void swelling
WCAP	Westinghouse Commercial Atomic Power
WOG	Westinghouse Owners Group
Zn	zinc

1/4T	one-fourth of the way through the RPV wall, measured from the internal surface of the vessel
3/4T	three-fourths of the way through the RPV wall, measured from the internal surface of the vessel

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 Turkey Point Nuclear Generating Unit Nos. 3 & 4 (Turkey Point or Turkey Point Units 3 and 4), as filed by Florida Power & Light Company (FPL or the applicant), by letters dated January 30, 2018, (Agencywide Documents Access and Management System (ADAMS) Package Accession No. ML18037A812), February 9, 2018 (ADAMS Accession No. ML18044A653), February 16, 2018 (ADAMS Package Accession No. ML18053A123), March 1, 2018 (ADAMS Package Accession No. ML18072A224), and April 10, 2018 (ADAMS Package Accession No. ML18113A132). FPL's application seeks to renew Turkey Point Renewed Facility Operating License Nos. DPR-31 and DPR-41 for an additional 20 years beyond the current expiration of their renewed licenses on July 19, 2032, for Unit 3 and April 10, 2033, for Unit 4. The NRC staff performed a safety review of FPL's application in accordance with Title 10 of the *Code of Federal Regulations* 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. Ms. James may be contacted by telephone at 301-415-3306 or by e-mail at Lois.James@nrc.gov. Alternatively, send written correspondence to the following address:

Division of Materials and License Renewal
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
Attention: Lois James, Mail Stop O11-F1

Turkey Point Units 3 and 4 are located in Miami-Dade County, east of Florida City, FL. Each unit consists of a Westinghouse pressurized-water reactor nuclear steam supply system with licensed thermal power of 2,644 megawatts thermal. The NRC issued the initial operating licenses on July 19, 1972, for Unit 3 and April 10, 1973, for Unit 4. The NRC issued renewed operating licenses for Turkey Point Units 3 and 4 on June 6, 2002. The Turkey Point updated final safety analysis report (UFSAR) shows details of the plant and the site (ADAMS Accession No. ML18117A085).

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 Turkey Point subsequent license renewal is based on FPL's SLRA, the NRC staff's audits, and responses to the staff's requests for additional information (RAIs). FPL supplemented its application and provided clarifications through its responses to the staff's questions in RAIs, audits, meetings, and docketed correspondence. The staff reviewed and considered information submitted through June 4, 2019.

The public may view the SLRA and all pertinent information and materials, including the UFSAR, at the NRC Public Document Room located on the first floor of One White Flint North, 11555 Rockville Pike, Rockville, MD 20852-2738 (phone 301-415-4737 or 800-397-4209). In addition, the public may view the SLRA, as well as materials related to the license renewal review, on the NRC Website at http://www.nrc.gov. Finally, the public may view a hard copy of the SLRA at the following four Florida-area libraries:

- Homestead Branch Library, 700 North Homestead Boulevard, Homestead, FL 33030
- South Dade Regional Library, 10750 SW 211th Street, Miami, Florida 33189
- Naranja Branch Library, 14850 SW 280 St., Homestead, FL 33032
- Main Library, 101 West Flagler St., Miami, FL 33130

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 is reserved for the report 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 FPL's commitments for subsequent renewal of the operating license. 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.

As discussed in Section 1.2.2 of this SER, in accordance with 10 CFR Part 51, the staff prepared and published a draft Turkey Point plant-specific supplement to NUREG-1437, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS)." The draft supplement is titled NUREG-1437, Supplement 5, Second Renewal, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants: Supplement 5, Second Renewal, Regarding Subsequent License Renewal for Turkey Point Nuclear Generating Unit Nos. 3 and 4," dated March 2019 (ADAMS Accession No. ML19078A330). The draft GEIS supplement discusses the environmental impacts and other environmental considerations for subsequent license renewal of Turkey Point. The final plant-specific GEIS supplement is scheduled to be issued later in 2019, following the staff's consideration of comments received concerning the draft GEIS supplement.

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 during the proposed license renewal period. 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).

To address the unique aspects of material aging and degradation that would apply to SLR (e.g., to permit plants to operate to 80 years), the NRC's Office of Nuclear Reactor Regulation requested support from the NRC's Office of Nuclear Regulatory Research (RES) to develop technical information to evaluate the feasibility of SLR. RES has memoranda of understanding with both the U.S. Department of Energy (DOE) and the Electric Power Research Institute (EPRI) to cooperate in nuclear safety research related to long-term operations beyond 60 years. Under these memoranda, the NRC and the DOE held two international conferences, in 2008 and 2011, on reactor operations beyond 60 years. In May 2012, the NRC and the DOE also co-sponsored 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 a forum on long-term operations and SLR. These conferences laid out the technical issues that would need to be addressed to provide assurance for safe operation beyond 60 years.

Based on the information gathered from these conferences and forums, and from other sources over the past several years, 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. Throughout the development of the subsequent license renewal process, the NRC staff has emphasized that it is the industry's responsibility to resolve these and other issues and provide the technical bases to ensure safe operation beyond 60 years.

The NRC, in cooperation with the DOE, completed the Expanded Materials Degradation Assessment (EMDA) in 2014 (ADAMS Accession Nos. ML14279A321, ML14279A331, ML14279A349, ML14279A430, and ML14279A461). The EMDA uses 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 NRC 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 aging management programs (AMPs) that will require modification for SLR.

On May 9, 2012 (ADAMS Accession No. ML12159A174) and subsequently on November 1, 13, and 14, 2012, the NRC staff and interested stakeholders met to discuss issues and receive comments for consideration for SLR. 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 addition to working with external stakeholders, the NRC staff conducted AMP effectiveness audits at three units that were at least 2 years into the initial period of extended operation. The purpose of these information-gathering audits was to better understand how licensees are implementing the license renewal AMPs, in terms of both the findings and the effectiveness of the programs, and to develop recommendations for updating license renewal guidance. The

NRC staff used the information gathered from these audits to update the SLR guidance based on the staff's experience with the aging management activities during the plant's initial license renewal periods. A summary of 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 Plants] and Nine Mile Point Nuclear Station, Unit 1" (ADAMS Accession No. ML13122A007). The summary of 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 the staff's observations from reviewing license renewal applications and the AMP effectiveness audits.

The NRC staff 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 Ageing Lessons Learned Programme; (iii) the Organisation for Economic Co-operation and Development (OECD)/Nuclear Energy Agency (NEA) Component Operational Experience and Degradation and Ageing Programme database; and (iv) the OECD/NEA Cable Ageing Data and Knowledge database. The NRC staff reviewed the results from AMP audits, findings from the EMDA, domestic and international operating experience, and public comments to identify technical issues that need to be considered for assuring the safe operation of NRC-licensed nuclear power plants. 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 SLR. Between fiscal years 2014 and 2015, the NRC staff reviewed the comments and recommendations and drafted NUREG-2191, Revision 0, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," dated July 2017 (ADAMS Accession Nos. ML17187A031 and ML17187A204) (GALL-SLR Report) to ensure that sufficient guidance is in place to support the review of an SLR application in 2018 or 2019.

The staff proposed an update to the Part 54 rule for subsequent license renewal in SECY-14-0016. In the Commission's staff requirements memorandum (SRM) on SECY-14-0016, "Ongoing Staff Activities to Assess Regulatory Considerations for Power Reactor Subsequent License Renewal" (ADAMS Accession No. ML14241A578), the Commission did not approve rulemaking but rather 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 subsequent license renewal. The SRM also directed the staff to keep the Commission informed on the progress in resolving the following technical issues related to SLR: (i) reactor pressure vessel neutron embrittlement at high fluence; (ii) irradiation-assisted stress corrosion cracking 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.

1.2.1 Safety Review

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

(1) The regulatory process is adequate to ensure that the licensing bases of all currently operating plants maintain an acceptable level of safety with the possible exception of the detrimental aging effects on the functions of certain 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,” defines the scope of license renewal as including those SSCs that (1) are safety-related, (2) whose failure could affect safety-related functions, or (3) are relied on to demonstrate compliance with the NRC’s regulations for fire protection, environmental qualification (EQ), pressurized thermal shock (PTS), anticipated transient without scram (ATWS), and station blackout (SBO).

In accordance with 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 considered to be 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.

In accordance with 10 CFR 54.21(d), a license renewal application is required to 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. During the plant design phase, certain assumptions about the length of time the plant can operate are incorporated into design calculations for several plant SSCs. In accordance with 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 Turkey Point SLRA, FPL 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.

1.2.2 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 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 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. In accordance with 10 CFR 51.53(c)(3)(i), a license renewal applicant may incorporate these generic findings in its environmental report. 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 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 concurrently with the final rule. The revised GEIS specifically supports the revised list of environmental issues identified in the final rule. Revision 1 to the GEIS and the 2013 final rule reflect lessons learned and knowledge gained during previous license renewal environmental reviews.

In accordance with the National Environmental Policy Act of 1969 and 10 CFR Part 51, the staff reviewed the Turkey Point plant-specific environmental impacts of subsequent license renewal, including any new and significant information that was not considered in the GEIS. As part of its scoping process, the staff held two public meetings on May 31, 2018, at the City of Homestead City Hall, in Homestead, FL, to assist the staff in identifying plant-specific environmental issues (ADAMS Accession No. ML18176A404). The staff issued an environmental scoping summary report in January 2019, which included the comments received during the scoping process and the NRC staff's responses to those comments (ADAMS Accession No. ML18342A014).

The NRC staff issued its draft plant-specific supplement to the GEIS (Supplement 5, Second Renewal) on March 29, 2019. Draft, plant-specific GEIS Supplement 5, Second Renewal, documents the results of the NRC staff's environmental review and makes a preliminary recommendation on the license renewal action based on environmental considerations. The staff held two public meetings on May 1, 2019, at the Homestead City Hall in Homestead, FL, to discuss the draft, plant-specific GEIS Supplement 5, Second Renewal (ADAMS Accession No. ML19078A330). After considering comments on the draft GEIS supplement, the staff will publish the final, plant-specific GEIS Supplement 5, Second Renewal, 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 Turkey Point 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 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.

In accordance with 10 CFR 54.19(a), the NRC requires a license renewal applicant to submit general information, which FPL provided in SLRA Section 1. The staff reviewed SLRA Section 1 and finds that FPL has submitted the required information.

In accordance with 10 CFR 54.19(b), the NRC 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, FPL stated in the SLRA:

> The requirements of 10 CFR 54.19(b) state that SLRAs must include, “…conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license.” The current indemnity agreement (B-46) for the Turkey Point Nuclear Generating Unit states, in Article VII, that the agreement shall terminate at the time of expiration of that license specified in Item 3 of the Attachment to the agreement, which is the last to expire. Item 3 of the Attachment to the indemnity agreement, as revised by Amendment No. 5, lists four license numbers. FPL has reviewed the original Indemnity Agreement and the Amendments. Neither Article VII nor Item 3 of the Attachment specifies an expiration date for license numbers DPR-31 or DPR-41. Therefore, no changes to the Indemnity Agreement are deemed necessary as part of this SLRA. Should the license numbers be changed upon issuance of the subsequent renewed licenses, FPL requests that conforming changes be made to Item 3 of the Attachment, and any other sections of the indemnity agreement as appropriate.

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

In accordance with 10 CFR 54.21, “Contents of application--technical information,” the NRC 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. Turkey Point SLRA Sections 3 and 4 and Appendix B address the license renewal requirements of 10 CFR 54.21(a), (b), and (c). Turkey Point SLRA Appendix A satisfies the license renewal requirements of 10 CFR 54.21(d).

In accordance with 10 CFR 54.21(b), the NRC 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 April 1, 2019, FPL submitted an SLRA update that summarizes the CLB changes that have occurred during the staff’s review of the SLRA. This submission satisfies 10 CFR 54.21(b) requirements.

In accordance with 10 CFR 54.22, “Contents of application--technical specifications,” the NRC 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 Turkey Point SLRA Appendix D, FPL stated that it had not identified any technical specifications changes necessary for issuance of the Turkey Point 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 will issue a report documenting its evaluation of the staff's SLRA review and SER. The NRC staff has reserved SER Section 5 for the ACRS report when it is issued. 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 can incorporate the information into license renewal guidance documents such as the SRP-SLR and GALL-SLR Report.

As of June 4, 2019, the staff has not issued any ISGs to the SRP-SLR or the GALL-SLR Report.

1.5 Summary of the Closure of Open Items

After reviewing the Turkey Point SLRA, including additional information FPL submitted through June 4, 2019, the staff closed the following open items previously identified in the "Safety Evaluation Report with Open Items Related to the License Renewal of Turkey Point Nuclear Generating Units 3 and 4," dated May 21, 2019 (ADAMS Accession No. ML19078A010). No other open items remain to be addressed. 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. A summary of the basis for closing this open item is presented here.

Open Item 3.0.3.1.7-1, Buried and Underground Piping and Tanks

During the audit, the staff noted that several leaks have occurred in buried steel piping, both in scope and out of scope of license renewal. By letter dated March 28, 2019, the staff issued RAI 2.3.28-1b requesting that the applicant clarify the relevant operating experience and any impact it has on the inspection plan for the Buried and Underground Piping and Tanks aging management program. This issue was tracked as Open Item (OI) 3.0.3.1.7-1.

In its responses dated May 21, 2019 and June 4, 2019 (ADAMS Accession Nos. ML19143A092 and ML19157A028), the applicant revised SLRA Sections B.2.3.28 and A.17.2.2.28, and SLRA Appendix A Table 17-3 to reflect that additional inspections beyond those recommended in GALL-SLR Report Table XI.M41-2 would be performed in the 10-year period prior to the subsequent period of extended operation based on the effectiveness of cathodic protection and the results of soil corrosivity testing. The staff's evaluation of the response to RAI 2.3.28-1b and the bases for closure of OI 3.0.3.1.7-1 are documented in SER Section 3.0.3.1.7.

1.6 Summary of Confirmatory Items

After reviewing the Turkey Point SLRA, including additional information FPL submitted through June 4, 2019, the staff has determined that no confirmatory items exist that require a formal response from FPL.

1.7 Summary of Proposed License Conditions

After reviewing the Turkey Point SLRA, including additional information and clarifications from FPL, the NRC staff identified three proposed license conditions.

The first license condition requires FPL, following 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 time-limited aging analyses for the period of subsequent 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." FPL may make changes to the programs and activities described in the UFSAR update and supplement provided FPL 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 FPL to complete future activities described in the UFSAR supplement before the beginning of the subsequent period of extended operation. FPL must complete these activities no later than 6 months before the beginning of the subsequent period of extended operation, and shall notify the NRC in writing when it has completed those activities

The third license condition addresses FPL's new One-Time Inspection program which it identified as being consistent with GALL-SLR Report AMP XI.M32, "One-Time Inspection." Specifically, FPL committed to replace the portions of the carbon steel containment spray system piping inside containment that are exposed to treated borated water with stainless steel piping, which is not susceptible to loss of material in a treated borated water environment. The condition requires FPL to submit a letter to the NRC, within 60 days following the completion of the piping replacement confirming the installation of the stainless steel material.

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 license renewal in accordance with 10 CFR 54.4(a). The IPA must contain a list of those structures and components (SCs), included in the SSCs within the scope of license renewal, which perform an intended function as described in 10 CFR 54.4, “Scope,” and are subject to 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

Chapter 2.0, “Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review and Implementation Results,” of the Florida Power & Light Company (FPL or the applicant) SLRA for Turkey Point Nuclear Generating Unit Nos. 3 & 4 (Turkey Point or Turkey Point Units 3 and 4) 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,” endorsed by U.S. Nuclear Regulatory Commission (NRC) letter dated January 30, 2018 (ML18029A368)

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

- 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). In addition, the staff reviewed the applicant's subsequent license renewal implementing procedures, evaluation reports, boundary drawings, and scoping and screening results documentation. The staff's review of the results of the applicant's implementation of this methodology (SLRA Sections 2.2-2.5) is discussed in Sections 2.3 through 2.5 of this document.

2.1.3.1 Documentation Sources Used for Scoping and Screening

2.1.3.1.1 Summary of Technical Information in the Application

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

- updated final safety analysis report (UFSAR)
- technical specifications
- design-basis documents
- component database
- piping and instrumentation drawings (P&IDs)
- fire shutdown analysis essential equipment list and basis document
- station blackout equipment list
- environmental qualification (EQ) documentation
- initial license renewal documentation

2.1.3.1.2 Staff Evaluation

The NRC staff reviewed the applicant's scoping and screening methodology subsequent license renewal implementing procedures, reports, drawings, and documentation, to ensure that they are consistent with the requirements of the Rule, the guidance in the SRP-SLR, and the guidance in Nuclear Energy Institute (NEI) 17-01. The staff determines that the scoping and screening methodology implementing procedures (including subsequent license renewal guidelines, documents, and reports) are consistent with the Rule, the SRP-SLR, and NEI 17-01.

The applicant's scoping and screening implementing procedures contain guidance for (1) identifying SSCs within the scope of the Rule and (2) identifying structures and components within those SSCs that are subject to an aging management review. During the review of the implementing procedures, the staff focused on the consistency of the detailed procedural guidance with information contained in the SLRA, including the implementation of NRC staff positions documented in the SRP-SLR. After reviewing the SLRA and supporting documentation, the staff determines that the scoping and screening methodology implementing procedures are consistent with the methodology described in SLRA Section 2.1. The staff also determines that the methodology is sufficiently detailed in the implementing procedures to provide the applicant's staff with concise guidance on the scoping and screening process for SLRA activities.

Sources of Current Licensing Basis Information

As defined in 10 CFR 54.3(a), the current licensing basis (CLB) is the set of NRC requirements applicable to a specific plant and a licensee's written commitments for ensuring compliance with and operation within applicable NRC requirements and the plant-specific design basis (including all modifications and additions to such commitments over the life of the license) that are docketed and in effect. The CLB includes the NRC regulations contained in 10 CFR Parts 2, 19, 20, 21, 26, 30, 40, 50, 51, 52, 54, 55, 70, 72, 73, and 100 and appendices thereto; orders; license conditions; exemptions; and technical specifications. It also includes the plant-specific design-basis information defined in 10 CFR 50.2, "Definitions," as documented in the most recent 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 reviewed the implementing procedures and results documentation that the applicant used to identify SSCs within the scope of subsequent license renewal (as defined by 10 CFR 54.4(a)). Turkey Point's subsequent license renewal program guidelines list the documents used to support scoping evaluations. 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 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 license renewal, consistent with the plant's CLB.

2.1.3.1.3 Conclusion

Based on its review of SLRA Sections 2.1.1 and 2.1.2, the staff finds that the applicant's consideration of document sources, including CLB information, is consistent with the Rule, the SRP-SLR, and NEI 17-01 guidance and, therefore, is acceptable.

2.1.4 Plant Systems, Structures, and Components Scoping Methodology

SLRA Section 2.1.5, "Scoping Procedure," states that the scoping process is the systematic process used to identify the Turkey Point SSCs within the scope of the 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 functions and intended functions were identified from a review of the source CLB documents.

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 used to identify SSCs that are included within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(1), in SLRA Section 2.1.5.1, “Safety-Related—10 CFR 54.4(a)(1),” which states the following:

> At Turkey Point, the safety-related components are identified in NAMS [Nuclear Asset Management Suite]. The safety-related classification in NAMS was populated using a controlled procedure that is consistent with the above 10 CFR 54.4(a)(1) criteria and design verified. The safety-related classification is also considered a controlled attribute in the database, and any modification to a component’s safety classification must be design verified.
>
> Safety-related classifications for systems and structures are based on system and structure descriptions and analysis in the UFSAR. Safety-related structures are those structures listed in the UFSAR and classified as Class I systems and structures identified as safety-related in the UFSAR, meet the criteria of 10 CFR 54.4(a)(1), and are included within the scope of license renewal. Safety-related components in NAMS were also reviewed, and the systems and structures that contained these components were also included within the scope of license renewal. The review also confirmed that all plant conditions, including conditions of normal operation, internal events, anticipated operational occurrences, DBAs [design basis accidents], external events, and natural phenomena as described in the CLB, were considered for 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:

- the integrity of the reactor coolant pressure boundary
- the capability to shut down the reactor and maintain it in a safe-shutdown condition
- the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to those referred to in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11, as applicable

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

> 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 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 2.1.5.1, 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

Based on 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 license renewal is in accordance with the requirements of 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 license renewal, in accordance with the requirements of 10 CFR 54.4(a)(2) in SLRA Section 2.1.5.2, "Nonsafety-Related Affecting Safety-Related—10 CFR 54.4(a)(2)." In addition, SLRA Chapter 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, "Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule," Appendix F, Revision 6, dated June 2005) 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 accomplishments of safety functions.

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

SLRA Section 2.1.5.2.1, "Nonsafety-Related SSCs with Potential to Prevent Satisfactory Accomplishment of Safety Functions," discusses nonplant systems, such as cranes, high-energy line break pipe whip restraints, internally generated missile barriers, and flood mitigation features, that were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). In addition, SLRA Section 2.1.5.2.1, states, "In some cases, safety-related SSCs may rely on certain nonsafety related SSCs to perform a system function. As such, these nonsafety-related SSCs are within the scope of SLR [subsequent license renewal] per 10 CFR 54.4(a)(2)," and identifies eight SSCs that were included within the scope of license renewal on this basis.

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

SLRA Section 2.1.5.2.2, “Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs that Provide Structural Support for the Safety-Related SSCs,” states the following:

> The following criteria from Appendix F of NEI 95-10 apply to the identification of the first seismic or equivalent anchor at Turkey Point:
>
> - A seismic anchor is defined as a device or structure that ensures that forces and moments are restrained in three orthogonal directions.
> - An equivalent anchor defined in the CLB can be credited for the 10 CFR 54.4(a)(2) evaluation.
> - An equivalent anchor may also consist of a large piece of plant equipment 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.
> - When an equivalent anchor point for a piping segment is not clearly described within the existing CLB information or original design basis, the use of a combination of restraints or supports such that the nonsafety-related piping and associated structures and components attached to 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 2.1.5.2.2, states the following:

> The following methods (a) through (d) are used to define end points for the portion of [nonnuclear-safety related (NNS)] piping attached to SR piping to be included in the scope of SLR. The bounding criteria in methods (a) through (d) provide assurance that SLR scoping encompasses the NNS piping systems included in the design basis seismic analysis and is consistent with the CLB.
>
> (a) A base-mounted component that is a rugged component and is designed not to impose loads on connecting piping. The SLR scope includes 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 system.
>
> (c) A free end of NNS piping, such as a drain pipe that ends at an open floor drain.
>
> (d) For NNS piping runs that are connected at both ends to SR piping, include the entire run of NNS piping.
>
> For Turkey Point, the following methods (e) and (f) may be used to define conservative end points for the portion of NNS piping attached to SR piping to be included in the scope of SLR. The basis for these methods is documented in the

Turkey Point SLR nonsafety-related SSCs directly connected to safety-related SSCs technical report.

(e) A point where buried piping exits the ground. The buried portion of the piping should be included in the scope of SLR. Turkey Point buried piping is well founded on compacted soil that is not susceptible to liquefaction based on the seismic reevaluations performed for Turkey Point as part of the post-Fukushima lessons learned.

(f) Consistent with the Turkey Point CLB, a smaller branch line when the moment of inertia ratio of larger piping to the smaller piping is equal to or greater than 25:1, the branch piping may be considered to have no significant effect on the response of the run pipe.

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

SLRA Section 2.1.5.2.3, “Nonsafety-Related SSCs that Have the Potential to Affect Safety Related SSCs through Spatial Interactions,” discusses the evaluation of nonsafety-related SSCs that could potentially impact safety-related SSCs through spatial interaction (impact, spray, or leakage). Further, the SLRA Section 2.1.5.2.3, evaluation differentiates between three types of locations: indoor structures other than containment, containment, and outdoor structures, as described below.

<u>Indoor Structures other than Containment</u>

SLRA Section 2.1.5.2.3 states the following:

> To address this requirement of 10 CFR 54.4(a)(2), Turkey Point has chosen the preventive option [with the exception of inside containment]. 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 license renewal without consideration of plant mitigative features. The concern is that age-related degradation of nonsafety-related SSCs could lead to adverse interactions with safety-related SSCs that have not been previously considered.

<u>Containment</u>

SLRA Section 2.1.5.2.3 states the following:

- UFSAR Appendix 8A describes the Turkey Point program for the EQ of electrical equipment. Appendix 8A refers to EQ Doc Pac 1001 for the identification of environmental conditions for these components. Section 6.4 of EQ Doc Pac 1001 identifies accident chemical spray as an environment to consider when qualifying electrical equipment inside containment.
- Appendix 8A further states that Section 6.4 of EQ Doc Pac 1001 indicates that the equipment inside containment is qualified for an accident chemical spray environment for the full duration of the specified operating time.

SLRA Section 2.3.3.16, "Auxiliary Systems in the Scope of 10 CFR 54.4(a)(2) for Spatial Interactions," states the following:

> Spray/Leakage—For the reasons stated above [SLRA Section 2.1.5.2.3], SR SSCs inside the Units 3 and 4 Containments are designed to accommodate the effects of moderate-energy piping system leakage and/or spray, without loss of function, regardless of the source. This is further supported by Turkey Point's position regarding EQ of mechanical equipment in response to [NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment"] as documented in the EQ DBD [design-basis document].

Outdoor Structures

SLRA Section 2.1.5.2.3, further states the following:

> Outdoor structures at Turkey Point that include both nonsafety-related and safety-related SCs are the intake structure, yard structures, turbine building, and main steam and feedwater platforms. As the equipment in the outdoor structures is designed for outdoor service and is periodically exposed to torrential rains and wind, the safety-related equipment in this area would not be impacted by leakage or spray from moderate- or low-energy piping.

2.1.4.2.2 Staff Evaluation

The staff reviewed SLRA Sections 2.1.5.2, 2.1.5.2.1, 2.1.5.2.2, 2.1.5.2.3, and 2.3.3.16, in which the applicant described the scoping methodology for nonsafety-related SSCs pursuant to 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 SSCs Required to Perform a Function that Supports a Safety-Related Function

The staff reviewed SLRA Section 2.1.5.2.1, which describes nonsafety-related, nonplant SSCs, such as cranes, high-energy line break pipe whip restraints, internally generated missile barriers, and flood mitigation features, that support safety functions and that were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The staff confirmed that the applicant had reviewed the UFSAR, P&IDs, the equipment database, and other CLB documents to identify the nonsafety-related support SSCs whose failure could prevent the performance of a safety-related function. The staff determined that the applicant had identified the nonsafety-related support SSCs that perform or support a safety function and included those SSCs within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

The staff further reviewed SLRA Section 2.1.5.2, which describes the method used to identify nonsafety-related SSCs that are required to perform a function relied upon by safety-related SSCs to perform their safety functions, to be included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The staff confirmed that the applicant had reviewed the UFSAR, P&IDs, the equipment database, and other CLB documents to identify nonsafety-related SSCs that perform a function relied upon by safety-related SSCs, and whose failure could prevent the performance of a safety function. The staff determined that the applicant had appropriately identified nonsafety-related SSCs that perform a function relied upon by safety-related SSCs, and whose failure could prevent the performance of a safety function, and included those SSCs within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

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

Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs.

The staff reviewed SLRA Section 2.1.5.2.2, which describes the method used to identify nonsafety-related SSCs that are directly connected to safety-related SSCs, to be included within the scope of license renewal 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 license renewal: 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 finds that the applicant's methodology for identifying and including nonsafety-related SSCs directly connected to safety-related SSCs within the scope of license renewal 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 SSCs.

The staff reviewed SLRA Sections 2.1.5.2.3 and 2.3.3.16, which describe the methods used to identify nonsafety-related SSCs with the potential for spatial interaction with safety-related SSCs to be included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

The staff determined that for indoor spaces other than containment, the applicant had used a preventive approach and evaluated spaces to identify the portions of nonsafety-related systems with the potential for spatial interaction with safety-related SSCs. The approach focused on the interaction between nonsafety-related and safety-related SSCs that are located in the same space, which was described in the SLRA as a structure or a portion of a structure that contains active or passive safety-related SSCs. The staff determined that the applicant had included the nonsafety-related SSCs, located within the same space as safety-related SSCs, within the scope of subsequent license renewal in accordance with 10 CFR 54.4(a)(2).

The staff determined that for indoor spaces within containment, the applicant had evaluated the impacts of the failure of nonsafety-related SSCs and the impacts of leakage or spray on safety-related SSCs. The staff determined that the applicant's evaluation had provided a basis—safety-related SSCs were qualified for a loss-of-coolant accident environment that bounded the potential impacts of failed nonsafety-related SSCs—for not including the nonsafety-related SSCs within the scope of subsequent license renewal.

The staff determined that for outdoor spaces, the applicant had evaluated the failure of nonsafety-related SSCs and the impacts of leakage or spray on safety-related SSCs. The staff determined that the applicant's evaluation had provided a basis—safety-related SSCs were qualified for an outdoor environment that bounded the potential impacts of failed nonsafety-related SSCs—for not including the nonsafety-related SSCs within the scope of subsequent license renewal, in accordance with 10 CFR 54.4(a)(2).

The staff finds 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 license renewal is in accordance with the guidance of the SRP-SLR and the requirements of 10 CFR 54.4(a)(2).

2.1.4.2.3 Conclusion

Based on 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, within the scope of license renewal, is in accordance 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 2.1.5.3, "Regulated Events—10 CFR 54.4(a)(3)," describes the methods used to identify SSCs included within the scope of license renewal, in accordance with the requirements of 10 CFR 54.4(a)(3), and states the following:

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

SLRA Section 2.1.5.3, further states the following:

> [The] scoping technical report identifies the systems and structures required to demonstrate compliance with each of the regulated events. The scoping technical report also includes references to source documents used to determine the scope of components within a system that are credited to demonstrate compliance with each of the applicable regulated events. SSCs credited in the regulated events have been classified as satisfying criteria of 10 CFR 54.4(a)(3) and have been included within the scope of subsequent license renewal.

2.1.4.3.2 Staff Evaluation

The staff reviewed SLRA Section 2.1.5.3, which describes the method used to identify and include within the scope of license renewal 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 reviewed the applicant’s implementing procedures and technical reports that describe its method for identifying SSCs within the scope of subsequent license renewal in accordance with 10 CFR 54.4(a)(3). The implementing procedures describe a process that considered current licensing basis information (including the UFSAR), applicable portions of the SLRA, and subsequent license renewal drawings to verify that the appropriate SSCs were included within the scope of subsequent license renewal.

The staff reviewed implementing procedures, subsequent license renewal drawings, and selected scoping results documentation. The staff determined that the applicant had evaluated current licensing basis information to identify SSCs that perform functions addressed in 10 CFR 54.4(a)(3) and included these SSCs within the scope of license renewal as documented in the scoping results documentation. 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.

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 license renewal, 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 license renewal.

Based on its review of information contained in the SLRA and the CLB documents reviewed, the staff determined that the applicant’s methodology is sufficient for identifying and including SSCs credited in performing functions within the scope of license renewal 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 2.1.5.3, the staff finds that the applicant’s methodology for identifying and including SSCs that are relied on to remain functional during regulated events is consistent 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 Chapter 2.0 states the following:

> The scoping and screening methodology is consistent with the guidelines presented in NEI 17-01, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal.” The methodology is implemented in accordance with the 10 CFR Part 50 Appendix B quality assurance program.

SLRA Section 2.1.1, “Introduction,” states the following:

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

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

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

2.1.4.4.2 Staff Evaluation

The staff reviewed SLRA Sections 2.0 and 2.1.1, which describe the applicant’s methodology for identifying SSCs within the scope of license renewal to verify that it met the requirements of 10 CFR 54.4(a). SLRA Section 2.1.1 states that the applicant had defined the plant in terms of systems and structures.

The staff reviewed SLRA Section 2.1.5, “Scoping Procedure,” and its subsections. SLRA Section 2.1.5 describes the applicant’s methodology for identifying SSCs within the scope of subsequent license renewal to verify that the applicant had met the requirements of 10 CFR 54.4(a) for identifying SSCs within the scope of subsequent license renewal. 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 subsequent license renewal review, (2) determine whether the system or structure performed its intended functions consistent with the criteria of 10 CFR 54.4(a), and (3) document the activities in scoping results documentation. The applicant’s process, which defined the plant in terms of systems and structures, was completed for all onsite systems and structures.

The NRC staff reviewed the applicant’s implementing procures and a sampling of results documentation and determined that the applicant had identified the SSCs within the scope of license renewal and documented the results of the scoping process in accordance with the implementing procedures. The results documentation included a description of the structure or system, a listing of functions performed by the system or structure, identification of intended functions, the 10 CFR 54.4(a) scoping criteria met by the system or structure, references, and the basis for the classification of the system or structure's intended functions.

The staff determined that the applicant had identified the SSCs within the scope of license renewal and documented the results of the scoping process in SLRA Section 2.3, "Scoping and Screening Results: Mechanical Systems," SLRA Section 2.4, "Scoping and Screening Results: Structures," and SLRA Section 2.5, "Scoping and Screening Results: Electrical and Instrumentation and Controls." SLRA Sections 2.3–2.5 include a description of the structure or system, a listing of functions performed by the system or structure, 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 component types subject to an AMR. The staff determined that the applicant's process is consistent with the description provided in SLRA Sections 2.1–2.5 and the guidance in SRP-SLR Section 2.1.

2.1.4.4.3 Conclusion

Based on 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 functions, and (3) that are necessary to demonstrate compliance with the NRC's regulations for fire protection, EQ, pressurized thermal shock, anticipated transient without scram, and station blackout. The staff finds that the applicant's methodology is consistent with the requirements of 10 CFR 54.4(a) and, therefore, is acceptable.

2.1.5 Screening Methodology

2.1.5.1 Summary of Technical Information in the Application

SLRA Section 2.1.1 states the following:

> After completion of the scoping and boundary evaluations, 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 an AMR. The passive intended functions of structures and components subject to an AMR were also identified.

SLRA Section 2.1.1 further states the following:

> Selected components, such as equipment supports, structural items, and passive electrical components, were scoped and screened as commodities. The structural commodities were evaluated for each in-scope structure and electrical commodities were evaluated collectively.

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

> For mechanical systems and civil structures, this process establishes evaluation boundaries, determines the SCs that comprise the system or structure, determines which of those SCs support system/structure intended functions, and identifies

> specific SC intended functions. Consequently, not all of the SCs for in-scope systems or structures are in the scope of SLR because some of the components in a system are outside the evaluation boundaries for subsequent license renewal. Once these in-scope SCs are identified, the process then determines which SCs are subject to an AMR per the criteria of 10 CFR 54.21(a)(1).

SLRA Section 2.1.6 further states the following:

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

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 license renewal 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 subsequent period of extended operation.

The staff reviewed SLRA Sections 2.1.1 and 2.1.6, which describe the methodology used by the applicant to identify the mechanical, structural, and electrical SCs within the scope of license renewal that are subject to an AMR. The applicant implemented a process for determining which SCs were subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). SLRA Section 2.1.6 describes that the screening process, during which the applicant evaluated the component types and commodity groups included within the scope of license renewal to determine which ones were passive and long lived and, therefore, subject to an AMR.

<u>Mechanical and Structural</u>

The staff reviewed the applicant's methodology used for mechanical and structural component screening, as described in SLRA Sections 2.1.1 and 2.1.6. The staff determined that the applicant used the screening process described in the SLRA along with the information contained in NEI 17-01 and the SRP-SLR to identify the 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 SCs that were not subject to replacement based on a qualified life or specified time period (long lived). These remaining passive, long-lived components were determined to be subject to an AMR.

<u>Electrical</u>

The staff reviewed the applicant's methodology used for electrical component screening, as described in SLRA Sections 2.1.1 and 2.1.6. 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 SSCs subject to an AMR. The staff determined that the applicant had identified electrical 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). These remaining passive, long-lived components were determined to be subject to an AMR.

2.1.5.3 Conclusion

Based on 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 license renewal that are subject to an AMR. The staff concludes that the applicant's methodology is consistent with the requirements of 10 CFR 54.21(a)(1) and, therefore, is acceptable.

2.1.6 Summary of Evaluation Findings

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 license renewal and SCs subject to an AMR, as described, are consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1) and, therefore, are acceptable.

2.2 Plant-Level Scoping Results

2.2.1 Introduction

In SLRA Section 2.1, the applicant described its methodology for identifying SSCs within the scope of license renewal and subject to an AMR. In SLRA Section 2.2, "Plant Level Scoping Results," the applicant applied the scoping methodology to determine which systems and structures must be included within the scope of license renewal. The NRC staff reviewed the plant-level scoping results to determine whether the applicant had properly identified the following:

(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).

(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 this section.

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

2.2.2 Summary of Technical Information in the Application

In SLRA Table 2.2-1, "Subsequent License Renewal Scoping Results for Mechanical Systems," the applicant listed the plant mechanical systems within the scope of license renewal. In SLRA Table 2.2-2, "Subsequent License Renewal Scoping Results for Structures," the applicant listed the structures that are within the scope of license renewal. In SLRA Table 2.2-3, "Subsequent License Renewal Scoping Results for Electrical Systems," the applicant listed plant electrical and instrumentation and controls systems within the scope of license renewal.

Based on the DBEs considered in the plant's CLB, other CLB information relating to nonsafety-related systems and structures, and certain regulated events, the applicant identified plant-level systems and structures within the scope of license renewal, as defined by 10 CFR 54.4.

2.2.3 Staff Evaluation

Section 2.1 of this safety evaluation report (SER) contains the NRC staff's review and evaluation of the applicant's scoping and screening methodology. To verify that the applicant properly implemented its methodology, the staff's review focused on the implementation results shown in SLRA Tables 2.2-1, 2.2-2, and 2.2-3 to confirm that the applicant did not omit any plant-level systems and structures within the scope of license renewal.

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

The staff sampled the contents of the UFSAR based on the systems and structures listed in SLRA Tables 2.2-1, 2.2-2, and 2.2-3. The staff sought to determine whether there are any systems or structures that may have intended functions within the scope of license renewal (as defined by 10 CFR 54.4) that had been omitted from the scope of license renewal. The staff identified no such omissions.

2.2.4 Conclusion

The NRC staff reviewed SLRA Section 2.2 and the UFSAR supporting information to determine whether the applicant failed to identify any systems and structures within the scope of license renewal. The staff finds no such omissions.

Based on its review, the staff finds that there is reasonable assurance that the applicant has adequately identified (in accordance with 10 CFR 54.4) the systems and structures within the scope of license renewal.

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 coolant system (RCS)
- engineered safety features (ESFs)
- auxiliary systems
- steam and power conversion systems

In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant must list those 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 license renewal. 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 Coolant System

SLRA Section 2.3.1, "Reactor Coolant System," identifies the RCS SCs subject to an AMR for license renewal. The applicant described the supporting SCs of the RCS in the following SLRA sections:

- SLRA Section 2.3.1.1, "Reactor Coolant and Connected Piping"
- SLRA Section 2.3.1.2, "Pressurizers"
- SLRA Section 2.3.1.3, "Reactor Vessels"
- SLRA Section 2.3.1.4, "Reactor Vessel Internals"
- SLRA Section 2.3.1.5, "Steam Generators"

SER Sections 2.3.1.1–2.3.1.5 include the staff's findings on its review of SLRA Sections 2.3.1.1–2.3.1.5, respectively.

2.3.1.1 Reactor Coolant and Connected Piping

2.3.1.1.1 Summary of Technical Information in the Application

SLRA Section 2.3.1.1 describes the components subject to an AMR within the reactor coolant piping (SLRA Section 2.3.1.1.1, "Reactor Coolant Piping"), regenerative and excess letdown heat exchangers (SLRA Section 2.3.1.1.2, "Regenerative and Excess Letdown Heat Exchangers"), and reactor coolant pumps (RCPs) (SLRA Section 2.3.1.1.3, "Reactor Coolant Pumps"). The RCS boundaries are included in the license renewal boundary drawings listed in SLRA Section 2.3.1. SLRA Table 2.3.1-1 provides a list of the reactor coolant and connected piping 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 coolant and connected piping 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 has included within the scope of license renewal all components with intended functions delineated under 10 CFR 54.4(a).

The staff then reviewed those components that the applicant identified as within the scope of license renewal to verify that the applicant has included all passive and long-lived components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The staff's review identified two areas in which additional information was necessary to complete the review of the applicant's scoping and screening results, which resulted in the issuance of RAIs 2.3.1.1-1 and 2.3.1.1-2. In RAI 2.3.1.1-1, the staff noted that on boundary drawing 5613-M-3041, Sheet 3, "Reactor Coolant System, Reactor Coolant Pumps," the piping to/from the component cooling water for RCP A is shown as not within the scope of license renewal (i.e., not highlighted). Given that the RCPs perform a safety-related function (i.e., pressure boundary), the staff requested that the applicant verify whether the piping to/from the component cooling water for RCP A is within the scope of license renewal (and should have been highlighted on the boundary drawing) in accordance with 10 CFR 54.4(a), and whether it is subject to an AMR, in accordance with 10 CFR 54.21(a)(1). In addition, the staff noted that the subject piping is connected to the thermal barrier heat exchanger for RCP A. The thermal barrier heat exchanger appears to be included in the RCS components subject to aging management (coil type heat exchanger), as shown in Table 2.3.1-1 of the SLRA; however, it is not specifically described with the RCP seal discussion in SLRA Section 2.3.1.1.3 or elsewhere in SLRA Section 2.3.1.1. Therefore, the staff requested that the applicant verify whether the thermal barrier heat exchanger is within the scope of license renewal in accordance with 10 CFR 54.4(a), and whether it is subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The RAI and the applicant's response are documented in Agencywide Documents Access and Management System (ADAMS) Accession No. ML19050A420. The applicant responded that the component cooling water supply to the RCP A thermal barrier heat exchanger is within the scope of subsequent license renewal and that shading of this piping on boundary drawing 5613-M-3041, Sheet 3, was inadvertently omitted. The applicant revised the subject boundary drawing to include this piping. The applicant also stated that the RCP thermal barrier heat exchangers are within the scope of license renewal and subject to an AMR. The applicant responded that the thermal barrier heat exchangers are included in SLRA Table 2.3.1-1 as the component type "Heat exchanger (tubes and coils)," and the AMR of the component type "Heat exchanger (coil)" is included in SLRA Table 3.1.2-1. The staff finds the applicant's response acceptable, in that the applicant confirmed that the subject components are within the scope of license renewal and subject to an AMR. The staff also confirmed that the subject drawing has been updated accordingly. The staff's concern described in RAI 2.3.1.1-1 is resolved.

In RAI 2.3.1.1-2, the staff noted that on boundary drawing 5613-M-3041, Sheet 2, "Reactor Coolant System," three instrument lines off of the piping downstream of the pressurizer safety relief valves are shown as not within the scope of license renewal (i.e., not highlighted). These same lines are highlighted (i.e., within the scope of license renewal) on the equivalent drawing for Unit 4 (5614-M-3041, Sheet 2, "Reactor Coolant System"). The staff requested that the applicant verify whether these lines are within the scope of license renewal, in accordance with 10 CFR 54.4(a), and whether they are subject to an AMR, in accordance with 10 CFR 54.21(a)(1). The RAI and the applicant's response are documented in ADAMS Accession No. ML19050A420.

The applicant responded that the three instrument lines off of the piping downstream of the pressurizer safety relief valves connected to instruments ZS-3-6303A, ZS-3-6303B, and ZS-3-6303C are within the scope of subsequent license renewal and subject to an AMR and that shading of these instrumentation lines on boundary drawing 5613-M-3041, Sheet 2, was inadvertently omitted. The applicant revised the subject boundary drawing to address this concern. The staff finds the applicant's response acceptable, in that the applicant confirmed that the subject components are within the scope of license renewal and subject to an AMR. The staff also confirmed that the subject drawing has been updated accordingly. The staff's concern described in RAI 2.3.1.1-2 is resolved.

2.3.1.1.3 Conclusion

Based on its review, as discussed above, the NRC staff concludes that there is reasonable assurance that the applicant has appropriately identified the reactor coolant and connected piping components within the scope of subsequent license renewal, as required by 10 CFR 54.4, and that the applicant has adequately identified the system components subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

2.3.1.2 Pressurizers

2.3.1.2.1 Summary of Technical Information in the Application

SLRA Section 2.3.1.2 describes the pressurizer components subject to an AMR. The pressurizer boundaries are included in the license renewal boundary drawings listed in SLRA Section 2.3.1. SLRA Table 2.3.1-2 provides a list of the pressurizer 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 pressurizer 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 has included within the scope of license renewal all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of license renewal to verify that the applicant has included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.1.2.3 Conclusion

Based on its review, as discussed above, the NRC staff concludes that there is reasonable assurance that the applicant has appropriately identified the pressurizer components within the scope of subsequent license renewal, as required by 10 CFR 54.4, and that the applicant has adequately identified the system components subject to an AMR, in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.1.3 Reactor Vessels

2.3.1.3.1 Summary of Technical Information in the Application

SLRA Section 2.3.1.3 describes the reactor vessel components subject to an AMR. The reactor vessel boundaries are included in the license renewal boundary drawings listed in SLRA Section 2.3.1. SLRA Table 2.3.1-3 provides a list of the reactor vessel 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 vessel SCs.

2.3.1.3.2 Staff Evaluation

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

2.3.1.3.3 Conclusion

Based on its review, as discussed above, the NRC staff concludes that there is reasonable assurance that the applicant has appropriately identified the reactor vessel components within the scope of subsequent license renewal, as required by 10 CFR 54.4, and that the applicant has adequately identified the system components subject to an AMR, in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.1.4 Reactor Vessel Internals

2.3.1.4.1 Summary of Technical Information in the Application

SLRA Section 2.3.1.4 describes the reactor vessel internals components subject to an AMR. The reactor vessel internals boundaries are included in the license renewal boundary drawings listed in SLRA Section 2.3.1. SLRA Table 2.3.1-4 provides a list of the reactor vessel internals 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 reactor vessel internals SCs.

2.3.1.4.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant has included within the scope of license renewal all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of license renewal to verify that the applicant has

included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.1.4.3 Conclusion

Based on its review, as discussed above, the NRC staff concludes that there is reasonable assurance that the applicant has appropriately identified the reactor vessel internal components within the scope of subsequent license renewal, as required by 10 CFR 54.4, and that the applicant has adequately identified the system components subject to an AMR, in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.1.5 Steam Generators

2.3.1.5.1 Summary of Technical Information in the Application

SLRA Section 2.3.1.5 describes the steam generator components subject to an AMR. The steam generator boundaries are included in the license renewal boundary drawings listed in SLRA Section 2.3.1. SLRA Table 2.3.1-5 provides a list of the steam generator component types subject to an AMR and their intended functions. SLRA Table 3.1.2-5 provides the results of the applicant's AMR for steam generator 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 has included within the scope of license renewal all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of license renewal to verify that the applicant has included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.1.5.3 Conclusion

Based on its review, as discussed above, the NRC staff concludes that there is reasonable assurance that the applicant has appropriately identified the steam generator components within the scope of subsequent license renewal, as required by 10 CFR 54.4, and that the applicant has adequately identified the system components subject to an AMR, in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.2 Engineered Safety Features

SLRA Section 2.3.2, "Engineered Safeguards Features," identifies the ESF SCs subject to an AMR for license renewal. The applicant described the supporting SCs of the ESFs in the following SLRA sections:

- SLRA Section 2.3.2.1, "Emergency Containment Cooling"
- SLRA Section 2.3.2.2, "Containment Spray"
- SLRA Section 2.3.2.3, "Containment Isolation"
- SLRA Section 2.3.2.4, "Safety Injection"
- SLRA Section 2.3.2.5, "Residual Heat Removal"
- SLRA Section 2.3.2.6, "Containment Post-Accident Monitoring and Control"

SER Sections 2.3.2.1–2.3.2.6 include the staff's findings on its review of SLRA Sections 2.3.2.1–2.3.2.6, respectively.

2.3.2.1 Emergency Containment Cooling

2.3.2.1.1 Summary of Technical Information in the Application

SLRA Section 2.3.2.1 describes the emergency containment cooling (ECC) components subject to an AMR and lists the license renewal boundary drawings that show the ECC system boundaries. SLRA Table 2.3.2-1 provides a list of the ECC 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 ECC SCs.

2.3.2.1.2 Staff Evaluation

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

Using the evaluation methodology described in SLRA Section 2.1 and the guidance in SRP-SLR Section 2.3, "Scoping and Screening Results: Mechanical Systems," the staff reviewed the following:

- SLRA Section 2.3.2.1
- SLRA Table 2.3.2-1
- UFSAR Sections 6.3 and 14.3.4

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 license renewal boundary drawings, the staff concludes that FPL appropriately identified the ECC components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL 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 Containment Spray

2.3.2.2.1 Summary of Technical Information in the Application

SLRA Section 2.3.2.2, describes the containment spray system (CSS) components subject to an AMR and lists the boundary drawings that show the CSS boundaries. SLRA Table 2.3.2-2 provides a list of the CSS 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 CSS SCs.

2.3.2.2.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant has included within the scope of license renewal all components with intended

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

2.3.2.2.3 Conclusion

Based on its review, as discussed above, the NRC staff concludes that there is reasonable assurance that the applicant has appropriately identified the CSS components within the scope of subsequent license renewal, as required by 10 CFR 54.4, and that the applicant has adequately identified the system components subject to an AMR, in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.2.3 Containment Isolation

2.3.2.3.1 Summary of Technical Information in the Application

SLRA Section 2.3.2.3 describes the containment isolation components subject to an AMR and lists the license renewal boundary drawings that show the containment isolation system boundaries. SLRA Table 2.3.2-3 provides a list of the containment isolation 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 containment isolation SCs.

2.3.2.3.2 Staff Evaluation

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

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

- SLRA Section 2.3.2.3
- SLRA Table 2.3.2-3
- UFSAR Sections 6.6 and 9.8

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 license renewal boundary drawings, the staff concludes that FPL appropriately identified the containment isolation components within the scope of license renewal, as required by 10 CFR 54.4(a).The staff also concludes that FPL 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 (SI) components subject to an AMR and lists the license renewal boundary drawings that show the SI system boundaries. SLRA Table 2.3.2-4 provides a list of the SI 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 SI SCs.

2.3.2.4.2 Staff Evaluation

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

2.3.2.4.3 Conclusion

Based on its review, as discussed above, the NRC staff concludes that there is reasonable assurance that the applicant has appropriately identified the SI components within the scope of subsequent license renewal, as required by 10 CFR 54.4, and that the applicant has adequately identified the system components subject to an AMR, in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.2.5 Residual Heat Removal

2.3.2.5.1 Summary of Technical Information in the Application

SLRA Section 2.3.2.5 describes the residual heat removal (RHR) components subject to an AMR and lists the license renewal boundary drawings that show the RHR system boundaries. SLRA Table 2.3.2-5 provides a list of the RHR component types subject to an AMR and their intended functions. SLRA Table 3.2.2-5 provides the results of the applicant's AMR for RHR SCs.

2.3.2.5.2 Staff Evaluation

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

The staff's review identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results, which resulted in the issuance of RAI 2.3.2.5-1. In this RAI, the staff noted that on boundary drawing 5614-M-3050, Sheet 1, "Residual Heat Removal System," RHR/Low Head Safety Injection Pumps 4A and 4B and their associated piping, as shown in Detail 1 and Detail 2, were highlighted in blue, which is inconsistent with the equivalent drawing for Unit 3 (5613-M-3050, Sheet 1, "Residual Heat

Removal System"), which shows these components highlighted in green. Section 2.1.1 of the SLRA provides the highlighting criteria as follows:

> Nonsafety-related mechanical components that are included within the scope of license renewal because component failure could prevent the accomplishment of a safety-related function due to potential physical interaction with safety-related SSCs are shown highlighted in blue.

Given that these pumps (and associated piping) provide a safety-related function, as specified in SLRA Section 2.3.2.5, the staff requested that the applicant confirm that these components are indeed safety related and should have been highlighted in green (denoting they perform a safety-related function) and are within the scope of license renewal, in accordance with 10 CFR 54.4(a), and whether they are subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

The RAI and the applicant's response are documented in ADAMS Accession No. ML18341A003. The applicant responded that the Turkey Point Unit 4 RHR pump piping within the "B" class boundary, shown on Detail 1 and 2 of boundary drawing 5614-M-3050, Sheet 1, is safety related and within the scope of subsequent license renewal and subject to an AMR. The applicant stated that the subject piping was inadvertently highlighted in blue, and the subject boundary drawing has been revised to highlight the subject piping green, consistent with its safety-related classification, in accordance with 10 CFR 54.21(a)(1).

The staff finds the applicant's response acceptable, as the applicant confirmed that the subject components are indeed safety related and are within the scope of subsequent license renewal and subject to an AMR. The staff also confirmed that the subject drawing has been updated accordingly. The staff's concern described in RAI 2.3.2.5-1 is resolved.

2.3.2.5.3 Conclusion

Based on its review, as discussed above, the NRC staff concludes that there is reasonable assurance that the applicant has appropriately identified the RHR components within the scope of subsequent license renewal, as required by 10 CFR 54.4, and that the applicant has adequately identified the system components subject to an AMR, in accordance with the requirements stated in 10 CFR 54.21(a)(1).

2.3.2.6 Containment Post-Accident Monitoring and Control

2.3.2.6.1 Summary of Technical Information in the Application

SLRA Section 2.3.2.6 describes the containment post-accident monitoring and control components subject to an AMR and lists the license renewal boundary drawings that show the system boundaries. SLRA Table 2.3.2-6 provides a list of the containment post-accident monitoring and control component types subject to an AMR and their intended functions. SLRA Table 3.2.2-6 provides the results of the applicant's AMR for containment post-accident monitoring and control SCs.

2.3.2.6.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant has included within the scope of license renewal all components with intended

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

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 2.3.2.6
- SLRA Table 2.3.2-6
- UFSAR Sections 7.5, 9.3, 9.12, 9.13, 9.14, and 11.2.3

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, which resulted in the issuance of RAI 2.3.2.6-1. The RAI and the applicant's response are documented in ADAMS Accession No. ML18261A028.

In RAI 2.3.2.6-1, the staff observed that the 1-inch stainless steel tubing and valve "3-11-034" to containment penetration P-33 on the relevant Unit 3 SLRA drawing (P&ID 5613-M-3094) were displayed as not being subject to an AMR. Similarly, the staff noted that the 1-inch stainless steel tubing and valve "4-11-034" to containment penetration P-33 on the relevant Unit 4 SLRA drawing (P&ID 5614-M-3094) were displayed as not being subject to an AMR.

In contrast, SLRA Section 2.3.2.6, under the subheading "System Intended Functions," includes the following:

> Safety-related functions (10 CFR 54.4(a)(1)):
>
> 2) Provide control of radioactive releases by isolating the containment purge and instrument air bleed lines in any abnormal event that results in excessive radiation releases to the containment. Additionally, provide a signal to isolate the control room ventilation system (CRVS) and thus prevent the potential ingress of radioactivity into the control room.

The staff observed that Technical Specification 3/4.3.2 Functional Unit 3.c, "Containment Ventilation Isolation," aligns with safety-related function (2).

The staff inquired as to whether the stainless steel sensing line and valve to each Unit 3 and Unit 4 containment penetration P-33 support the accomplishment of a safety-related function during plant modes 1, 2, 3, and 4, and were (1) part of each containment's post-accident monitoring and control system's pressure boundary and, therefore, (2) subject to an AMR.

The applicant confirmed in the RAI response the functions of the stainless steel sensing lines and valves, as follows:

> The subject [Turkey Point] Unit 3 and 4 Containment Post Accident Monitoring and Control system 1" stainless steel tubing and valves 3-11-034 and 4-11-034, respectively, are required to supply air samples from the normal containment coolers to the particulate and gaseous radiation monitors which signal containment ventilation isolation during Plant Modes 1, 2, 3, and 4. Consistent with the SLR pressure boundary intended function of the tubing and valves in question, and the

operability requirements outlined in the [Turkey Point] Technical Specifications, these components directly support the accomplishment of Safety-Related function (2) during Plant Modes 1, 2, 3, and 4.

The applicant also indicated that SLRA Table 3.2.2-6 already addresses stainless steel tubing and valves exposed to an internal and external environment of “Air–indoor uncontrolled” and, therefore, no SLRA change would be required. However, the applicant did state that the relevant subsequent license renewal boundary drawings would be updated to include the subject stainless steel tubing and valves within the scope of subsequent license renewal and requiring aging management.

The staff finds the applicant’s response acceptable because it requires that the relevant license renewal boundary drawings be updated to reflect that the stainless steel sensing line and valve to each Unit 3 and Unit 4 containment penetration P-33 require aging management. In addition, the staff finds the applicant’s response to be comprehensive, in that it affirmed that SLRA Table 3.2.2-6 already addresses the subject stainless steel tubing and valves as being exposed to an internal and external environment of “Air–indoor uncontrolled.” The staff’s concern described in RAI 2.3.2.6-1 is resolved.

2.3.2.6.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.2.6.2 and on a review of the SLRA, UFSAR, and license renewal boundary drawings, the staff concludes that FPL appropriately identified the containment post-accident monitoring and control components within the scope of license renewal, as required by 10 CFR 54.4(a).The staff also concludes that FPL 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 license renewal. The applicant described the supporting SCs of the auxiliary systems in the following SLRA sections:

- SLRA Section 2.3.3.1, “Intake Cooling Water”
- SLRA Section 2.3.3.2, “Component Cooling Water”
- SLRA Section 2.3.3.3, “Spent Fuel Pool Cooling”
- SLRA Section 2.3.3.4, “Chemical and Volume Control”
- SLRA Section 2.3.3.5, “Primary Water Makeup”
- SLRA Section 2.3.3.6, “Primary Sampling”
- SLRA Section 2.3.3.7, “Secondary Sampling”
- SLRA Section 2.3.3.8, “Waste Disposal”
- SLRA Section 2.3.3.9, “Plant Air”
- SLRA Section 2.3.3.10, “Normal Containment Ventilation”
- SLRA Section 2.3.3.11, “Plant Ventilation”
- SLRA Section 2.3.3.12, “Fire Protection”
- SLRA Section 2.3.3.13, “Emergency Diesel Generator Cooling Water”
- SLRA Section 2.3.3.14, “Emergency Diesel Generator Air”

- SLRA Section 2.3.3.15, “Emergency Diesel Generator Fuel and Lubricating Oil”
- SLRA Section 2.3.3.16, “Auxiliary Systems in the Scope of 10 CFR 54.4(a)(2) for Spatial Interactions”

SER Sections 2.3.3.1–2.3.3.16 include the staff’s findings on its review of SLRA Sections 2.3.3.1–2.3.3.16, respectively.

2.3.3.1 Intake Cooling Water

2.3.3.1.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.1 describes the intake cooling water (ICW) components subject to an AMR and lists the license renewal boundary drawings that show the ICW system boundaries. SLRA Table 2.3.3-1 provides a list of the ICW 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 ICW SCs.

2.3.3.1.2 Staff Evaluation

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

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 2.3.3.1
- SLRA Table 2.3.3-1
- UFSAR Section 9.6.2

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, which resulted in the issuance of RAI 2.3.3.1-1. The RAI and the applicant’s response are documented in ADAMS Accession No. ML18334A182.

The staff was concerned that the list of intended functions for the ICW system provided in SLRA Section 2.3.3.1 may be inconsistent with licensing basis information and, in combination with the list of component types and component intended functions, insufficient to meet the requirements of 10 CFR 54.21(a)(1) to identify the components subject to an AMR. Specifically, the staff noted that Section 1.9, “Quality Assurance Program,” and Appendix 5A, “Seismic Classification & Design Basis for Structures, Systems and Equipment for Turkey Point,” of the UFSAR describe the portion of the ICW system from the system pumps to the component cooling water (CCW) heat exchanger inlet nozzle as subject to the facility quality assurance program and designated as Class I, respectively. Components in the CCW, spent fuel pool cooling, and residual heat removal systems are similarly classified. Furthermore, in SLRA Sections 2.3.3.2, and 2.3.3.3, the core decay heat removal and spent fuel pool cooling functions are classified under 10 CFR 54.4(a)(1) as safety-related intended functions. However, SLRA Section 2.3.3.1 indicated that only the removal of heat from the CCW system for reactor and containment heat removal during design-basis accident conditions is a safety-related function. SLRA

Section 2.3.3.1 indicated that the intended functions of providing spent fuel cooling and core decay heat removal are not safety-related.

In RAI 2.3.3.1-1, the staff requested that the applicant clarify the intended functions of the ICW system in a manner that supports identification of the ICW system components that are subject to an aging management program (AMP). The applicant confirmed that all the ICW system components that provide the spent fuel cooling and core decay heat removal intended functions are safety-related. Therefore, the applicant determined that the components subject to an AMP were correctly identified along with the associated component's intended functions. The applicant amended Section 2.3.3.1 of the SLRA to indicate that spent fuel cooling and removal of core decay heat under normal operating conditions are safety-related intended functions of the ICW system. Thus, the issue discussed in RAI 2.3.3.1-1 is resolved.

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, system DBD, UFSAR, and license renewal boundary drawings, the staff concludes that FPL appropriately identified the ICW components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.2 Component Cooling Water

2.3.3.2.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.2 describes the CCW components subject to an AMR and lists the license renewal boundary drawings that show the CCW system boundaries. SLRA Table 2.3.3-2 provides a list of the CCW component types subject to an AMR and their intended functions. SLRA Table 3.3.2-2 provides the results of the applicant's AMR for CCW SCs.

2.3.3.2.2 Staff Evaluation

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

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 2.3.3.2
- SLRA Table 2.3.3-2
- UFSAR Section 9.3

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 for the CCW system, which resulted in the issuance of RAI 2.3.17-1. The RAI and the applicant's response are documented in ADAMS Accession No. ML18296A024.

In RAI 2.3.17-1, the staff noted that UFSAR Section 9.3.3, “System Evaluation, Availability and Reliability, Leakage Provisions, Component Cooling Loop,” indicated that the CCW system design basis included an assumed passive failure of valve packing or a pump seal having leakage of 50 gallons per minute and that operation of the CCW system could continue with leakage up to the makeup capacity of the line from the primary water storage tank to the CCW surge tank. However, the staff found that the components necessary to provide makeup water to the CCW system surge tank were not among the components identified as subject to an AMR in Section 2.3.3 of the SLRA.

In RAI 2.3.17-1, the staff requested that the applicant either identify specific components subject to management of aging effects in a makeup water flowpath from the primary water makeup (PWM) system (or other suitable inventory source) or describe the conditions and actions necessary to maintain the intended functions of the CCW system in the event of leakage. The applicant chose to include the flowpath from the Turkey Point Unit 3 and Unit 4 primary water storage tanks (PWSTs) to the respective CCW surge tank within the scope of license renewal. The applicant stated that the flowpath provides a long-term nonsafety-related function that supports the safety-related function of the CCW system. The applicant identified the following specific changes to the SLRA sections to identify how the aging effects applicable to the PWM to CCW system intended function:

- Revised SLRA Section 2.1.5.2.1, “Nonsafety-Related SSCs Required to Functionally Support Safety-Related SSCs,” to add: “The primary water makeup system provides long-term make up to the Unit 3 and 4 CCW system surge tanks.”
- Revised SLRA Section 2.3.3.2, “Component Cooling Water,” to identify that CCW license renewal boundary drawings (i.e., Unit 3 Drawing 5613-M-3030, Sheet 1, and Unit 4 Drawing 5614-M-3030, Sheet 1) have been updated to reflect the addition of the flowpath from the PWM system to the CCW surge tanks discussed in SLRA Section 2.3.3.5.
- Revised SLRA Section 2.3.3.4, “Chemical and Volume Control,” to identify that a chemical and volume control system (CVCS) boundary drawing (i.e., Common Drawing 5610-M-3046, Sheet 1) has been updated to reflect the addition of the flowpath from the PWM system to the CCW surge tanks discussed in SLRA Section 2.3.3.5.
- Revised SLRA Section 2.3.3.5, “Primary Water Makeup,” to identify that PWM license renewal boundary drawings (i.e., Unit 3 Drawing 5613-M-3020, Sheets 1 and 2, and Unit 4 Drawing 5614-M-3020, Sheets 1 and 2) have been updated to reflect the addition of the flowpath from the PWM system to the CCW surge tanks and added a statement that the PWM system flowpath provides a long term nonsafety- related makeup function that supports the safety-related function of the CCW system.
- Revised SLRA Table 2.3.3-5, “PWM—Summary of Aging Management Review,” to add pump casing and tank component types with a pressure boundary intended function.
- Revised SLRA Section 3.3.2.1, “Materials, Environments, Aging Effects Requiring Management,” to add the following to Section 3.3.2.1.5, “Primary Water Makeup”: “coating as a material of construction; air–outdoor and underground as component environments; and loss of coating or lining integrity as an aging effect requiring management.”

The staff reviewed the additions and modifications to the SLRA for compliance with the requirements of 10 CFR 54.4(a)(2) and 10 CFR 54.21(a)(1). The staff found that the added description of the PWM flowpath from the PWSTs to the CCW system appropriately identified the CCW system components within the scope of license renewal and subject to an AMR, consistent with the requirements of 10 CFR 54.4(a)(2) and 10 CFR 54.21(a)(1).

2.3.3.2.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.2.2 and on a review of the SLRA, UFSAR, and license renewal boundary drawings, the staff concludes that FPL appropriately identified the CCW components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.3 Spent Fuel Pool Cooling

2.3.3.3.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.3 describes the spent fuel pool cooling (SFPC) components subject to an AMR and lists the license renewal boundary drawings that show the SFPC system boundaries. SLRA Table 2.3.3-3 provides a list of the SFPC 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 SFPC SCs.

2.3.3.3.2 Staff Evaluation

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

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 2.3.3.3
- SLRA Table 2.3.3-3
- UFSAR Sections 9.5

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 license renewal boundary drawings, the staff concludes that FPL appropriately identified the SFPC components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.4 Chemical and Volume Control

2.3.3.4.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.4 describes the CVCS components subject to an AMR and lists the license renewal boundary drawings that show the CVCS boundaries. SLRA Table 2.3.3-4 provides a list of the CVCS 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 CVCS SCs.

2.3.3.4.2 Staff Evaluation

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

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 2.3.3.4
- SLRA Table 2.3.3-4
- UFSAR Section 9.2

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 for the CVCS, which resulted in the issuance of RAI 2.3.3.4-1. The RAI and the applicant's response are documented in ADAMS Accession No. ML18334A182.

In RAI 2.3.3.4-1, the staff noted that the seal water head tanks and associated piping directly connected to the charging pumps are not identified as subject to an AMP by either SLRA Table 2.3.3-4, "Chemical and Volume Control Components Subject to Aging Management Review," or Detail 1–Detail 3 (charging pumps) shown on license renewal boundary drawings 5613-M-3047, Sheet 2, and 5614-M-3047, Sheet 2, "Chemical and Volume Control System Charging and Letdown." Section 4, "Non-Safety SSCs Directly Connected to Safety-Related SSCs," of Appendix F to NEI 95-10, Revision 6, states the following:

> For non-safety SSCs directly connected to safety-related SSCs (typically piping systems), the non-safety piping and supports, up to and including the first equivalent anchor beyond the safety/non-safety interface, are within the scope of license renewal per 10 CFR 54.4(a)(2).

The drawings indicate the seal water head tanks are directly connected to the charging pump bodies. Therefore, the staff concluded that the seal water tanks should be included in the scope of components that are subject to an AMR.

In RAI 2.3.3.4-1, the staff requested that the applicant either justify the exclusion of the charging pump seal water head tanks and associated piping connecting the tanks to the charging pump bodies to the scope of equipment subject to an AMR or amend the applicable program as appropriate. The applicant stated that the charging pump seal water head tanks and associated piping connecting the tanks to the charging pump bodies are within the scope of equipment subject to an AMR as nonsafety SSCs directly connected to safety-related SSCs. The applicant indicated that the seal water head tanks, tubing, and valves would be managed as piping and piping components with a structural integrity "attached" intended function exposed to an external environment of air indoor uncontrolled and an internal environment of treated borated water, which correspond to existing aging management evaluations listed in SLRA Table 3.3.2-4.

As discussed in SER Section 2.3.3.2, the applicant stated that SLRA Section 2.3.3.4 would be revised to identify that CVCS boundary drawing (i.e., Common Drawing 5610-M-3046, Sheet 1) has been updated to reflect the addition of the flowpath from the PWM system to the CCW surge tanks discussed in SLRA Section 2.3.3.5, which reflects the addition of additional piping segments to the scope of components subject to an aging management evaluation.

The staff reviewed the additions and modifications to the SLRA for compliance with the requirements of 10 CFR 54.4(a)(2) and 10 CFR 54.21(a)(1). The staff found that the existing description of an intended function to maintain the integrity of nonsafety-related components to prevent interaction with safety-related components adequately encompasses the intended function of the charging pump seal water head tanks and associated piping. This intended function, combined with the existing component types and environments, adequately identifies the components associated with the charging pump seal water head tank as components subject to an aging management evaluation. Similarly, the added description of the flowpath through CVCS components from the PWSTs to the CCW system appropriately identified the components within the scope of license renewal and subject to an AMR.

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 license renewal boundary drawings, the staff concludes that FPL appropriately identified the CVCS components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.5 Primary Water Makeup

2.3.3.5.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.5 describes the PWM components subject to an AMR and lists the license renewal boundary drawings that show the PWM system boundaries. SLRA Table 2.3.3-5 provides a list of the PWM 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 PWM SCs.

2.3.3.5.2 Staff Evaluation

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

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 2.3.3.5
- SLRA Table 2.3.3-5
- UFSAR Section 9.6.2

As discussed in SER Section 2.3.3.2, the applicant stated that the following changes to SLRA Section 2.3.3.5 would be implemented to identify components in portions of the PWM system necessary to deliver water from the PWSTs to the CCW system surge tanks, subject to an aging management evaluation:

- Revised SLRA Section 2.3.3.5 to identify that PWM license renewal boundary drawings (i.e., Unit 3 Drawing 5613-M-3020, Sheets 1 and 2, and Unit 4 Drawing 5614-M-3020, Sheets 1 and 2) have been updated to reflect the addition of the flowpath from the PWM system to the CCW surge tanks and added a statement that the PWM system flowpath provides a long-term nonsafety-related makeup function that supports the safety-related function of the CCW system.
- Revised SLRA Table 2.3.3-5, "PWM—Summary of Aging Management Review," to add pump casing and tank component types with a pressure boundary intended function.
- Revised SLRA Section 3.3.2.1 to add the following to Section 3.3.2.1.5: "coating as a material of construction; air–outdoor and underground as component environments; and loss of coating or lining integrity as an aging effect requiring management."

The staff reviewed the additions and modifications to the SLRA for compliance with the requirements of 10 CFR 54.4(a)(2) and 10 CFR 54.21(a)(1). The staff found that the added description of the PWM flowpath from the PWSTs to the CCW system and the addition of the pump casing and tank component types with pressure boundary intended functions appropriately identified the PWM system components within the scope of license renewal and subject to an AMR, consistent with the requirements of 10 CFR 54.4(a)(2) and 10 CFR 54.21(a)(1).

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 license renewal boundary drawings, the staff concludes that FPL appropriately identified the PWM components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.6 Primary Sampling

2.3.3.6.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.6 describes the primary sampling components subject to an AMR and lists the license renewal boundary drawings that show the primary sampling system boundaries. SLRA Table 2.3.3-6 provides a list of the primary sampling 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 primary sampling SCs.

2.3.3.6.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant has included within the scope of license renewal all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of license renewal to verify that the applicant has

included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

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 2.3.3.6
- SLRA Table 2.3.3-6
- UFSAR Section 9.4

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, UFSAR, and license renewal boundary drawings, the staff concludes that FPL appropriately identified the primary sampling components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.7 Secondary Sampling

2.3.3.7.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.7 describes the secondary sampling components subject to an AMR and lists the license renewal boundary drawings that show the secondary sampling system boundaries. SLRA Table 2.3.3-7 provides a list of the secondary sampling 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 secondary sampling SCs.

2.3.3.7.2 Staff Evaluation

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

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 2.3.3.7
- SLRA Table 2.3.3-7
- UFSAR Section 9.4

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, and license renewal boundary drawings, the staff concludes that FPL appropriately identified the secondary sampling components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.8 Waste Disposal

2.3.3.8.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.8 describes the waste disposal components subject to an AMR and lists the license renewal boundary drawings that show the waste disposal system boundaries. SLRA Table 2.3.3-8 provides a list of the waste disposal 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 waste disposal SCs.

2.3.3.8.2 Staff Evaluation

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

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 2.3.3.8
- SLRA Table 2.3.3-8
- UFSAR Section 11.1

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 license renewal boundary drawings, the staff concludes that FPL appropriately identified the waste disposal components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.9 Plant Air

2.3.3.9.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.9 describes the plant air components subject to an AMR and lists the license renewal boundary drawings that show the plant air system boundaries. SLRA Table 2.3.3-9 provides a list of the plant air 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 plant air SCs.

2.3.3.9.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant has included within the scope of license renewal all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of license renewal to verify that the applicant has

included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

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 2.3.3.9
- SLRA Table 2.3.3-9
- UFSAR Section 9.17

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 license renewal boundary drawings, the staff concludes that FPL appropriately identified the plant air system components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.10 Normal Containment Ventilation

2.3.3.10.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.10 describes the normal containment ventilation system (NCVS) components subject to an AMR and lists the license renewal boundary drawings that show the NCVS system boundaries. SLRA Table 2.3.3-10 provides a list of the NCVS 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 NCVS SCs.

2.3.3.10.2 Staff Evaluation

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

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 2.3.3.10
- SLRA Table 2.3.3-10
- UFSAR Section 9.10

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, system DBD, UFSAR, and license renewal boundary drawings, the staff concludes that FPL appropriately identified the NCVS components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.11 Plant Ventilation

The plant ventilation system includes the auxiliary building and electrical equipment room ventilation system and the control building ventilation system, which are common to both units, and the emergency diesel generator (EDG) building ventilation systems and the turbine building ventilation systems, which are unit specific. The staff's evaluation the four plant ventilation systems are provided in SER Sections 2.3.3.11.1–2.3.3.11.4.

2.3.3.11.1 Auxiliary Building and Electrical Equipment Room Ventilation

2.3.3.11.1.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.11.1, "Auxiliary Building and Electrical Equipment Room Ventilation," describes the auxiliary building and the electrical room ventilation system components subject to an AMR. This section also lists the license renewal boundary drawings that show the system boundaries and provides additional information regarding the system boundaries. SLRA Table 2.3.3-11 provides a list of the plant ventilation 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 auxiliary building and the electrical room ventilation SCs.

2.3.3.11.1.2 Staff Evaluation

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

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 2.3.3.11.1
- SLRA Table 2.3.3-11
- UFSAR Sections 9.8.1 and 9.8.2

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, which resulted in the issuance of RAI 2.3.3.11.1-1. The RAI and the applicant's response are documented in ADAMS Accession No. ML18261A028.

In RAI 2.3.3.11.1-1, the staff noted that SLRA Section 2.3.3.11.1 indicated that there are no nonsafety-related ventilation components that could affect safety-related functions (10 CFR 54.4(a)(2)) within the electrical equipment room.

The staff observed that SLRA Table 2.3.3.16-3, "Component Intended Functions for 10 CFR 54.4(a)(2) Components in the Auxiliary Building Subject to Aging Management Review," and Table 2.3.3-11, "Plant Ventilation Components Subject to Aging Management Review," indicate that "Component Types" within the electrical equipment room have an "Intended Function" of "Leakage Boundary (spatial)." These nonsafety-related components are displayed as being subject to an AMR on the relevant SLRA drawing (P&ID 5610-M-3060-SH3). The staff observed that these nonsafety-related components of the auxiliary building ventilation system (i.e., bolted connections, heat exchanger tubes, piping, and valves) are located inside the electrical equipment room alongside the safety-related components. In agreement, both SLRA Table 2.3.3-11 and Table 3.3.2-11, "Auxiliary Building and Electrical Equipment Room Ventilation—Summary of Aging Management Evaluation," identify an "Intended Function" of "Leakage Boundary (Spatial)" for the "Component Types" of "Bolting," "Heat Exchanger (tubes)," "Piping," and "Valves."

The staff also noted that the heat exchanger condensate drain lines from each of the three air handling units (AHUs) V76, V77, and V78 were neither displayed nor represented as being subject to an AMR on the relevant SLRA drawing (P&ID 5610-M-3060-SH3). The staff identified that if the heat exchanger tubes of these AHUs represent a leakage boundary (spatial) threat to nearby safety-related components, then portions of, or all, the condensate drain lines could also represent a similar hazard. In part (a) to RAI 2.3.3.11.1-1, the staff asked why SLRA Section 2.3.3.11.1 specified that there are no nonsafety-related ventilation components that affect safety-related functions (10 CFR 54.4(a)(2)) within the electrical equipment room, when the staff's observations above identified a potential hazard.

The applicant responded by referencing SLRA Section 2.1.5.2, which indicates that there are three categories of SSCs that are within the scope of 10 CFR 54.4(a)(2):

(1) nonsafety-related SSCs that may have the potential to prevent satisfactory accomplishment of safety functions; this includes nonsafety-related SSCs credited as design features in the CLB and nonsafety-related SSCs required to functionally support safety-related SSCs

(2) nonsafety-related SSCs directly connected to safety-related SSCs that provide structural support for the safety-related SSCs

(3) nonsafety-related SSCs that are not directly connected to safety-related SSCs but have the potential to affect safety-related SSCs through spatial interactions

For the electrical equipment room portion of auxiliary building and electrical equipment room ventilation, the applicant indicated that there are no SSCs that fall into the first two bulleted categories above. The applicant stated the following:

> [I]f there are nonsafety-related SSCs for a particular system that meet the category for the third bullet above, the spatial interaction function is addressed separately in the [Turkey Point] SLRA as part of the spaces approach. In SLRA Section 2.1.5.2.3, for nonsafety-related SSCs that are not directly connected to safety-related SSCs, the nonsafety-related SSCs may be in-scope if their failure could prevent the performance of a system safety function. By utilizing the spaces approach, the only nonsafety-related mechanical system categories determined to have the potential for spatial interactions are auxiliary systems and steam and power conversion systems.

The applicant concluded that both SLRA Section 2.3.3.11.1 and SLRA Table 2.3.3.16-3 are accurate since nonsafety-related ventilation components that could affect safety-related functions due to spatial interactions within the electrical equipment room are addressed under the third bulleted category. The staff confirmed that the scoping and screening results for nonsafety-related SSCs of the "third category" are appropriately reported in Section 2.3.3.16 of the SLRA.

In part (b) to RAI 2.3.3.11.1-1, the staff requested that the applicant either identify where the SLRA addresses the AMR for the condensate drain lines for each of the AHUs V76, V77, and V78 or provide a justification for not including internal “Environment” of “Condensation (int)” for the “Component Type” of “Piping” in the AMP documented in SLRA Table 3.3.2-11 for the auxiliary building and electrical equipment room ventilation system.

The applicant responded, in part, as follows:

> [C]ondensate drain lines associated with AHUs are typically not reflected on the P&IDs. Note that these lines are not pressurized, so leakage is the only potential spatial interaction. To confirm the location and configuration of the condensate drain lines, walkdowns of the specific areas where the AHUs are installed were performed.

From these detailed walkdowns, the applicant concluded that for AHUs V76, V77, and V78 of the auxiliary building and electrical equipment room ventilation system, the location of the condensate drain lines from each AHU do not represent a spatial 10 CFR 54.4(a)(2) threat to safety-related SSCs and, therefore, do not perform a subsequent license renewal intended function. Therefore, these drain lines do not require an AMR.

In part (c) to RAI 2.3.3.11.1-1, the staff noted that RAI 2.3.3.11.4-2 for the turbine building ventilation system documented a similar issue relating to condensate drain lines from the cooler and AHUs. In that particular case, the staff identified that both the SLRA drawing notes and the lack of identification of the drain lines as subject to an AMR within the turbine building load center and switchgear rooms was inconsistent with the guidance of SRP-SLR Section 3.3, “Aging Management of Auxiliary Systems.” In particular, Section 3.3 reads, in part, the following:

> This review plan section also includes structures and components in nonsafety- related systems that are not connected to safety-related systems, structures, and components (SSCs) but have a spatial relationship such that their failure could adversely impact the performance of a safety-related SSC intended function. Examples of such nonsafety-related systems may be plant drains, liquid waste processing, potable/sanitary water, water treatment, process sampling, and cooling water systems.

Based on the identification by the staff of two cases of inconsistency with the SRP-SLR guidance without exceptions or proposed alternative approaches, the staff requested that the applicant provide additional details of how it applied the guidance of SRP-SLR Section 3.3.

In the RAI response, the applicant indicated that its discussion of the condensate drain lines for the AHUs associated with load center and switchgear room cooling in the turbine building was captured in the response to RAI 2.3.3.11.4-2. For other AHUs located in areas containing safety-related SSCs, the applicant performed walkdowns of the specific areas where 16 AHUs are installed to confirm the location and configuration of the condensate drain lines (Table 2-1). The walkdowns of these 16 AHUs confirmed that leaks from the condensate drain lines from each AHU did not have the potential to affect safety-related SSCs. Therefore, the subject condensate drain lines as identified in the RAI response were not within the scope of license renewal.

Based on the foregoing, the applicant confirmed that the condensate drain lines identified in the RAI response do not perform a subsequent license renewal intended function and thus do not require an AMR. With respect to the request for additional details on the application of the guidance in SRP-SLR Section 3.3, the applicant responded as follows:

> [D]ocumented plant walkdowns were used to verify the potential for 10 CFR 54.4(a)(2) spatial interactions as part of the spaces approach described in the SLRA. If there was the potential for spatial interaction of nonsafety-related SSCs with safety-related SSCs, the nonsafety-related SSCs were included in the scope of SLR. The review above confirms that none of the condensate drain lines are in the scope of SLR.

The staff finds the applicant's response to parts (a), (b), and (c) acceptable for the following reasons:

- It provided clarification of the results contained in SLRA Section 2.3.3.11.1.
- It provided comprehensive documentation, via plant area walkdowns, that the regulatory guidance of SRP-SLR Section 3.3 has been followed.

The staff's concern described in RAI 2.3.3.11.1-1 is resolved.

2.3.3.11.1.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.11.1.2 and on a review of the SLRA, UFSAR, and license renewal boundary drawings, the staff concludes that FPL appropriately identified the auxiliary building and electrical equipment room ventilation components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.11.2 Control Building Ventilation

2.3.3.11.2.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.11.2, "Control Building Ventilation," describes the control building ventilation system components subject to an AMR. This section also lists the license renewal boundary drawings that show the system boundaries and provides additional boundary information. SLRA Table 2.3.3-11 provides a list of the plant ventilation 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 control building ventilation SCs.

2.3.3.11.2.2 Staff Evaluation

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

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 2.3.3.11.2
- SLRA Table 2.3.3-11
- UFSAR Sections 9.9.1, 9.9.2, and 9.9.3

The staff's review identified three areas 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 2.3.3.11.2-1, RAI 2.3.3.11.2-2, and RAI 2.3.3.11.2-3. These three RAIs and the applicant's responses are documented in ADAMS Accession No. ML18261A028.

In RAI 2.3.3.11.2-1, the staff noted that Sheet 3 of the SLRA drawing for System 025 (Control Building Ventilation, P&ID 5610-M-3025) displays heating, ventilation, and air conditioning (HVAC) supply and return ducts to the rooftop AHUs of components South Unit E-16F and North Unit E-16E. This HVAC ductwork appeared to the staff to be exposed to outside air as an external environment. SLRA Table 3.0-1, "Service Environments for Mechanical Aging Management Reviews," describes the "Environment" of "Air–outdoor" as "The outdoor environment consists of atmospheric air, salt-laden air, ambient temperature and humidity, and exposure to precipitation."

The staff noted that SLRA Table 3.3.2-12, "Control Building Ventilation—Summary of Aging Management Evaluation," does not list "Air–outdoor (ext)" as an environment. Therefore, the staff requested the applicant either identify where the SLRA addresses the AMR for these supply and return ducts with an external environment of "Air–outdoor (ext)" or provide a justification for not including an external environment of "Air–outdoor (ext)" for this "Component Type" in the AMP.

In the RAI response, the applicant acknowledged that the subject supply and return ducts of the Turkey Point control building direct current (DC) equipment/inverter room rooftop AHUs, between the roof and the connection to the AHU, are exposed to an environment of "Air–outdoor." The applicant updated SLRA Table 3.3.2-12 in a revision to the SLRA to reflect that these sections of ductwork are subject to the following:

- an environment of "Air–outdoor (ext)"
- loss of material
- are managed by the External Surfaces Monitoring of Mechanical Components AMP

The staff finds the applicant's response acceptable because the components were adequately addressed and staff confirmed that the applicant provided a change to the SLRA that adequately addressed the staff's concern. The staff's concern described in RAI 2.3.3.11.2-1 is resolved.

In RAI 2.3.3.11.2-2, the staff noted that Sheet 3 of the SLRA drawing for System 025 (Control Building Ventilation, P&ID 5610-M-3025) identifies that the exhaust ducts from battery room 4B and battery room 3A are not subject to an AMR. In addition, the staff observed that these exhaust ducts are routed through DC equipment room 4A and DC equipment room 3B to the control building roof. The staff noted that SLRA Sections 2.3.3.11.2 and 2.3.3.16 do not address the staff's concern about "physical contact" of these exhaust ducts from potential seismic interaction with safety-related equipment within the DC equipment room 4A and DC equipment room 3B. The staff requested that the applicant clarify whether these particular sections of exhaust ductwork are subject to an AMR and, if not, provide a justification for not including these exhaust ducts in the AMP.

In the RAI response, the applicant confirmed that, as represented on Sheet 3 of the SLRA drawing for System 025 (Control Building Ventilation), nonnuclear safety (NNS) exhaust ductwork connected to the control building battery room exhaust fans (V60, V61, V62, V63) is not subject to an AMR. The applicant stated, in part, the following:

> Consistent with NEI 95-10, Appendix F, Section 5.2.2.3, new and aged NNS piping which may fall on or otherwise physically impact SR SSCs is not considered in scope of SLR for 54.4(a)(2) as long as the associated piping supports do not fail. The control building battery room exhaust fan's NNS exhaust ductwork is treated as functionally equivalent to the NNS piping systems described in NEI 95-10, Appendix F, Section 5.2.2.3, and as such, only the ductwork supports are included in the scope of SLR. Consistent with this guidance, Table 3.5.2-4 of the [Turkey Point] SLRA includes an AMR line item for HVAC and pipe supports.

The staff confirmed that SLRA Table 3.5.2-4, "Control Building—Summary of Aging Management Evaluation," does contain a line item for the "Component Type" of "HVAC and pipe supports."

The staff finds the applicant's response acceptable because the response established a technical basis for not subjecting the exhaust ductwork connected to the control building battery room exhaust fans (V60, V61, V62, V63) to an AMR, in accordance with the scoping requirements of 10 CFR 54.4(a)(2). The staff's concern described in RAI 2.3.3.11.2-2 is resolved.

In RAI 2.3.3.11.2-3, the staff noted that Sheet 1 of the SLRA drawing for System 025 (Control Building Ventilation, P&ID 5610-M-3025) displays two diversely oriented (i.e., south and north) emergency air intakes for the control room emergency ventilation system (CREVS) mode of system operation. Of relevance, Note 10 on this SLRA drawing reads, "A bird screen is attached to the outside of the pipe inlet."

The staff observed that these "bird screens" could provide an important passive system function, consistent with the regulatory requirements of 10 CFR 54.21(a)(1)(i), in maintaining the operability of the CREVS by keeping the air intakes free of flow restrictions (i.e., birds, foreign debris). The staff noted that review of the following documents did not provide affirmation that the subject "bird screens" are subject to an AMR:

- SLRA Section 2.3.3.11.2
- Sheet 1 of the SLRA drawing for System 025 (Control Building Ventilation)
- SLRA Table 3.3.2-12, "Control Building Ventilation—Summary of Aging Management Evaluation"

The staff requested that the applicant clarify whether the subject "bird screens" are subject to an AMR and, if not, provide a justification for not including these exhaust ducts in the AMP.

In the RAI response, the applicant confirmed that the air intake bird screens associated with the Unit 3 and 4 control room ventilation system are within the scope of subsequent license renewal and are subject to an AMR. The applicant stated, in part, the following:

> The bird screens provide a filtering function to prevent flow blockage of the air intakes. The bird screens are composed of stainless steel, exposed to outdoor air, and are considered a filter component type. As such, the bird screens are subject to loss of material and cracking and are managed by the External Surfaces Monitoring of Mechanical Components AMP.

The applicant also proposed an update to Table 3.3.2-12 in a subsequent SLRA revision to include these “bird screens.”

The staff finds the applicant’s response acceptable because the components were adequately addressed and staff confirmed that the applicant provided a subsequent revision to the SLRA, including Table 3.3.2-12, that adequately addressed the staff’s concern. The staff’s concern described in RAI 2.3.3.11.2-3 is resolved.

2.3.3.11.2.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.11.2.2 and on a review of the SLRA, UFSAR, and license renewal boundary drawings, the staff concludes that FPL appropriately identified the control building ventilation components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.11.3 Emergency Diesel Generator Building Ventilation

2.3.3.11.3.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.11.3, “Emergency Diesel Generator Building Ventilation,” describes the EDG building ventilation system components subject to an AMR. This section also lists the license renewal boundary drawings that show the system boundaries and provides additional boundary information. SLRA Table 2.3.3-11 provides a list of the plant ventilation 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 EDG building ventilation SCs.

2.3.3.11.3.2 Staff Evaluation

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

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 2.3.3.11.3
- SLRA Table 2.3.3-11
- UFSAR Sections 8.2.2.1.1.3 and 9.15

The staff's review identified three areas in which additional information was necessary to complete the review of the applicant's scoping and screening results, which resulted in the issuance of RAI 2.3.3.11.3-1, RAI 2.3.3.11.3-2, and RAI 2.3.3.11.3-3. These three RAIs and the applicant's responses are documented in ADAMS Accession No. ML18261A028.

In RAI 2.3.3.11.3-1, the staff noted that Sheet 1 of the SLRA drawing for System 108 (Unit 4 Emergency Diesel Generator Building Ventilation, P&ID 5614-M-3108) identifies, that within control panel rooms 4A and 4B and switchgear rooms 3D and 4D, the "Component Types" of damper housings, fan housings, intake hoods, and louvers are subject to an AMR.

The staff noted that neither SLRA Table 2.3.3-11 nor SLRA Table 3.3.2-13 listed the "Component Type" of "Louvers" or "Intake Hoods." In addition, SLRA Table 3.3.2-13 neither listed the "Component Type" of "Damper housings" or "Fan housings" nor identified an external environment of "Air–outdoor" for the "Component Types" of "Intake Hood" and "Louver." The staff requested that the applicant identify where the SLRA addresses the AMR for these "Component Types" and its "Environment" associated with the EDG building ventilation system.

The applicant's response indicated that SLRA Table 2.3.3-11 lists the component types associated with the following four different Turkey Point ventilation systems:

- auxiliary building and electrical equipment room ventilation system
- the control building ventilation system
- the EDG building ventilation system
- the turbine building ventilation system

The applicant indicated Turkey Point Unit 4 EDG building ventilation system's dampers and fans were considered to be active components and therefore not included in SLRA Table 3.3.2-13. However, after further review, the applicant determined that the housings for these component types are passive and subject to an AMR. FPL provided an update to SLRA Table 3.3.2-13 that reflects the AMR of the subject damper housings and fan housings.

The applicant's response indicated that the intake hoods and louvers, as shown on Sheet 1 of the SLRA drawing for System 108 (Unit 4 Emergency Diesel Generator Building Ventilation) are considered to be structural components. As such, the subject intake hoods and louvers are addressed with the "Component Type" line items of "Miscellaneous steel supports and steel commodities" and "Louvers," respectively, in SLRA Table 2.4.2-8, "Emergency Diesel Generator Buildings Components—Subject to Aging Management Review." As noted in SLRA Table 3.5.2-9, "Emergency Diesel Generator Buildings—Summary of Aging Management Evaluation," the Structures Monitoring AMP will manage the aging effects for the more specific component type "HVAC roof hoods" and "Louvers."

The staff finds the applicant's response acceptable, in part, because the components were adequately addressed and the staff confirmed that the applicant provided a change to SLRA Table 3.3.2-13 that fully addresses the staff's concern. Furthermore, the staff finds the applicant's response acceptable, in part, because Turkey Point has an established Structures Monitoring AMP that will prevent the aging effect of "Loss of material" from exposure to an environment of "Air–outdoor" from impacting the "Intended Functions" of the subject EDG building ventilation system stainless steel intake "HVAC roof hoods." Finally, the staff finds the applicant's response acceptable because Turkey Point has an established Structures Monitoring AMP that will prevent the aging effects of "Loss of material" and "Cracking" from exposure to an environment of "Air–outdoor," from impacting the "Intended Functions" of the subject EDG building ventilation system aluminum louvers. The staff's concern described in RAI 2.3.3.11.3-1 is resolved.

In RAI 2.3.3.11.3-2, the staff noted that Sheet 1 of the SLRA drawing for System 108 (Unit 4 Emergency Diesel Generator Building Ventilation, P&ID 5614-M-3108) identifies exhaust louvers rated at "211926 CFM Diesel Running" for both diesel generator room 4A and diesel generator room 4B. The exhaust louver "L2A" for room 4A and the exhaust louver "L2B" for room 4B are identified as within the scope of subsequent license renewal and subject to an AMR. The building intake louvers are also rated at "211926 CFM Diesel Running" and are located within air receiver room 4A and air receiver room 4B. The staff noted that, in contrast, the intake openings on the SLRA drawing for room 4A and room 4B were neither identified as within the scope of the SLR nor subject to an AMR.

The staff observed that all four of these louvers appear to be exposed to an external environment of "Air-outside." The staff also noted that exhaust "Louvers" "L2A" and "L2B" have attached "Screens" per the "Remarks" listed in the Table entitled, "Louvers," as shown on the SLRA drawing. In contrast, the staff noted that neither SLRA Table 2.3.3-11, "Plant Ventilation Components Subject to Aging Management Review," nor SLRA Table 3.3.2-13, "Emergency Diesel Generator Building Ventilation—Summary of Aging Management Evaluation," lists the "Component Type" of "Louvers" or "Screens" associated with the external "Environment" of "Air–outdoor."

The staff requested that the applicant identify where the SLRA addresses the AMR for the four Unit 4 EDG building ventilation system intake and exhaust louvers with attached screens that are associated with an external environment of "Air–outdoor (ext)."

The applicant responded that the air intake and air exhaust louvers for the EDG room 4A and room 4B ventilation systems are equipped with screens that prevent wildlife and personnel from entering the building. The applicant stated the following:

> [The screens] do not filter the air used in the ventilation system and their failure does not disable the system's subsequent license renewal intended function in accordance with 10 CFR 54.4. Therefore, these screens are not subject to an aging management review.

The applicant indicated that the intake and exhaust louvers associated with the EDG building ventilation system are considered structural components. As such, the component type "Louvers" are subject to an AMR, as stated in SLRA Table 2.4.2-8, "Emergency Diesel Generator Buildings Components Subject to Aging Management Review," with a "Component Intended Function" of "Shelter, protection." The Structures Monitoring AMP will manage the aging effects for the "Louvers" component type, as documented in SLRA Table 3.5.2-9, "Emergency Diesel Generator Buildings—Summary of Aging Management Evaluation," which includes an environment of "Air–outdoor."

The staff finds the applicant’s response acceptable, in part, because the applicant provided a technical basis for why the screens attached to the louvers are not reflected in SLRA Table 2.3.3-11 as subject to an AMR. In addition, the staff finds the applicant’s response acceptable because the applicant has an established AMP that will prevent the aging effects of “Loss of material” and “Cracking,” due to exposure to an environment of “Air–outdoor,” from impacting the “Intended Functions” of the subject louvers. Therefore, the staff’s concern described in RAI 2.3.3.11.3-2 is resolved.

In RAI 2.3.3.11.3-3, the staff noted an inconsistency in the level of detail provided in SLRA Section 2.3.3.11.3 and the UFSAR pertaining to the Unit 3 EDG building ventilation system with that provided the component types and environments in the Unit 4 EDG rooms. Specifically, it was noted that, for consistency, the following Unit 3 EDG building ventilation system “Component Types” and “Environment” should be included in SLRA Table 3.3.2-13:

- “Flex Connections”
- “Louvers” (i.e., EDG building intake and exhaust for the EDG rooms)
- “Screens”
- “Air–outdoor” (i.e., associated with the louvers)

The staff requested that the applicant identify where the SLRA addresses the AMR for these “Component Types” and “Environment” associated with the Unit 3 EDG building ventilation system.

The applicant responded that a walkdown was performed to confirm that the component types of flexible connections, louvers, or screens are not subject to an AMR. The walkdown results identified no flex connections, which confirms that “Flex Connections” are not subject to an AMR.

The walkdown confirmed the existence of louvers in the Turkey Point Unit 3 EDG building ventilation system. The applicant stated that while not currently identified in the EDG building ventilation system screening report, these louvers are considered structural components. As such, the component type “Louvers” are subject to an AMR per SLRA Table 2.4.2-8, “Emergency Diesel Generator Buildings Components—Subject to Aging Management Review.” To ensure the “Intended Function” of “Shelter, Protection” is preserved during the period of extended plant operations, the Structures Monitoring AMP will manage the aging effects of “Loss of Material” and “Cracking” for the “Louvers” as documented in SLRA Table 3.5.2-9, “Emergency Diesel Generator Buildings—Summary of Aging Management Evaluation,” which lists the environment of “Air–outdoor” for this line item.

The applicant’s walkdown of the Unit 3 EDG building ventilation system also confirmed that the air intake and air exhaust louvers are equipped with screens. The applicant stated, in part, the following:

> These screens are connected to the building louvers and are not directly connected to the ventilation system ductwork. They prevent wildlife and personnel from entering the building; they do not filter the air used in the ventilation system and their failure does not disable the system’s SLR intended function in accordance with 10 CFR 54.4. Therefore, these screens are not subject to an aging management review.

The staff finds the applicant’s response acceptable, in part, because Turkey Point has an established AMP that will prevent the aging effects of “Loss of material” and “Cracking,” from exposure to an environment of “Air–outdoor,” from impacting the “Intended Functions” of the subject Unit 3 EDG building ventilation system louvers. In addition, the applicant provided a technical basis for why the screens attached to the louvers are not reflected in SLRA Table 2.3.3-11 as subject to an AMR. Therefore, the staff’s concern described in RAI 2.3.3.11.3-3 is resolved.

2.3.3.11.3.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.11.3.2 and on a review of the SLRA, UFSAR, and license renewal boundary drawings, the staff concludes that FPL appropriately identified the EDG building ventilation components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.11.4 Turbine Building Ventilation

2.3.3.11.4.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.11.4, “Turbine Building Ventilation,” describes the turbine building ventilation system components subject to an AMR. This section also lists the license renewal boundary drawings that show the system boundaries and provides additional boundary information. SLRA Table 2.3.3-11 provides a list of the plant ventilation 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 turbine building ventilation SCs.

2.3.3.11.4.2 Staff Evaluation

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

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 2.3.3.11.4
- SLRA Table 2.3.3-11
- UFSAR Section 9.16

The staff’s review identified two areas in which additional information was necessary to complete the review of the applicant’s scoping and screening results, which resulted in the issuance of RAI 2.3.3.11.4-1 and RAI 2.3.3.11.4-2. These two RAIs and the applicant’s responses are documented in ADAMS Accession No. ML18261A028.

In RAI 2.3.3.11.4-1 Part (a), the staff noted that Sheets 1 and 2 of the SLRA drawing System 070 (Turbine Building Ventilation, P&ID 5613-M-3070 and P&ID 5614- M-3070), “Turbine Building Ventilation Load Center & Switch Gear Rooms Chilled Water System Train A” and “Turbine Building Ventilation Load Center & Switch Gear Rooms Chilled Water System Train B,” respectively, identify the following component types as subject to an AMR:

- “Tubing”
- “Piping” (expansion tank—vents and overflow lines)
- wye “Strainers”
- “Strainer element”

The staff noted that SLRA Table 3.3.2-14 does not list these “Component Types” and their appropriate environment. Therefore, the staff requested that the applicant identify where the SLRA addresses the AMR for these “Component Types” and “Environments” associated with the turbine building ventilation system.

The applicant’s response indicated that SLRA Table 2.3.3-11 lists the following component types associated with four different Turkey Point ventilation systems:

- auxiliary building and electrical equipment room ventilation system
- control building ventilation system
- EDG building ventilation system
- turbine building ventilation system

The applicant noted that SLRA Table 2.3.3-11 does appropriately list the “Component Types” of “Tubing,” “Piping,” “Strainer body,” and “Strainer element.” The applicant acknowledged that, after further review, additional information needed to be added to SLRA Table 3.3.2-14 to ensure all component type/material/environment/aging effect combinations are identified. To this end, FPL provided the update to SLRA Table 3.3.2-14 in the RAI response and stated the following:

> SLRA Table 3.3.2-14 is updated to add stainless steel tubing rows with a treated water internal environment and a condensation external environment. SLRA Table 3.3.2-14 is updated to add a stainless strainer element row with a treated water internal environment. SLRA Table 3.3.2-14 is updated to add carbon steel strainer body rows with a treated water internal environment and a condensation external environment. SLRA Table 3.3.2-14 is updated to add a carbon steel piping row with a condensation internal environment that corresponds to the piping that connects to the expansion tanks. SLRA Table 3.3.2-14 is updated to add a carbon steel tank row with a condensation internal environment that corresponds to the portions of the expansion tanks that are not filled with water.

The staff reviewed the updated SLRA Table 3.3.2-14 and found no errors or omissions. The staff finds the applicant’s response acceptable because the components were adequately addressed and the applicant provided a change to SLRA Table 3.3.2-14 that fully addresses the staff’s documented concern. The staff’s concern described in RAI 2.3.3.11.4-1 Part (a) is resolved.

In RAI 2.3.3.11.4-1 Part (b), the staff noted that Unit 3 and Unit 4 Train A and Train B chiller packages are shown on Sheets 1 and 2 of the license renewal boundary drawings for System 070 (Turbine Building Ventilation) as subject to an AMR. The staff notes that SLRA Section 2.3.3.11.4 and its relevant SLRA tables do not address the aging management of these chiller packages. Therefore, the staff requested that the applicant add clarity to the SLRA to address the aging management of the Unit 3 and Unit 4 Train A and Train B chiller packages.

The applicant's response referred to SLRA Section 2.1.6.1, "Mechanical System," paragraph 5, which provides examples of complex assemblies at Turkey Point that include "emergency diesel generators (EDGs), chiller units, compressors that are part of direct expansion cooling units, and air compressor skids." The applicant stated that chiller packages, as shown on SLRA boundary drawing 5613-M-3070, Sheets 1 and 2, are treated as complex assemblies in the SLRA, with chilled water system boundaries ending at the inlet and outlet piping connections to the chiller packages. This position is consistent with the screening methodology for complex assemblies as described in SRP-SLR Table 2.1-2. The applicant provided a revision to SLRA Section 2.3.3.11.4, paragraph 5, that reads, in part, "The chiller packages are considered complex assemblies and the boundaries are at the inlet and outlet piping connections to the chiller packages."

The staff finds the applicant's response acceptable because the components were adequately addressed and the applicant provided a change to SLRA Section 2.3.3.11.4 that resolves the staff's documented concern. The staff's concern described in RAI 2.3.3.11.4-1 Part (b) is resolved.

In RAI 2.3.3.11.4-2, the staff noted that "Condensate Drain Detail—See Notes 4 & 6," as displayed on Sheet 1 of the license renewal boundary drawings for System 070 (Turbine Building Ventilation, P&ID 5613-M-3070 and P&ID 5614-M-3070) depicts the routing of "Air Handling Unit" condensate drain lines to the nearest floor drain or header as not subject to an AMR. Note 6 on these license renewal boundary drawings reads, "Only Exposed Drain Piping From AHU's Over The SWGR To Drain Is Insulated."

The staff observed that for the "Component Type" of "Piping," SLRA Table 3.3.2-14, "Turbine Building Ventilation—Summary of Aging Management Evaluation," does not list an environment of "Condensation (int)." The staff also noted that SLRA Section 2.3.4.4, "Steam and Power Conversion Systems in the Scope of 10 CFR 54.4(a)(2) for Spatial Interactions," neither addressed the subject condensate drain lines nor listed as "SLR boundary drawings" the subject System 070 (Turbine Building Ventilation) license renewal boundary drawings. The staff stated that from the information presented in the SLRA, it was not clear how the SLRA satisfied the guidance of SRP-SLR Section 3.3 with respect to preventing leakage from these AHU condensate drain lines from spatially interacting with the safety-related equipment. The staff therefore requested that the applicant identify where the SLRA addressed the AMR for the condensate drain lines for each of the Unit 4 and Unit 3 AHUs associated with the load center and switchgear rooms within the turbine building.

The applicant responded, in part, as follows:

> The load center and switchgear room ventilation in the turbine building consists of two AHUs in each of eight rooms; the 3A and 3B switchgear rooms, the 3A/3B and 3C/3D load center rooms, the 4A and 4B switchgear rooms, and the 4A/4B and 4C/D load center rooms. These AHUs are supplied by redundant chiller units located outside on the turbine building operating deck. As noted in the RAI, the condensate drain lines associated with the AHUs are reflected in a detail on the P&IDs. To confirm the location and configuration of the condensate drain lines, walkdowns of the specific areas where the AHUs are installed were performed.

From the walkdowns of the 16 AHUs, the unit load center, and the switchgear rooms within the turbine building, the applicant reported that, for AHUs 3E244A, 3E244B, 4E244A, and 4E244B, the location of the condensate drain lines from each AHU represent a spatial 10 CFR 54.4(a)(2) threat to safety-related SSCs. Accordingly, the applicant added the drain lines from each of these four AHUs to the scope of subsequent license renewal because failure of the drain lines could prevent accomplishment of a safety-related function and therefore require AMR in accordance with 10 CFR 54.4(a)(2).

Additionally, the applicant stated that, based on walkdowns performed during the NRC site audit conducted from August 27–29, 2018, additional piping was identified for inclusion in the scope of subsequent license renewal. This piping includes the following:

- drain piping from the load center rooms in the ceiling areas of the 3A switchgear room because of the potential for leakage
- drain piping from the load center rooms in the ceiling areas of the 4A switchgear room because of the potential for leakage
- discharge piping associated with the switchgear room sump pumps because of the potential for spray

Based on the observations from these walkdowns, the applicant updated the SLRA as follows:

- SLRA Table 3.3.2-14 was updated with new line items for "Piping" with internal environments of "Condensation (int)" and "Waste water (int)" and external environments of "Air indoor–controlled (ext)" and "Condensation (ext)."
- SLRA Section 2.3.3.16 was revised to include the turbine building (switchgear rooms only) as a structure that has 10 CFR 54.4a(2) interactions from an auxiliary system, plant ventilation.
- The Turkey Point Units 3 and 4 load center and switchgear room license renewal boundary drawings 5613-M-3070, Sheet 1, and 5614-M-3070, Sheet 1, were updated to reflect the following:
    - the condensate drain lines for AHUs 3E244A, 3E244B, 4E244A, and 4E244B
    - the drain lines from the load center rooms
    - the switchgear room sump pump discharge piping as within the scope of subsequent license renewal.

The staff reviewed the applicant's updates to the SLRA and found no errors or omissions. The staff finds the applicant's response acceptable because the components were adequately addressed and the applicant provided changes to the SLRA that fully address the staff's concern. The staff's concern described in RAI 2.3.3.11.4-2 is resolved.

2.3.3.11.4.3 Conclusion

Based on the staff's evaluation in SER Section 2.3.3.11.4.2 and on a review of the SLRA, UFSAR, and license renewal boundary drawings, the staff concludes that FPL appropriately identified the turbine building ventilation components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.12 Fire Protection

2.3.3.12.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.12 describes the fire protection components subject to an AMR and lists the license renewal boundary drawings that show the fire protection system boundaries. SLRA Table 2.3.3-12 provides a list of the fire protection 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 fire protection SCs.

2.3.3.12.2 Staff Evaluation

For Turkey Point, the staff reviewed SLRA Section 2.3.3.12; NUREG-1579, "Safety Evaluation Report Related to the License Renewal of Turkey Point Nuclear Plant, Units 3 and 4" (ADAMS Accession Nos. ML021280496 and ML021280532, issued February 2002; Supplement 1, ML021560094, issued May 2002); relevant license renewal boundary drawings as listed in SLRA Section 2.3.3.12; UFSAR Section 9.6.1, "Fire Protection Program"; DBD Volume 23, "Fire Protection System NFPA 805 Design Basis"; and the following fire protection CLB document listed in Turkey Point license condition 3.D:

> Turkey Point Nuclear Generating Unit Nos. 3 and 4—Issuance of Amendments Regarding Transition to a Risk-Informed, Performance-Based Fire Protection Program in Accordance with Title 10 of the *Code of Federal Regulations* Section 50.48(c) (TAC Nos. ME8990 and ME8991), May 28, 2015, ADAMS Accession No. ML15061A237.

SLRA Section 2.3.3.12 lists the SLR boundary drawings that reflect the boundaries for subsequent license renewal. Although Turkey Point has implemented 10 CFR 50.48(c), there are no significant differences between the SLR boundary drawings and the boundaries identified as part of the Turkey Point initial license renewal application.

The purpose of the fire protection program established by National Fire Protection Association (NFPA) 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," is to provide assurance, through a defense-in-depth design, that a fire will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition or significantly increase the risk of radioactive releases to the environment during any operational mode or plant configuration. The NRC staff's review focused on the effects of the increased decay heat on the plant's nuclear safety capability assessment (NSCA) to ensure that SSCs required to meet the nuclear safety performance criteria (NSPC) have sufficient capability and effectiveness to satisfy the fire protection program requirements of NFPA 805. The NSCA is the term used by NFPA 805 to represent the safe-shutdown analysis within the context of NFPA 805.

SLRA Section 2.3.3.12 states that the Turkey Point fire shutdown analysis essential equipment list and fire shutdown analysis basis document were used in determining equipment required for the support of fire protection. Specifically, these documents were used to identify credited fire protection equipment that is not classified as safety related, already included within the scope of subsequent license renewal, or both. The essential equipment list is the list of minimum equipment necessary to bring the plant to cold shutdown as determined by the fire safe-shutdown analysis, fire probabilistic risk analysis, and nonpower operations fire analysis. The equipment included in the essential equipment list was based on the system functions (e.g., RCS makeup, boration, RHR) required to achieve safe and stable conditions, as defined in Appendix R, “Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979,” to 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities,” and NFPA 805.

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

SLRA Section 2.3.3.12 states that majority of fire protection is common to Units 3 and 4, and those portions of fire protection that are unit specific are essentially identical on both units. The PTN fire protection system consists of a fire water system, halon fire suppression system, and RCP oil collection system. SLRA Table 2.3.3-12 identifies the fire protection system component types that are within the scope of the SLR, with AMR results in SLRA Table 3.3.2-15.

The staff noted that license renewal boundary drawings listed in SLRA Table 2-2 show the following fire protection systems or components as out of scope:

LRA Drawing	Systems/Components	Location
5610-M-3016, Sheet 3	Remote Filling Station	B3
5610-M-3016, Sheet 3	Piping, Valve, and Drain	C2, C7, D3, G7
5610-M-3016, Sheet 5	Test Connection	C2, C8, E4, E6
5610-M-3016, Sheet 3	Fire Department Connection	G8

The staff’s review identified areas in which it needed additional information to complete its review of FPL’s scoping and screening results, which resulted in the issuance of RAI 2.3.3.12-1 and RAI 2.3.3.12-2. The RAIs and the applicant’s responses are documented in ADAMS Accession No. ML18232A512.

In RAI 2.3.3.12-1 the staff asked FPL to verify whether the fire protection systems/components listed in Table 2-2 are within the scope of license renewal, in accordance with 10 CFR 54.4(a), and whether they are subject to an AMR, in accordance with 10 CFR 54.21(a)(1). The staff requested that FPL clarify whether it had excluded the fire protection system/component from the scope of license renewal and deemed it not to be subject to an AMR.

The staff finds that FPL’s response addressed and resolved each item in the RAI, as follows:

> In accordance with SLRA Section 2.1.3.4.1, equipment relied on for fire protection includes SSCs credited with fire prevention, detection, and mitigation in areas containing equipment important to safe operation of the plant, as well as systems that contain plant components credited to maintain the nuclear fuel in a safe and stable condition. The components within the fire protection system boundary that are relied on to meet 10 CFR 50.48 requirements are typically marked with “Q” flags on the license renewal fire protection boundary drawings 5610-M-3016 Sheet 3 and 5610-M-3016 Sheet 5. The components on license renewal boundary drawings 5610-M-3016 Sheet 3 and 5610-M-3016 Sheet 5 that are not within the “Q” boundary do not perform a function associated with 10 CFR 50.48 per the fire

protection screening document. Components not within these "Q" flags are not subject to an aging management review because they do not meet the scoping criteria of 10 CFR 54.4.

Other components that do not meet 10 CFR 54.4 criteria are components that are not part of the system pressure boundary or components that do not provide structural support for components that meet 10 CFR 54.4 criteria. The SLRA is clarified to state that components downstream of drain, vent, or test connection valves are not relied on for system pressure boundary.

For the specific locations identified in the RAI response, the following table provides the disposition for why the components do or do not require an aging management review.

Drawing/Location	Component Description	Disposition
5610-M-3016, Sheet 3 Location B3	Piping and valves upstream of remote filling station isolation valve 70-037	Not within system quality boundary
5610-M-3016, Sheet 3 Location C2	Piping downstream of valve 70-040	Downstream of drain valve
5610-M-3016, Sheet 3 Location C7	Piping downstream of valve 10-770	Downstream of drain valve
5610-M-3016, Sheet 3 Location C7	Piping downstream of valve 10-776	Downstream of drain valve
5610-M-3016, Sheet 3 Location D3	Piping downstream of valve 10-774	Downstream of drain valve
5610-M-3016, Sheet 3 Location G7	Piping downstream of valve 10-625	FPL reviewed this location and determined that valve 10-626 and the associated tubing should be subject to an aging management review.
5610-M-3016, Sheet 5 Location C2	Piping downstream of test connection isolation valve 3-10-1307	Downstream of test connection isolation valve
5610-M-3016, Sheet 5 Location C8	Piping downstream of test connection isolation valve 4-10-1307	Downstream of test connection isolation valve
5610-M-3016, Sheet 5 Location E4	Piping downstream of test connection isolation valve 10-370	Downstream of test connection isolation valve
5610-M-3016, Sheet 5 Location E6	Piping downstream of test connection isolation valve 10-361	Downstream of test connection isolation valve
5610-M-3016, Sheet 5 Location G8	Piping downstream of fire department connection valve 10-PIV-75	FPL reviewed this location and determined that the license renewal boundary should extend to the unnamed check valve and the associated piping should be subject to an aging management review.

The license renewal boundary drawings 5610-M-3016 Sheet 3 and 5610-M-3016 Sheet 5 will be updated to clarify the shading associated with this RAI response.

…

The following changes to SLRA Section 2.1.6.1 will be made in a future SLRA revision as indicated by text deletion (strikethrough) and text addition (red underlined font).

Revise SLRA Section 2.1.6.1 paragraph 2 as follows:

Mechanical system evaluation boundaries were established for each system within the scope of SLR. These boundaries were determined by mapping the pressure boundary associated with the SLR system intended functions onto the system flow diagrams. The system pressure boundary does not include components downstream of drain, vent, or test connection valves. SLR system intended functions are the functions a system must perform relative to the scoping criteria of 10 CFR 54.4(a)(1), 10 CFR 54.4(a)(2), and 10 CFR 54.4(a)(3). The flow diagram license renewal boundary drawings associated with each mechanical system within the scope of SLR are identified with the mechanical system screening results described in Section 2.3.

Based on its review, the staff finds FPL's response to this portion of RAI 2.3.3.12-1 acceptable because it resolves the staff's concerns regarding the scoping and screening of components located upstream of remote filling station isolation at location B3 of SLRA drawing 5610-M-3016, Sheet 3. The staff verified that these components not within system "Q" boundary do not perform a function associated with 10 CFR 50.48, as stated in the fire protection screening document. Further, components not within the "Q" boundary is not subject to an AMR because they do not meet the scoping criteria of 10 CFR 54.4.

Based on its review, the staff finds FPL's response to this portion of RAI 2.3.3.12-1 acceptable because it resolves the staff's concerns regarding the scoping and screening of components, remote filling station isolation piping, and components for the purpose of determining whether FPL adequately identified the fire protection system components within the scope of license renewal.

With respect to the components, piping, valves, and drain at locations C2, C7, and D3 of SLRA drawing 5610-M-3016, Sheet 3, FPL's response stated that these components are not relied on for system pressure boundary; further, FPL reviewed location G3 of SLRA drawing 5610-M-3016, Sheet 3, and determined that valve 10-626 and the associated tubing should be subject to an AMR.

The staff agrees with FPL's exclusion of the piping and valves at locations C2, C7, and D3 of SLRA drawing 5610-M-3016, Sheet 3, from the scope of license renewal because these valves and piping can be isolated and do not perform a 10 CFR 54.4(a)(1) or (3) function. Based on its review, the staff finds FPL's response to this portion of RAI 2.3.3.12-1 acceptable for the purpose of determining whether FPL adequately identified the fire protection system components within the scope of subsequent license renewal. With respect to test connections at locations C2, C8, E4, and E6 of SLRA drawing 5610-M-3016, Sheet 3, FPL's response stated these components are not relied on for system pressure boundary.

The staff agrees with FPL's exclusion of the test connections at locations C2, C7, and D3 of SLRA drawing 5610-M-3016, Sheet 3, from the scope of license renewal because these test connections are not within system "Q" boundary and do not perform a function associated with 10 CFR 50.48, as stated in the fire protection screening document, and do not perform a 10 CFR 54.4(a)(1) or (3) function. Based on its review, the staff finds FPL's response to this portion of RAI 2.3.3.12-1 acceptable for the purpose of determining whether FPL adequately identified the fire protection system components within the scope of subsequent license renewal.

With respect to fire department connection at location G8 of SLRA drawing 5610-M-3016, Sheet 3, FPL's response stated that FPL reviewed this location and determined that the license renewal boundary should extend to the unnamed check valve, and the associated piping should be subject to an AMR. The staff finds FPL's response to this portion of RAI 2.3.3.12-1 acceptable for the purpose of determining whether FPL adequately identified the fire protection system components within the scope of license renewal.

In RAI 2.3.3.12-2 the staff stated that SLRA Table 2.3.3-12, "Fire Protection Components Subject Aging Management Review," does not include the following fire protection components:

- diesel driven fire pump engine silencer
- sprinklers
- valves body
- fire hose stations, fire hose connections, hose racks
- standpipe risers
- seismic support for standpipes system piping
- floor drains for removal of fire water
- halon fire suppression system storage cylinders

The staff asked FPL to verify whether the fire protection components listed above are within the scope of subsequent license renewal, in accordance with 10 CFR 54.4(a), and whether they are subject to an AMR, in accordance with 10 CFR 54.21(a)(1). The staff requested that if these components are excluded from the scope of license renewal and are not subject to an AMR, that FPL justify the exclusion.

In a letter dated September 14, 2018 (ADAMS Accession No. ML18261A028), FPL provided the results of the scoping and screening process for the fire protection system component types listed above, as follows:

> All of the components identified in the [RAI] Issue section above are within the scope of license renewal in accordance with 10 CFR 54.4(a) and are subject to an AMR in accordance with 10 CFR 54.21(a)(1) as described in the numbered items below.
>
> (1) The [Turkey Point] Unit 3 and 4 diesel driven fire pump engine and its associated subcomponents meet the scoping requirements of 10 CFR 54.4(a) because it is part of the fire protection system relied upon to meet 10 CFR 50.48 criteria. The engine silencer is considered to be part of the diesel driven fire pump engine complex assembly and is not subject to an aging management review. A discussion of complex assemblies is included in Section 2.1.6.1 of the SLRA. SLRA section 2.3.3.12 is clarified to specify the diesel driven fire pump engine complex assembly boundaries.
>
> (2) Sprinklers in areas that contain equipment relied upon to meet 10 CFR 50.48 criteria meet the scoping requirements of 10 CFR 54.4(a). These sprinklers are subject to an aging management review in accordance with 10 CFR 54.21(a). The component type "nozzle" listed in SLRA

Table 2.3.3-12 and Table 3.3.2-15 with a SLR intended function of “Spray” includes all types of sprinklers and deluge nozzles subject to aging management review.

(3) Valve bodies associated with piping that is relied upon to meet 10 CFR 50.48 criteria meet the scoping requirements of 10 CFR 54.4(a). These valve bodies are subject to an aging management review in accordance with 10 CFR 54.21(a). Revision 1 of the [Turkey Point] SLRA includes the "Valve body" component type in SLRA Table 2.3.3-12 and Table 3.3.2-15.

(4) Fire hose stations, fire hose connections, and fire hose racks in areas that contain equipment relied upon to meet 10 CFR 50.48 criteria meet the scoping requirements of 10 CFR 54.4(a). These fire hose stations, fire hose connections, and fire hose racks are subject to an aging management review in accordance with 10 CFR 54.21(a). The component type "Flexible hose" listed in SLRA Table 2.3.3-12 and Table 3.3.2-15 includes the hose stations subject to aging management review. The component type "Piping" listed in SLRA Table 2.3.3-12 and Table 3.3.2-15 includes the hose connections subject to aging management review. Hose racks are subject to an aging management review and are included in the miscellaneous steel component types listed in the SLRA section 2.4 and 3.5 tables.

(5) Standpipe risers in areas that contain equipment relied upon to meet 10 CFR 50.48 criteria meet the scoping requirements of 10 CFR 54.4(a). These standpipe risers are subject to an aging management review in accordance with 10 CFR 54.21(a). The component type "Piping" listed in SLRA Table 2.3.3-12 and Table 3.3.2-15 includes standpipe risers subject to aging management review.

(6) Seismic supports for standpipes system piping in areas that contain equipment relied upon to meet 10 CFR 50.48 criteria meet the scoping requirements of 10 CFR 54.4(a). These seismic supports are subject to an aging management review in accordance with 10 CFR 54.21(a). Seismic supports are included in the miscellaneous steel component types listed in the SLRA section 2.4 and 3.5 tables.

(7) Floor drains for removal of fire water in areas that contain equipment relied upon to meet 10 CFR 50.48 criteria meet the scoping requirements of 10 CFR 54.4(a). These floor drains are subject to an aging management review in accordance with 10 CFR 54.21(a). Floor drains are associated with the waste disposal system and are included in the "Drain" component type listed in the SLRA Table 2.3.3-8 and Table 3.3.2-8. The license renewal boundary drawings 5610-M-3061 Sheet 1 and 5610-M-3061 Sheet 3 will be updated to clarify which drains are subject to an aging management review.

(8) Halon fire suppression system storage cylinders relied upon to meet 10 CFR 50.48 criteria meet the scoping requirements of 10 CFR 54.4(a). These halon cylinders are subject to an aging management review in accordance with 10 CFR 54.21(a). The component type "Tank" listed in

SLRA Table 2.3.3-12 and Table 3.3.2-15 with an internal environment of "Gas" includes the halon cylinders subject to aging management review.

…

The following changes to SLRA Section 2.3.3.12 will be made in a future SLRA revision as indicated by text deletion (strikethrough) and text addition (red underlined font).

Revise SLRA Section 2.3.3.12 paragraph 3 as follows:

A 10-inch diameter fire loop encompasses Units 3 and 4 supplied by two fire pumps, one electric-driven and the other diesel-driven, and two jockey pumps. As the diesel-driven fire pump engine is considered a complex assembly that is bounded by the fuel oil supply and return lines, subcomponents associated with the engine are not subject to an aging management review. One jockey pump maintains normal operating fire header pressure. The fire pumps automatically supply water to the fire loop on low header pressure. Fire hydrants are strategically located throughout the site.

The staff finds that FPL's response to RAI 2.3.3.12-2 addresses and resolves each item in the RAI, and staff has confirmed that updated SLRA documents are appropriate as discussed in the following paragraphs.

With regard to the diesel-driven fire pump engine silencer, FPL indicated that diesel-driven fire engine and its subcomponents are credited for compliance with 10 CFR 50.48. FPL considered the diesel engine silencer to be part of the diesel-driven fire pump engine complex assembly; therefore, the diesel engine silencer is not subject to an AMR. The staff confirmed that the engine silencer is integral to the active diesel engine assembly of the fire pump diesel engine and does not meet the AMR criteria of 10 CFR 54.21(a)(1)(i). SRP-SLR Table 2.1-6 indicates that the fire pump diesel engines are not subject to an AMR.

Sprinklers are addressed under the component category type "nozzle" in SLRA Tables 2.3.3-12 and 3.3.2-15 and are subject to an AMR, in accordance with 10 CFR 54.21(a)(1).

FPL indicated that valves bodies and associated piping are within the scope of license renewal, in accordance with 10 CFR 54.4(a), and subject to an AMR, in accordance with 10 CFR 54.21(a)(1). Revision 1 of the SLRA includes the "Valves body" component type in SLRA Tables 2.3.3-12 and 3.3.2-15.

Fire hose stations, fire hose connections, and hose racks are subject to an AMR, in accordance with 10 CFR 54.21(a)(1). These components are addressed below:

- Fire hose stations are addressed under the component category type "Flexible hose" in SLRA Tables 2.3.3-12 and 2.3.3.2-15.
- Fire hose connections and standpipe risers are subject to an AMR, in accordance with 10 CFR 54.21(a)(1) and included as "Piping" in SLRA Tables 2.3.3-12 and 3.3.2-15.
- Hose racks and seismic support for standpipe system piping are subject to an AMR, in accordance with 10 CFR 54.21(a)(1), and included in the miscellaneous steel components

types in SLRA Section 2.4 and Section 3.5. “Aging Management of Containments, Structures, and Component Supports.”

Floor drains for the removal of fire water are credited for compliance with 10 CFR 50.48 and subject to an AMR, in accordance with 10 CFR 54.21(a)(1). Floor drains are addressed under the component category type “Drain” in SLRA Tables 2.3.3.8 and 3.3.2.8. Also, FPL provided updated license renewal boundary drawings 5610-M-3061, Sheet 1, and 5610-M-3061, Sheet 3, to clarify which drains are subject to an AMR.

Halon fire suppression system storage cylinders are credited for compliance with 10 CFR 50.48. Halon cylinders are subject to an AMR, in accordance with 10 CFR 54.21(a)(1), with an internal environment of gas and included as component type “Tank” in SLRA Tables 2.3.3-12 and 3.3.2-15.

Based on its review, the staff finds FPL’s response to RAI 2.3.3.12-2 acceptable because it states that the fire protection system and the components listed above (other than the diesel-driven fire pump engine silencer) are within the scope of license renewal and subject to an AMR, and provided clarification regarding where FPL addresses these components in the SLRA. Further, the applicant stated that the diesel-driven fire pump engine is within the scope of license renewal but not subject to an AMR due to it being an integral part of an active complex assembly as described in SLRA Section 2.1.6.1. The applicant clarified that the diesel-driven fire pump engine are complex assembly boundaries consistent with SRP-SLR Table 2.1-2. The staff finds that the applicant appropriately screened the components in question and the staff’s concern described in RAI 2.3.3.12-2 is resolved.

2.3.3.12.3 Conclusion

Based on the staff’s evaluation in SER Section 2.3.3.12.2 and on its review of the SLRA, UFSAR, license renewal boundary drawings, and RAI responses, and SLRA updates, the staff concludes that FPL has appropriately identified the fire protection system components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL has adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.13 Emergency Diesel Generator Cooling Water

2.3.3.13.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.13 describes the EDG cooling water systems components subject to an AMR and lists the license renewal boundary drawings that show the EDG cooling water systems boundaries. SLRA Table 2.3.3-13 provides a list of the EDG cooling water 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 EDG cooling water SCs.

2.3.3.13.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant has included within the scope of license renewal all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of license renewal to verify that the applicant has

included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

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 2.3.3.13
- SLRA Table 2.3.3-13
- UFSAR Section 9.15.2

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 license renewal boundary drawings, the staff concludes that FPL appropriately identified the EDG cooling water systems components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.14 Emergency Diesel Generator Air

2.3.3.14.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.14 describes the EDG air systems components subject to an AMR and lists the license renewal boundary drawings that show the EDG air systems boundaries. SLRA Table 2.3.3-14 provides a list of the EDG air 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 EDG air SCs.

2.3.3.14.2 Staff Evaluation

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

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 2.3.3.14
- SLRA Table 2.3.3-14
- UFSAR Section 9.15.3

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 license renewal boundary drawings, the staff concludes that FPL appropriately identified the EDG air systems components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.15 Emergency Diesel Generator Fuel and Lubricating Oil

2.3.3.15.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.15 describes the EDG fuel and lubricating oil systems components subject to an AMR and lists the license renewal boundary drawings that show the systems boundaries. SLRA Table 2.3.3-15 provides a list of the EDG fuel and lubricating oil systems component types subject to an AMR and their intended functions. SLRA Table 3.3.2-18 provides the results of the applicant's AMR for EDG fuel and lubricating oil SCs.

2.3.3.15.2 Staff Evaluation

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

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 2.3.3.15
- SLRA Table 2.3.3-15
- UFSAR Section 9.15

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 license renewal boundary drawings, the staff concludes that FPL appropriately identified the EDG fuel and lubricating oil components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.3.16 Auxiliary Systems in the Scope of 10 CFR 54.4(a)(2) for Spatial Interactions

2.3.3.16.1 Summary of Technical Information in the Application

SLRA Section 2.3.3.16 describes the applicant's scoping and screening for physical failures of nonsafety-related SSCs that could impact a safety function based on spatial interactions with auxiliary systems, in accordance with 10 CFR 54.4(a)(2). This section lists the license renewal boundary drawings that show the relevant system boundaries. SLRA Tables 2.3.3.16-1, 2.3.3.16-2, and 2.3.3.16-3 provide lists of the component types subject to an AMR and their intended functions, as well as links to the SLRA tables that provide the results of the applicant's AMR, for the components in the scope of 10 CFR 54.4(a)(2) in the EDG buildings, control building, and auxiliary building, respectively.

2.3.3.16.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant has included within the scope of license renewal all components with intended

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

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 2.3.3.16
- SLRA Tables 2.3.3.16-1, 2.3.3.16-2, and 2.3.3.16-3
- UFSAR Sections 9.2, 9.4, 9.6.2, 9.8.1, 9.8.2, 9.15, and 11.1

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 for auxiliary systems evaluated for spatial interactions, which resulted in the issuance of RAI 2.3.3.11.4-2. The RAI and the applicant's response are documented in ADAMS Accession No. ML18261A028. This RAI and applicant response are also discussed in SER Section 2.3.3.11.4.

In RAI 2.3.3.11.4-2, the staff noted that "Condensate Drain Detail—See Notes 4 & 6" as shown on Sheet 1 of license renewal boundary drawings 5613-M-3070 and P&ID 5614-M-3070 depicted the routing of "Air Handling Unit" condensate drain lines to the nearest floor drain or header as not subject to an AMR. The staff also observed that Note 6 on these license renewal boundary drawings reads, "Only Exposed Drain Piping From AHU's Over The SWGR To Drain Is Insulated." In addition, the staff found that, for the "Piping" component type, SLRA Table 3.3.2-14 did not list an environment consistent with that for a condensate drain line.

Accordingly, in RAI 2.3.3.11.4-2, the staff requested that the applicant identify where the SLRA addressed the AMR for the condensate drain lines for each of the AHUs associated with the Unit 3 and Unit 4 load center and switchgear rooms within the turbine building.

The applicant performed walkdowns of the 16 AHUs associated with the Unit 3 and Unit 4 load center and switchgear rooms within the turbine building. The applicant reported that the location of the condensate drain lines for AHUs 3E244A, 3E244B, 4E244A, and 4E244B have the potential for spatial interaction through leakage with nearby safety-related switchgear. Additionally, the applicant stated that based on walkdowns performed during the NRC onsite scoping and screening audit conducted from August 27–29, 2018, the applicant added piping to the scope of subsequent license renewal because its failure could prevent accomplishment of a safety-related function and therefore requires AMR in accordance with 10 CFR 54.4(a)(2). This piping includes the following:

- drain piping from the load center rooms in the ceiling areas of the 3A switchgear room due to the potential for leakage
- drain piping from the load center rooms in the ceiling areas of the 4A switchgear room due to the potential for leakage
- discharge piping associated with the switchgear room sump pumps due to the potential for spray

The licensee provided the following specific changes to the SLRA to identify how the aging effects applicable to the condensate drain lines, drain piping, and sump pump discharge piping would be managed to prevent potential spatial interaction:

- Revised SLRA Section 2.3.3.16 to note that the turbine building switchgear rooms contain nonsafety-related condensate drain lines for AHUs 3E244A, 3E244B, 4E244A, and 4E244B, drain piping from the load center rooms, and discharge piping associated with sump pumps. Leakage from these nonsafety related components could potentially affect safety-related electrical equipment if age-related failures are assumed.
- Revised SLRA Section 2.3.3.16 to add Table 2.3.3.16-4, which lists the component types that require an AMR in the switchgear rooms in the turbine building and provides a reference to the table providing the results of the AMR.
- Revised SLRA Section 2.3.3.16 to reference Unit 3 and 4 load center and switchgear room license renewal boundary drawings 5613-M-3070, Sheet 1, and 5614-M-3070, Sheet 1, and update the drawings to reflect the condensate drain lines for AHUs 3E244A, 3E244B, 4E244A, and 4E244B, the drain lines from the load center rooms, and the switchgear room sump pump discharge piping as within the scope of subsequent license renewal.
- Added new line items to SLRA Table 3.3.2-14 for piping and bolting with an intended function of "leakage boundary (spatial)" constructed of carbon steel or elastomer and having internal environments of "Condensation (int)" and "Waste water (int)" and external environments of "Air indoor–controlled (ext)" and "Condensation (ext)."

The staff reviewed the additions and modifications to the SLRA for compliance with the requirements of 10 CFR 54.4(a)(2) and 10 CFR 54.21(a)(1). The staff found that the updated SLRA information appropriately identified turbine building ventilation and drain components with the potential for spatial interactions with nearby safety-related equipment as within the scope of license renewal and subject to an AMR, consistent with the requirements of 10 CFR 54.4(a)(2) and 10 CFR 54.21(a)(1).

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 license renewal boundary drawings, the staff concludes that FPL appropriately identified the auxiliary systems components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.4 Steam and Power Conversion

SLRA Section 2.3.4, "Steam and Power Conversion System," identifies the steam and power conversion system SCs subject to an AMR for license renewal. 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 and Turbine Generators"
- SLRA Section 2.3.4.2, "Feedwater and Blowdown"

- SLRA Section 2.3.4.3, “Auxiliary Feedwater and Condensate Storage”
- SLRA Section 2.3.4.4, “Steam and Power Conversion Systems in the Scope of 10 CFR 54.4(a)(2) for Spatial Interactions”

SER Sections 2.3.4.1–2.3.4.4 include the staff’s findings on its review of SLRA Sections 2.3.4.1–2.3.4.4, respectively.

2.3.4.1 Main Steam and Turbine Generators

2.3.4.1.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.1 describes the main steam and turbine generator systems components subject to an AMR and lists the license renewal boundary drawings that show the systems boundaries. SLRA Table 2.3.4-1 provides a list of the main steam and turbine generator 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 main steam and turbine generator SCs.

2.3.4.1.2 Staff Evaluation

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

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 2.3.4.1
- SLRA Table 2.3.4-1
- UFSAR Section 10.2.2

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, system DBD, UFSAR, and license renewal boundary drawings, the staff concludes that FPL appropriately identified the main steam and turbine generator components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.2 Feedwater and Blowdown

2.3.4.2.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.2 describes the feedwater and blowdown system components subject to an AMR and lists the license renewal boundary drawings that show the systems boundaries. SLRA Table 2.3.4-2 provides a list of the feedwater and blowdown 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 feedwater and blowdown SCs.

2.3.4.2.2 Staff Evaluation

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

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 2.3.4.1
- SLRA Table 2.3.4-1
- UFSAR Section 10.2.2

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, system DBD, UFSAR, and license renewal boundary drawings, the staff concludes that FPL appropriately identified the feedwater and blowdown system components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.3 Auxiliary Feedwater and Condensate Storage

2.3.4.3.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.3 describes the auxiliary feedwater (AFW) and condensate storage components subject to an AMR and lists the license renewal boundary drawings that show the systems boundaries. SLRA Table 2.3.4-3 provides a list of the AFW and condensate storage 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 AFW and condensate storage SCs.

2.3.4.3.2 Staff Evaluation

The staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant has included within the scope of license renewal all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of license renewal to verify that the applicant has included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). 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 2.3.4.3
- SLRA Table 2.3.4-3
- UFSAR Section 9.11

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, system DBD, UFSAR, and license renewal boundary drawings, the staff concludes that FPL appropriately identified the AFW and condensate storage components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.3.4.4 Steam and Power Conversion Systems in the Scope of 10 CFR 54.4(a)(2) for Spatial Interactions

2.3.4.4.1 Summary of Technical Information in the Application

SLRA Section 2.3.4.4 describes the applicant's scoping and screening for physical failures of nonsafety-related SSCs that could impact a safety function based on spatial interactions with steam and power conversion systems, in accordance with 10 CFR 54.4(a)(2). This section lists the license renewal boundary drawings that show the relevant system boundaries. SLRA Tables 2.3.4.4-1 and 2.3.4.4-2 provide lists of the component types subject to an AMR and their intended functions, as well as links to the SLRA tables that provide the results of the applicant's AMR, for the components in the scope of 10 CFR 54.4(a)(2) in the turbine building and yard structures, respectively.

2.3.4.4.2 Staff Evaluation

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

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 2.3.4.4
- SLRA Table 2.3.4.4-1 and Table 2.3.4.4-2
- UFSAR Section 10

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, which resulted in the issuance of RAI 2.3.4.4-1. The RAI and the applicant's response are documented in ADAMS Accession No. ML18334A182.

SLRA Section 2.3.4.4, page 2.3-86, indicates that segments of the auxiliary steam, condensate, feedwater, and feedwater heater drains and vents systems could potentially affect safety-related cable trays and conduit in certain areas of the turbine building if age-related failures are assumed. However, the SLRA did not define criteria for exclusion of piping segments in these high-energy systems from the scope of components subject to an AMR.

The staff was concerned that the following piping segments on the indicated license renewal boundary drawings were not shown as subject to an AMR and that the SLRA lacked a clear basis for this exclusion:

- Drawing 5613-M-3073, Sheet 3, “Condensate System”—The 14-inch piping bypassing the 3rd-, 4th-, and 5th-stage feedwater heaters was not indicated as subject to an AMR, but the piping through the feedwater heaters was indicated as subject to an AMR.
- Drawing 5614-M-3073, Sheet 3, “Condensate System”—The 14-inch piping bypassing the 3rd-, 4th-, and 5th-stage feedwater heaters was not indicated as subject to an AMR, but the piping through the feedwater heaters was indicated as subject to an AMR.
- Drawing 5613-M-3081, Sheets 2 and 3, “Feedwater Heater Drains & Vents System”—The 10-inch piping from the reheater drain tank and the 6th-stage feedwater heater was indicated as subject to an AMR in two segments, but adjacent piping segments were not indicated as subject to an AMR.
- Drawing 5614-M-3081, Sheets 2 and 3, “Feedwater Heater Drains & Vents System”—The 10-inch piping from the reheater drain tank and the 6th-stage feedwater heater was indicated as subject to an AMR in one segment, but adjacent piping segments and similar piping segments in a parallel flowpath were not indicated as subject to an AMR.

Furthermore, during the NRC staff’s audit of nonsafety piping systems conducted August 25–26, 2018, the applicant’s staff indicated that piping above the operating deck and piping that meets high-energy criteria for less than 2 percent of the operating time was excluded from being subject to an AMP. Accordingly, the staff requested that the applicant provide the basis for excluding the above-identified piping segments from being subject to an AMR.

The applicant re-evaluated whether the above piping segments were within the scope of license renewal and subject to an AMR. The applicant determined that the feedwater heater bypass lines are within the scope of license renewal based on the potential for spatial interactions and stated that the Turkey Point Units 3 and 4 condensate system SLR boundary drawings would be updated to indicate the subject feedwater heater bypass piping within the scope of SLR and requiring aging management. However, the applicant stated that this piping would not be subject to inspection under the applicable flow-accelerated corrosion aging management program because the piping is normally isolated and used less than 2 percent of the plant operating time, and the program specifies that piping operated under high-energy conditions less than 2 percent of the plant operating time can be excluded from inspection. For the feedwater drains and vents piping, the applicant determined that the subject piping segments had been re-evaluated for inclusion with the scope of license renewal during the original license renewal review and found not to have the potential for spatial interaction with safety-related components, and, therefore, were not within the scope of license renewal.

The staff reviewed the modifications to the SLRA and related documents for conformance with the requirements of 10 CFR 54.4(a)(2) and 10 CFR 54.21(a)(1). The staff found that the addition of the 14-inch feedwater heater bypass piping to the components of the feedwater heater drains and vents system components subject to an AMR through revisions to the system license renewal boundary drawings appropriately identified the components within the scope of license renewal and subject to an AMR, consistent with the requirements of 10 CFR 54.4(a)(2) and 10 CFR 54.21(a)(1). The staff concurs with the applicant’s assessment that the 10-inch feedwater heater drain piping is not within the scope of license renewal for the purpose of protecting safety-related equipment from potential spatial effects.

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, system DBD, UFSAR, and license renewal boundary drawings, the staff concludes that FPL appropriately identified the steam and power conversion systems components within the scope of license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL adequately identified the system components subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.4 Scoping and Screening Results—Structures

This section documents the staff's review of the applicant's scoping and screening results for structures and structural components. Specifically, this section discusses the following groups of structures:

- containment structure and internal structural components
- noncontainment structures

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

The staff's evaluation of the information in the SLRA was the same for all structures and structural components. The objective was to determine whether the applicant has identified, in accordance with 10 CFR 54.4, components and supporting structures for structures that appear to meet the license renewal 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 license renewal. The staff reviewed relevant licensing-basis documents, including the UFSAR, for each structure to determine whether the applicant has omitted from the scope of license renewal components with intended functions delineated under 10 CFR 54.4(a). The staff also reviewed the licensing-basis documents to determine whether the SLRA specified all intended functions delineated under 10 CFR 54.4(a). The staff issued RAIs to resolve any omissions or discrepancies identified.

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 RAIs as needed to resolve any omissions or discrepancies.

2.4.1 Containment Structure and Internal Structural Components

2.4.1.1 Summary of Technical Information in the Application

SLRA Section 2.4.1, "Containment Structure and Internal Structural Components," identifies the containment structure and internal structural components subject to an AMR for license renewal. The applicant described the supporting SCs in the following SLRA sections:

- SLRA Section 2.4.1.1, "Containment Structure"
- SLRA Section 2.4.1.2, "Containment Internal Structural Components"

SLRA Section 2.4.1.1 describes the containment structure components subject to an AMR and the boundaries of the structure. SLRA Section 2.4.1.2 describes the containment internal structural components subject to an AMR and the boundaries of these components. SLRA Table 2.4.1-1 lists the containment structure and internal structural component types subject to an AMR and their intended functions. SLRA Table 3.5.2-1 provides the results of the applicant's AMR for containment structure and internal structural components.

2.4.1.2 Staff Evaluation

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

The staff's review identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results, which resulted in the issuance of RAI B.2.3.31-1 on October 31, 2018. The staff noted that SLRA Section 2.4.1.1 states that the tendon access galleries are not within the scope of license renewal and requested that FPL explain how it will ensure the functionality of the lower horizontal tendons if the environment of the tendon access galleries is not managed for chronic water intrusion. The RAI and the applicant's response are documented in ADAMS Accession No. ML18334A182.

In its response, the applicant described the periodic inspections and water removal activities to be performed for the tendon pits and enhanced its ASME Section XI, Subsection IWL program to include these actions. The staff finds the applicant's response acceptable because, although the tendon access pits themselves are not within the scope of license renewal, the applicant enhanced its ASME Section XI, Subsection IWL, program to include a commitment to ensure that existing periodic inspections and water removal for tendon pits will be performed for the subsequent period of extended operation. The staff's concern described in RAI B.2.3.31-1 is resolved.

2.4.1.3 Conclusion

Based on the staff's evaluation in SER Section 2.4.1.2 and on its review of the SLRA, UFSAR, and license renewal boundary drawings, the staff concludes that FPL has appropriately identified the containment structure and internal structural components within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL has adequately identified the passive, long-lived SCs subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.4.2 Noncontainment Structures

2.4.2.1 Summary of Technical Information in the Application

SLRA Section 2.4.2 identifies the noncontainment structures subject to an AMR for license renewal. The applicant described the supporting SCs in the following SLRA sections:

- SLRA Section 2.4.2.1, “Auxiliary Building”
- SLRA Section 2.4.2.2, “Cold Chemistry Laboratory”
- SLRA Section 2.4.2.3, “Control Building”
- SLRA Section 2.4.2.4, “Cooling Water Canals”
- SLRA Section 2.4.2.5, “Diesel Driven Fire Pump Enclosure”
- SLRA Section 2.4.2.6, “Discharge Structure”
- SLRA Section 2.4.2.7, “Electrical Penetration Rooms”
- SLRA Section 2.4.2.8, “Emergency Diesel Generator Buildings”
- SLRA Section 2.4.2.9, “Fire Rated Assemblies”
- SLRA Section 2.4.2.10, “Intake Structure”
- SLRA Section 2.4.2.11, “Main Steam and Feedwater Platforms”
- SLRA Section 2.4.2.12, “Plant Vent Stack”
- SLRA Section 2.4.2.13, “Polar Cranes”
- SLRA Section 2.4.2.14, “Spent Fuel Storage and Handling”
- SLRA Section 2.4.2.15, “Turbine Building”
- SLRA Section 2.4.2.16, “Turbine Gantry Cranes”
- SLRA Section 2.4.2.17, “Yard Structures”

2.4.2.2 Staff Evaluation

SER Section 2.4.2.2.1 discusses the staff’s evaluation of SLRA Sections 2.4.2.1–2.4.2.8 and Sections 2.4.2.10–2.4.2.17. SER Section 2.4.2.2.2 discusses the staff’s evaluation of SLRA Section 2.4.2.9.

2.4.2.2.1 Staff Evaluation of SLRA Sections 2.4.2.1–2.4.2.8, and SLRA Sections 2.4.2.10 – 2.4.2.17

Using the evaluation methodology described in SLRA Section 2.1 and the guidance in SRP-SLR Section 2.3, the staff evaluated the structure functions described in the SLRA and UFSAR to verify that the applicant has included within the scope of license renewal all components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant identified as within the scope of license renewal to verify that the applicant has included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1).

2.4.2.2.2 Staff Evaluation of SLRA Section 2.4.2.9, Fire Rated Assemblies

Using the evaluation methodology described in SLRA Section 2.1 and the guidance in SRP-SLR Section 2.3, the staff reviewed SLRA Section 2.4.2.9; NUREG-1579; relevant license renewal boundary drawings as listed in SLRA Section 2.4.2.9; UFSAR Section 9.6.1; DBD Volume 23; and the following fire protection CLB document listed in Turkey Point licensing condition 3.D:

> Turkey Point Nuclear Generating Unit Nos. 3 and 4—Issuance of Amendments Regarding Transition to a Risk-Informed, Performance-Based Fire Protection Program in Accordance with Title 10 of the Code of Federal Regulations Section 50.48(c) (TAC Nos. ME8990 and ME8991), May 28, 2015, ADAMS Accession No. ML15061A237.

SLRA Section 2.4.2.9 lists the SLR boundary drawings that reflect the boundaries for subsequent license renewal. Although Turkey Point has implemented NFPA 805, there are no significant differences between SLR boundary drawings and the boundaries identified and evaluated as part of the Turkey Point initial license renewal application.

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

Fire barriers and associated assemblies exist throughout the plant power block. The plant power block refers to structures that have the equipment required for nuclear plant operations, such as the containment, auxiliary building, control building, fuel buildings, EDG buildings, radioactive waste processing, raw water storage and treatment, turbine building, and intake structure (ADAMS Accession No. ML15061A237). The credited fire-rated assemblies (concrete walls, floors, ceilings, penetrating seals, door, fire damper housings, Thermolag electric raceway fire barrier, structural-steel fire proofing, manhole sealants, fire retardant coatings, fire-rated manhole covers, and radiant shields) relied upon to demonstrate compliance with the fire protection (10 CFR 50.48) regulated event are within the scope of license renewal. This meets the 10 CFR 54.4(a)(3) scoping criteria and is subject to an AMR, in accordance with 10 CFR 54.21(a)(1). SLRA Table 2.4.2-9 identifies fire-rated assembles subject to an AMR. SLRA Table 3.5.2-10 provides the results of the AMR of fire-rated assembles and components.

SLRA Section 2.4.2.9 indicates that evaluation for a fire-rated assembly is the external surface of that assembly. There are no significant differences between the SLR boundaries and those identified as part of the Turkey Point initial license renewal application. SLRA Section 2.4.2.9 states that concrete walls, floors, and ceilings were evaluated with the specific structure in which they reside. Manhole covers were evaluated with yard structures (SLRA Section 2.4.2.17), and radiant energy shields (located inside containment) were evaluated with the containments (SLRA Section 2.4.1). Fire dampers were evaluated with the fire protection system (SLRA Section 2.3.3.12). Mechanical and electrical penetrations in walls or floors made of concrete or concrete blocks are properly sealed using the details provided in plant procedures.

The staff confirmed that the fire-rated assemblies are included in SLRA Tables 2.4.2-9 and 3.5.2-10. On the basis of the information in SLRA Section 2.4.2.9; NUREG-1579; UFSAR Section 9.6.1; DBD Volume 23; and CLB documents, the staff did not identify any omissions by the applicant in the scoping of the fire barriers according to 10 CFR 54.4(a). Based on its review, the staff concludes that FPL has appropriately identified the fire barriers and components within the scope of license renewal, in accordance with 10 CFR 54.4(a), and those subject to an AMR, in accordance with 10 CFR 54.21 (a)(1).

2.4.2.3 Conclusion

Based on the staff's evaluation in SER Sections 2.4.2.2 and 2.4.2.3 and on its review of the SLRA, UFSAR, and license renewal boundary drawings, the staff concludes that FPL has appropriately identified the noncontainment structures within the scope of subsequent license renewal, as required by 10 CFR 54.4(a). The staff also concludes that FPL has adequately identified the passive, long-lived SCs subject to an AMR, in accordance with the requirements in 10 CFR 54.21(a)(1).

2.5 Scoping and Screening Results—Electrical and Instrumentation and Controls

This section documents the staff's review of the applicant's scoping and screening results for electrical and instrumentation and controls (I&C) systems. Specifically, this section discusses electrical and I&C component commodity groups.

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

The staff's evaluation of the information in the SLRA was the same for all electrical and I&C components. The objective was to determine whether the applicant has identified, in accordance with 10 CFR 54.4, components that appear to meet the license renewal 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 license renewal. The staff reviewed relevant licensing-basis documents, including the UFSAR, for each component to determine whether the applicant has omitted from the scope of license renewal components with intended functions delineated under 10 CFR 54.4(a). The staff also reviewed the licensing-basis documents to determine whether the SLRA specified all intended functions delineated under 10 CFR 54.4(a). The staff issued RAIs to resolve any omissions or discrepancies identified.

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 RAIs as needed to resolve any omissions or discrepancies.

2.5.1 Summary of Technical Information in the Application

SLRA Section 2.5.1, "Electrical and I&C Component Commodity Groups," describes the electrical and I&C components subject to an AMR. SLRA Table 2.5-2 lists the electrical and

I&C systems components subject to an AMR and their intended functions. SLRA Table 3.6.2-1 provides the results of the applicant's AMR for electrical and I&C systems components.

2.5.2 Staff Evaluation

The staff's review of the SLRA for this section relates to 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 regulation at 10 CFR 54.4(a) requires a list of plant SSCs within the scope of the 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), the applicant must identify and list passive, long-lived SSCs within the scope of the subsequent license renewal and subject to an AMR. SRP-SLR Section 2.1 and NEI 17-01 provide guidance on the scoping and screening for license renewal.

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 structures and components 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 Instrumentation and Controls Systems," and NEI 17-01. The staff finds that the scoping methodology described in the SLRA is consistent with the SRP-SLR and NEI 17-01 guidance.

The staff evaluated the system functions described in the SLRA and UFSAR to verify that the applicant had included within the scope of the subsequent license renewal all components with intended functions delineated under 10 CFR 54.4(a). In SLRA Section 2.1.1, the applicant 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 subsequent license renewal. In addition, in SLRA Section 2.1.2.5, "SBO Equipment Lists," the applicant stated that the electrical equipment that supports the requirements of 10 CFR 50.63 is also within the scope of subsequent license renewal. 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 subsequent license renewal satisfies the requirements in 10 CFR 54.4(a).

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)." SRP-SLR, Section 2.5.2.1.1, "Components Within the Scope of SBO (10 CFR 50.63)," states, in part, that both the offsite and onsite power systems are relied upon to meet the requirements of the SBO Rule and include equipment that is required to cope with an SBO (e.g., alternate alternating current (AC) power sources) and the plant system portion of the offsite power system that is used to connect the plant to the offsite power source meeting the requirements under 10 CFR 54.4(a)(3).

In SLRA Section 2.1.3.4.5, "Station Blackout (10 CFR 50.63)," the applicant stated that Turkey Point's design satisfies the SBO Rule by providing for a unit cross-tie at the 4.16-kilovolt level. The section stated that resolution of the SBO issue for Turkey Point is by use of an alternate safety-related, Class 1 E, seismic Class/Category I, power source with the ability to align the source to the SBO unit within 10 minutes of confirmation of a station blackout condition.

However, the highlighted electrical drawing the applicant supplied did not include the cross-tie and the alternate safety-related power source.

The staff's review identified that additional information was necessary to complete the review of the applicant's scoping and screening results, which resulted in the issuance of RAI 2.5-1. The RAI and the applicant's response are documented in ADAMS Accession No. ML18311A299.

By letter dated October 4, 2018, the staff issued RAI 2.5-1, requesting that the applicant clarify whether the cross-tie and alternate AC power source (part of the SBO recovery path) are safety related and are considered in scope for license renewal and provide information regarding methods and type of components and structures used for the Unit 3 and 4 cross-tie connection.

In its response dated November 2, 2018, the applicant stated that cross-tie and alternate AC power sources provide onsite power supplies relied upon to meet safety-related requirements and the requirements of the SBO Rule to cope with a SBO and are safety related and within the scope of subsequent license renewal, as shown in SLRA Table 2.2-3. The applicant also stated that there is no cable bus, bus duct, metal enclosed bus, isophase bus, or manholes utilized in the cross-tie circuit configuration. The Unit 4 EDG building and the control building are seismic Class I structures and are within the scope of subsequent license renewal, as shown in SLRA Table 2.2-2.

The staff finds the applicant's response acceptable because the cross-tie and alternate AC power source are safety related and are considered within the scope of subsequent license renewal, consistent with 10 CFR 54.4(a)(3). The staff's concern described in RAI 2.5-1 is resolved.

The staff then reviewed those components that the applicant identified as within the scope of subsequent license renewal to verify that the applicant has included all passive and long-lived components subject to an AMR, in accordance with the requirements of 10 CFR 54.21(a)(1). The staff also verified 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).

The applicant grouped the electrical and I&C components that were identified to be within the scope of subsequent license renewal into component commodity groups. The applicant 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 SLRA Section 2.5, the applicant identified the following list of passive component and commodity groups that are subject to an AMR:

- insulated cables and connections not included in the EQ Program
- electrical and I&C penetration assemblies not included in the EQ Program
- high-voltage insulators (for SBO recovery)
- switchyard bus and connections (for SBO recovery)
- transmission conductors and connections (for SBO recovery)
- uninsulated ground conductors and connections

In addition to the above list, the applicant noted that electrical and I&C components and commodities included in the EQ Program (10 CFR 50.49) are excluded because they have 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).

As a result of the staff's review of the list of components subject to the AMR, the staff finds that the electrical components identified by the applicant as subject to the AMR were consistent with the SRP-SLR. The staff also finds that the applicant 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).

The applicant did not include cable tie-wraps in the electrical commodities subject to an AMR. SLRA Section 2.5.1.3 states that cable fasteners and tie-wraps are intended to be used for training cables, assembling wires or cables into neat bundles, and general housekeeping purposes and are not considered a cable support. The SLRA further states that electrical cable tie-wraps do not function as cable supports in raceway support analyses and their use is not credited in the seismic qualification of cable trays; therefore, cable tie-wraps have no subsequent license renewal intended functions, as defined in 10 CFR 54.4(a). Since cable tie-wraps do not have a subsequent license renewal intended function, they are not subject to an AMR. Based on the review of this information, the staff finds that the exclusion of cable tie-wraps from the electrical commodities subject to an AMR is acceptable.

SLRA Section 2.5.1.3 states that fuse holders (metallic clamps) that are not part of a larger (active) assembly are not included in the electrical commodities subject to an AMR because, based on a readiness assessment conducted before entering into the initial period of extended operation (i.e., the 40- to 60-year operating period), fuse holders were either installed in active equipment or did not perform a license-renewal intended function. Based on the review of this information, the staff finds that the exclusion of fuse holders metallic clamps (not part of a larger active assembly), from the electrical commodities subject to an AMR is acceptable.

SLRA Section 2.5.1.3 states that metal enclosed bus (MEB) is not included in the electrical commodities subject to an AMR because MEBs are not utilized in the restoration power path for offsite power following an SBO event or otherwise relied on to meet the subsequent license renewal scoping requirements of 10 CFR 54.4(a). Cable bus is a variation of metal enclosed bus and is not utilized at Turkey Point in the restoration power path for offsite power following an SBO event or otherwise relied on to meet the subsequent license renewal scoping requirements of 10 CFR 54.4(a). Based on the review of this information, the staff finds that the exclusion of MEBs and cable bus from the electrical commodities subject to an AMR is acceptable.

2.5.3 Conclusion

The staff reviewed the SLRA and the UFSAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff has found no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. Based on its review, the staff concludes that there is reasonable assurance that the applicant has appropriately identified the electrical and I&C systems components within the scope of the subsequent license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 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 concludes that the applicant has adequately identified those systems and components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

With respect to these matters, the staff concludes that there is reasonable assurance that if the NRC issues a subsequent renewed Turkey Point operating license, FPL will continue to conduct the activities authorized by the renewed licenses in accordance with the CLB. The staff also concludes that any changes to the CLB made in order to comply with 10 CFR 54.29(a) are in accordance with the Atomic Energy Act of 1954, as amended, and in accordance with NRC regulations.

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 Florida Power & Light Company's aging management programs (AMPs) and aging management reviews (AMRs) for Turkey Point Nuclear Generating Unit Nos. 3 & 4 (Turkey Point, or Turkey Point Units 3 and 4).

Florida Power & Light Company (FPL, or the applicant) describes these AMPs and AMRs in its subsequent license renewal application (SLRA) for Turkey Point. SLRA Appendix B lists the 50 AMPs that FPL will rely on to manage or monitor the aging of passive, long-lived structures and components (SCs). SLRA Section 3 provides the results of FPL's AMRs for those systems and components identified in SLRA Section 2 as within the scope of license renewal and subject to an AMR.

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

(1) reactor coolant system components and component groups (SER Section 3.1)

(2) engineered safety features components and component groups (SER Section 3.2)

(3) auxiliary systems components and component groups (SER Section 3.3)

(4) steam and power conversion systems components and component groups (SER Section 3.4)

(5) containment, structures, and component supports (SER Section 3.5)

(6) electrical and instrumentation and controls commodities (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 certain programs and AMR items. The GALL-SLR Report provides summaries of generic AMPs that the NRC staff has determined would be adequate to manage the effects of aging for related SCs subject to an AMR. If an applicant commits to implementing these staff-approved AMPs, the time, effort, and resources for SLRA review will be greatly reduced, thereby improving the efficiency and effectiveness of the review process.

- The GALL-SLR Report identifies the following:
- 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 FPL to use in performing its AMRs and drafting its SLRA (ADAMS Accession No. ML18029A368).

The organization of SLRA Section 3 follows the recommendations of NEI 17-01 and parallels the section structure of SRP-SLR Chapter 3. SLRA Section 3 presents the results of FPL’s AMR 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 Turkey Point Units 3 and 4 AMR results and the GALL-SLR Report AMR items. The applicant included a “discussion” column to document whether each of the AMR summary items in the Table 1 is consistent with the GALL-SLR Report or consistent with the GALL-SLR Report but uses a different AMP to manage aging effects, or whether the item is not applicable at Turkey Point. 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. The Table 2 includes a column linking each AMR item to a Table 1 item.

3.0.2 Staff’s Review Process

The staff conducted the following three types of evaluations of FPL’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 the item to determine consistency. In addition, the staff conducted either an audit or a technical review of the applicant’s technical justifications for the exceptions or the adequacy of the enhancements.

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

In some cases, an applicant may choose an existing plant program that does not currently meet all the program elements defined in the GALL-SLR Report AMP. However, the applicant may make a commitment to enhance the existing program before the subsequent period of extended operation to satisfy the GALL-SLR Report AMP. Enhancements may expand but not reduce the scope of an AMP.

(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 verify conformance with 10 CFR 54.21(a)(3) requirements.

In addition to its SLRA review, the staff conducted an operating experience review audit from May 7–18, 2018, an in-office regulatory audit from June 18–July 23, 2018, an onsite regulatory audit from August 27–31, 2018, and an irradiated concrete audit from July 16–October 17, 2018, as detailed in the audit reports dated July 23, 2018 (ADAMS Accession No. ML18183A445), October 15, 2018 (ADAMS Accession No. ML18230B482), January 25, 2019 (ADAMS Accession No. ML18341A024), and February 1, 2019 (ADAMS Accession No. ML19032A536), respectively. These audits and reviews are designed to maximize the efficiency of the staff's SLRA review. The applicant can respond to questions, the staff can readily evaluate the applicant's responses, and the need for formal correspondence between the staff and the applicant is reduced, resulting in a more efficient review.

These audits and technical reviews of the applicant's AMPs and AMRs determine whether 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 [current licensing basis] for the period of extended operation," as required by 10 CFR 54.21.

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

(6) "acceptance criteria" – these criteria, against which the need for corrective actions will be evaluated, should ensure that the SC intended function(s) are maintained under all current licensing basis (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" – add 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 is effective in managing the aging effects for which it is credited. The AMP is either enhanced or new AMPs are developed, as appropriate, when it is determined through the evaluation of 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 Reports 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.

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 (AERM), and AMP combination for a particular system component type. Item numbers in column seven, "NUREG-2191 Item," of each SLRA Table 2, correlate to an AMR combination 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, 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, 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

Consistent with the SRP-SLR for the AMRs and AMPs that it reviewed, the staff also reviewed the updated final safety analysis report (UFSAR) supplement, which summarizes the applicant's programs and activities for managing aging effects for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

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 applicant responses to requests for additional information (RAIs).

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

3.0.3 Aging Management Programs

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.

Table 3.0-1 Turkey Point Aging Management Programs

Turkey Point Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	GALL-SLR Report Comparison	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in this Safety Evaluation Report
Fatigue Monitoring	17.2.1.1 B.2.2.1	Existing	Consistent with Enhancements	X.M1 Fatigue Monitoring	3.0.3.2.1
Neutron Fluence Monitoring	17.2.1.2 B.2.2.2	Existing	Consistent with Enhancements	X.M2 Neutron Fluence Monitoring	3.0.3.2.2
Concrete Containment Unbonded Tendon Prestress	17.2.1.3 B.2.2.3	Existing	Consistent with Exceptions and Enhancements	X.S1 Concrete Containment Unbonded Tendon Prestress	3.0.3.2.3
Environmental Qualification of Electric Equipment	17.2.1.4 B.2.2.4	Existing	Consistent with Enhancement	X.E1 Environmental Qualification of Electric Equipment	3.0.3.2.4
ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	17.2.2.1 B.2.3.1	Existing	Consistent with Enhancements	XI.M1 ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	3.0.3.2.5

Turkey Point Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	GALL-SLR Report Comparison	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in this Safety Evaluation Report
Water Chemistry	17.2.2.2 B.2.3.2	Existing	Consistent with Enhancement	XI.M2 Water Chemistry	3.0.3.1.1
Reactor Head Closure Stud Bolting	17.2.2.3 B.2.3.3	Existing	Consistent with Exception and Enhancements	XI.M3 Reactor Head Closure Stud Bolting	3.0.3.2.6
Boric Acid Corrosion	17.2.2.4 B.2.3.4	Existing	Consistent with Enhancement	XI.M10 Boric Acid Corrosion	3.0.3.2.7
Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid- Induced Corrosion in Reactor Coolant Pressure Boundary Components	17.2.2.5 B.2.3.5	Existing	Consistent with Enhancement	XI.M11B Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs Only)	3.0.3.2.8
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel	17.2.2.6 B.2.3.6	New	Consistent	XI.M12 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel	3.0.3.1.2
Reactor Vessel Internals	17.2.2.7 B.2.3.7	Existing	Consistent with Enhancements	XI.M16A PWR Vessel Internals	3.0.3.2.9
Flow-Accelerated Corrosion	17.2.2.8 B.2.3.8	Existing	Consistent with Enhancements	XI.M17 Flow-Accelerated Corrosion	3.0.3.2.10
Bolting Integrity	17.2.2.9 B.2.3.9	Existing	Consistent with Enhancements	XI.M18 Bolting Integrity	3.0.3.2.11
Steam Generators	17.2.2.10 B.2.3.10	Existing	Consistent with Exception and Enhancement	XI.M19 Steam Generators	3.0.3.2.12
Open-Cycle Cooling Water System	17.2.2.11 B.2.3.11	Existing	Consistent with Enhancements	XI.M20 Open-Cycle Cooling Water System	3.0.3.2.13
Closed Treated Water Systems	17.2.2.12 B.2.3.12	Existing	Consistent with Exception and Enhancements	XI.M21A Closed Treated Water Systems	3.0.3.2.14
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	17.2.2.13 B.2.3.13	Existing	Consistent with Enhancements	XI.M23 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	3.0.3.2.15
Compressed Air Monitoring	17.2.2.14 B.2.3.14	Existing	Consistent with Enhancements	XI.M24 Compressed Air Monitoring	3.0.3.2.16
Fire Protection	17.2.2.15 B.2.3.15	Existing	Consistent with Enhancements	XI.M26 Fire Protection	3.0.3.2.17
Fire Water System	17.2.2.16 B.2.3.16	Existing	Consistent with Enhancements	XI.M27 Fire Water System	3.0.3.2.18

Turkey Point Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	GALL-SLR Report Comparison	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in this Safety Evaluation Report
Outdoor and Large Atmospheric Metallic Storage Tanks	17.2.2.17 B.2.3.17	Existing	Consistent with Exception and Enhancements	XI.M29 Outdoor and Large Atmospheric Metallic Storage Tanks	3.0.3.2.19
Fuel Oil Chemistry	17.2.2.18 B.2.3.18	Existing	Consistent with Exception and Enhancements	XI.M30 Fuel Oil Chemistry	3.0.3.2.20
Reactor Vessel Material Surveillance	17.2.2.19 B.2.3.19	Existing	Consistent with Exception	XI.M31 Reactor Vessel Material Surveillance	3.0.3.1.3
One-Time Inspection	17.2.2.20 B.2.3.20	New	Consistent	XI.M32 One-Time Inspection	3.0.3.1.4
Selective Leaching	17.2.2.21 B.2.3.21	New	Consistent	XI.M33 Selective Leaching	3.0.3.1.5
ASME Code Class 1 Small-Bore Piping	17.2.2.22 B.2.3.22	Existing	Consistent with Enhancement	XI.M35 ASME Code Class 1 Small-Bore Piping	3.0.3.2.21
External Surfaces Monitoring of Mechanical Components	17.2.2.23 B.2.3.23	Existing	Consistent with Enhancements	XI.M36 External Surfaces Monitoring of Mechanical Components	3.0.3.2.22
Flux Thimble Tube Inspection	17.2.2.24 B.2.3.24	Existing	Consistent with Enhancements	XI.M37 Flux Thimble Tube Inspection	3.0.3.2.23
Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	17.2.2.25 B.2.3.25	New	Consistent with Enhancement	XI.M38 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	3.0.3.1.6
Lubricating Oil Analysis	17.2.2.26 B.2.3.26	Existing	Consistent with Enhancements	XI.M39 Lubricating Oil Analysis	3.0.3.2.24
Monitoring of Neutron- Absorbing Materials other than Boraflex	17.2.2.27 B.2.3.27	Existing	Consistent with Enhancements	XI.M40 Monitoring of Neutron-Absorbing Materials other than Boraflex	3.0.3.2.25
Buried and Underground Piping and Tanks	17.2.2.28 B.2.3.28	New	Consistent	XI.M41 Buried and Underground Piping and Tanks	3.0.3.1.7
Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	17.2.2.29 B.2.3.29	New	Consistent	XI.M42 Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks	3.0.3.1.8
ASME Section XI, Subsection IWE	17.2.2.30 B.2.3.30	Existing	Consistent with Enhancements	XI.S1 ASME Section XI, Subsection IWE	3.0.3.2.26
ASME Section XI, Subsection IWL	17.2.2.31 B.2.3.31	Existing	Consistent with Exception and Enhancement	XI.S2 ASME Section XI, Subsection IWL	3.0.3.2.27

Turkey Point Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	GALL-SLR Report Comparison	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in this Safety Evaluation Report
ASME Section XI, Subsection IWF	17.2.2.32 B.2.3.32	Existing	Consistent with Exceptions and Enhancements	XI.S3 ASME Section XI, Subsection IWF	3.0.3.2.28
10 CFR Part 50, Appendix J	17.2.2.33 B.2.3.33	Existing	Consistent with Exception and Enhancement	XI.S4 10 CFR Part 50, Appendix J	3.0.3.2.29
Masonry Walls	17.2.2.34 B.2.3.34	Existing	Consistent with Enhancement	XI.S5 Masonry Walls	3.0.3.2.30
Structures Monitoring	17.2.2.35 B.2.3.35	Existing	Consistent with Exceptions and Enhancements	XI.S6 Structures Monitoring	3.0.3.2.31
Inspection of Water-Control Structures Associated with Nuclear Power Plants	17.2.2.36 B.2.3.36	New	Consistent	XI.S7 Inspection of Water-Control Structures Associated with Nuclear Power Plants	3.0.3.2.32
Protective Coating Monitoring and Maintenance	17.2.2.37 B.2.3.37	Existing	Consistent with Enhancements	XI.S8 Protective Coating Monitoring and Maintenance	3.0.3.2.33
Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements	17.2.2.38 B.2.3.38	Existing	Consistent with Enhancement	XI.E1 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.2.34
Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements used in Instrumentation Circuits	17.2.2.39 B.2.3.39	New	Consistent	XI.E2 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	3.0.3.1.9
Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements	17.2.2.40 B.2.3.40	New	Consistent	XI.E3A Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.1.10

Turkey Point Aging Management Program	SLRA Section(s)	New or Existing Aging Management Program	GALL-SLR Report Comparison	Corresponding Aging Management Program in the GALL-SLR Report	Corresponding Section in this Safety Evaluation Report
Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 EQ Requirements	17.2.2.41 B.2.3.41	New	Consistent	XI.E3B Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.1.11
Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements	17.2.2.42 B.2.3.42	New	Consistent	XI.E3C Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.1.12
Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements	17.2.2.43 B.2.3.43	New	Consistent	XI.E6 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	3.0.3.1.13
High-Voltage Insulators	17.2.2.44 B.2.3.44	New	Consistent	XI.E7 High-Voltage Insulators	3.0.3.1.14
Pressurizer Surge Line Fatigue	17.2.3.1 B.2.4.1	Existing	Site-Specific	N/A	3.0.3.3.1
Polymer High-Voltage Insulators	17.2.3.2 B.2.4.2	New	Site-Specific	N/A	3.0.3.3.2

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
- Thermal Aging Embrittlement of Cast Austenitic Stainless Steel
- Reactor Vessel Material Surveillance
- One-Time Inspection
- Selective Leaching
- 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

- Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements used in Instrumentation Circuits
- Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements
- Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 EQ Requirements
- Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements
- Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements
- High-Voltage Insulators

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

SLRA Section B 2.3.2, as amended, describes the existing Water Chemistry program as consistent, with enhancement, with GALL-SLR Report AMP XI.M2, "Water Chemistry." The applicant amended this SLRA section by letter dated October 16, 2018.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M2.

For the "parameters monitored or inspected," and "monitoring and trending," program elements, the staff determined that it needed additional information, which resulted in the issuance of RAIs. RAIs B.2.3.2-1, B.2.3.2-2, and B.2.3.2-3, and the applicant's responses are documented in ADAMS Accession Nos. ML18243A006, ML18243A007, and ML18296A024.

During its evaluation of the applicant's response to RAI B.2.3.2-1, the staff noted that the applicant has proposed to require a formal technical review for prolonged abnormal water chemistry conditions. The staff finds the applicant's response and changes to the Water Chemistry program, enhancements, and Table 17-3 commitment, acceptable because these changes require a formal technical review of prolonged abnormal water chemistry conditions. This is consistent with the recommendations of the Electric Power Research Institute (EPRI) "PWR [Pressurized-Water Reactor] Primary Water Chemistry Guidelines," Revision 7, dated April 2014, and, therefore, the recommendations of the GALL-SLR Report.

During its evaluation of the applicant's response to RAI B.2.3.2-2, the staff noted that the applicant stated that depending on the circumstances, reduction to less than 50 percent power may not be the appropriate response to Action Level 2 conditions for oxygen in the secondary water. The staff noted that this is consistent with the guidance provided in the EPRI "PWR Secondary Water Chemistry Guidelines," Revision 7, dated February 2009, and, therefore, the recommendations of the GALL-SLR Report. Therefore, the staff finds the applicant's response acceptable.

During its evaluation of the applicant's response to RAI B.2.3.2-3, the staff noted that the applicant affirmed that its procedure 0-ADM-651, Revision 12, "Nuclear Chemistry Parameters Manual," is the controlling document for primary water chemistry parameters. The staff finds the applicant's response acceptable because it clarifies that the above-mentioned procedure, and not the UFSAR which showed conflicting values, is the controlling document for primary water chemistry parameters. The applicant also noted that the inconsistencies discussed in the RAI will be addressed through the applicant's corrective action program.

During the audit, and as confirmed by the applicant by letter dated October 9, 2018 (ADAMS Accession No. ML18284A335), the staff noted that the "Isotopic Analysis" for the reactor coolant system (RCS) includes measurements for cobalt-58, cobalt-60, manganese-54, chromium-51, and iron-59. The staff noted that the monitoring of these parameters will allow for the detection of fuel integrity. The staff finds the applicant's response acceptable because the monitoring of these parameters is consistent with the EPRI PWR Primary Water Chemistry Guidelines and will allow for the detection of fuel integrity.

SLRA Section B.2.3.2, as amended by letter dated October 16, 2018, provides an enhancement to the "monitoring and trending," program element. As described above, the response to RAI B.2.3.2-1 was reviewed and found to be acceptable. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M2 and finds it acceptable because when it is implemented it will ensure that the applicant's Water Chemistry program includes a provision to perform a formal technical review for prolonged abnormal water chemistry conditions. This is consistent with the GALL-SLR "monitoring and trending" element.

Based on its audit and its review of the applicant's responses to RAIs B.2.3.2-1, B.2.3.2-2, and B.2.3.2-3, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M2. In addition, the staff reviewed the enhancement associated with the "monitoring and trending" program element and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.2 summarizes operating experience related to the Water Chemistry program. The applicant stated that plant-specific operating experience provides objective evidence that the Water Chemistry program will continue to effectively identify and address degradation prior to loss of intended function throughout the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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.

UFSAR Supplement. SLRA Section A.17.2.2.2 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 the applicant committed to ongoing implementation of the existing Water Chemistry program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff further noted that the applicant committed to implement the enhancement to the Water Chemistry program, no later than 6 months prior to the subsequent period of extended operation.

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

Conclusion. On the basis of its audit and its review of the applicant's Water Chemistry program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with GALL-SLR Report AMP XI.M2. Also, the staff reviewed the enhancement and confirmed that its implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel

SLRA Section B.2.3.6 describes the new Thermal Aging Embrittlement of Cast Austenitic Stainless Steel program as consistent with GALL-SLR Report AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)."

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M12.

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

Operating Experience. SLRA Section B.2.3.6 summarizes operating experience related to the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel program. The SLRA states that there is no plant-specific operating experience at Turkey Point that can validate the effectiveness of the AMP, because this is a new AMP; however, there is no relevant operating experience on CASS components exposed to RCS environment. The applicant also stated that it developed this AMP based on data from NUREG/CR-4513, Revision 1, "Estimation of Fracture Toughness of Cast Stainless Steels during Thermal Aging in LWR [Light-Water Reactor] Systems," dated August 1994 (ADAMS Accession No. ML052360554). The applicant stated that there is no additional industry operating experience that is specific to thermal aging of CASS components. The SLRA further states that as the program is implemented, operating experience will be reviewed, and corrective action will be initiated to either enhance the AMP or implement new AMPs, as appropriate, if it is found that the program is not adequately managing the aging effects.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 GALL-SLR Report AMP XI.M12 was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.6 provides the UFSAR supplement for the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to implement the new Thermal Aging Embrittlement of Cast Austenitic Stainless Steel program 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

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

3.0.3.1.3 Reactor Vessel Material Surveillance

SLRA Section B.2.3.19, as amended, describes the existing Reactor Vessel Material Surveillance program as consistent with GALL-SLR Report AMP XI.M31, "Reactor Vessel Material Surveillance," with one exception.

Section B.2.3.19 contains the description of the applicant's Reactor Vessel Material Surveillance AMP. The applicant stated that the AMP is consistent with the GALL-SLR, with one exception and no enhancements. The AMP meets the requirements of 10 CFR Part 50, Appendix H. The AMP monitors changes of fracture toughness in beltline materials, e.g., those with projected neutron fluence values > 1 x 10^{17} neutrons per centimeter squared (n/cm^2).

The description of the AMP states that this program includes withdrawal and testing of the X_4 surveillance capsule. The AMP further states that this capsule is demonstrated as being within one to two times the peak reactor vessel neutron fluence of interest at the end of the subsequent period of extended operation in the time-limited aging analyses (TLAAs) for upper-shelf energy (USE), pressurized thermal shock (PTS), and pressure-temperature (P-T) limits.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M31. For the "parameters monitored or inspected" and "monitoring and trending" program elements, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.19-1 and the applicant's response are documented in ADAMS Accession No. ML18292A642.

During its evaluation of the applicant's response to RAI B.2.3.19-1, the staff noted that the applicant proposed to modify the withdrawal schedule for the final Capsule X_4 from 38.5 effective full-power years (EFPY) to 41.5 EFPY, which will result in the capsule achieving a neutron fluence of 1.08×10^{20} n/cm^2, and also identified this proposed schedule change as an exception to the "parameters monitored or inspected" program element of GALL-SLR Report AMP XI.M31. This neutron fluence is equal to the projected peak neutron fluence at the end of the subsequent period of extended operation for the reactor pressure vessel (RPV) inner surface. This proposed schedule will result in the postponement of the withdrawal and testing of a capsule previously identified for withdrawal and testing to address the initial period of extended operation (i.e., from 40 to 60 years). The applicant also provided markups of SLRA Section 3.1.2.2.3.2; Table 3.1-1, item 014; Table 3.1.2-3; Section A.17.2.2.19; Section B.1.1; Table B-4; and Section B.2.3.19 to indicate the exception to the Reactor Material Surveillance AMP.

Exception 1. SLRA Section B.2.3.19, as amended by letter dated October 17, 2018, includes an exception to GALL-SLR Report AMP XI.M31. In this exception, the applicant requested an incremental adjustment to the approved capsule withdrawal schedule for Capsule X_4 in order to achieve the peak 72 EFPY end-of-life fluence values identified in SLRA Table 4.2.1-1.

The applicant provided the following information to justify this exception to GALL-SLR Report AMP XI.M31:

- Capsule X_4 is the last capsule for Turkey Point Units 3 and 4 scheduled to be withdrawn that contains the limiting weld material.
- Capsule V_4 also contains the limiting weld material, but it is a standby capsule in a low lead factor location that will not be able to achieve a neutron fluence of one to two times the peak RPV fluence prior to the end of the subsequent period of extended operation.
- The data from Capsule X_4 will be available before the subsequent period of extended operation, with a projected capsule removal at 41.5 EFPY, which corresponds to year 2026.

The staff reviewed the applicant's proposed capsule withdrawal schedule change, and noted the following:

- The proposed schedule meets 10 CFR Part 50, Appendix H because the Capsule X_4 will achieve a fluence equivalent to not less than once or greater than twice the peak projected RPV neutron fluence of interest (see GALL SLR Report AMP XI.M31) at the end of the subsequent period of extended operation (i.e., 80 year).

- For both Turkey Point Units 3 and 4, the limiting material for PTS is the lower shell to intermediate shell girth weld, Heat 71249, a Linde 80 weld, which is the weld material in Capsule X_4. This heat has a PTS reference temperature (RT_{PTS}) projected for 80 years of 261 °F, which provides considerable margin to the PTS screening criteria in 10 CFR 50.61 for circumferential welds of 300 °F.
- To date, five surveillance capsules containing Heat 71249 have been withdrawn and tested (four at Turkey Point and one at Davis-Besse Nuclear Power Station, Unit No. 1). These surveillance data for Heat 71249 show that Regulatory Guide (RG) 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," dated May 1988 (ADAMS Accession No. ML003740284), conservatively predicts embrittlement for this material. In other words, the best-fit chemistry factor (CF) determined for the weld material based on the surveillance data is lower than the CF that is determined using RG 1.99, Revision 2. The table values of the CF values from RG 1.99, Revision 2, are used in the Turkey Point Units 3 and 4 PTS analyses and P-T limits for this material because the surveillance data are non-credible.
- Heat 71249 is also a limiting material for P-T limits, for circumferential flaws. For axial flaws, the limiting materials for P-T limits are the upper shell forging for Turkey Point Unit 3, and the upper and intermediate shell forgings for Turkey Point Unit 4.
- The current P-T limits were approved as part of the extended power uprate (EPU) license amendment (ADAMS Accession No. ML11293A365) and are licensed to 48 EFPY.
- Capsule V_4 could potentially be relocated to a higher lead factor location, where it could achieve a neutron fluence equivalent to the peak RPV inner diameter fluence prior to the end of the subsequent period of extended operation. Specifically, Capsule V_4 could be relocated to the former location of Capsule S_4, the 280° location, which has a lead factor of 2.03. The staff estimates that Capsule V_4 could achieve an equivalent fluence to the RPV peak inner diameter fluence by approximately 55 EFPY. This would occur around year 2038 and would be several years into the subsequent period of extended operation. However, extension of the withdrawal schedule for Capsule X_4 by 3 EFPY as proposed in the RAI response would provide data at the same fluence, but several years prior to the subsequent period of extended operation. The staff finds that there is little benefit to relocating Capsule V_4 while maintaining the existing withdrawal schedule for Capsule X_4, because this would delay obtaining data for the peak RPV fluence of interest for 72 EFPY. However, with the applicant's proposed withdrawal schedule for Capsule X_4, the applicant would still have the option of relocating Capsule V_4 later if additional data on the limiting weld material were desired after testing the Capsule X_4 materials. For example, if the results of Capsule X_4 showed higher than expected embrittlement, it might be desirable to obtain more data.

The staff reviewed this exception to GALL-SLR Report AMP XI.M31 and this proposed modification to the surveillance capsule withdrawal schedule and finds them to be acceptable because:

(1) The proposed schedule meets the requirements of 10 CFR Part 50, Appendix H.

(2) Capsule X_4 will be withdrawn and tested prior to the subsequent period of extended operation thus providing data to assess RPV integrity several years before entering the subsequent period of extended operation.

(3) The effect on RPV integrity of a 3-EFPY extension is expected to be minimal because:

   a. Turkey Point Units 3 and 4 have considerable margin to the PTS screening criteria.

   b. The P-T limits for Turkey Point Units 3 and 4 are licensed until 6 years beyond the capsule withdrawal date, providing margin against the P-T limits becoming non-conservative.

   c. The previous surveillance data for the limiting weld material show lower embrittlement than would be predicted using RG 1.99, Revision 2.

The staff finds that withdrawal and testing of Capsule X_4 in approximately 2026, as stated by the applicant in its letter dated October 17, 2018, provides reasonable assurance of adequate aging management of RPV embrittlement for Turkey Point during the subsequent period of extended operation. The staff notes, however, that the applicant's currently proposed schedule is fundamental to this approval; any subsequent application to further increase the (1) time between capsule withdrawals and (2) the difference in neutron fluence between previously tested capsules and the peak projected RPV neutron fluence of interest (see GALL-SLR Report AMP XI.M31) at the end of the subsequent period of extended operation, would increase the uncertainty in embrittlement predictions, and reduce the assurance of adequate aging management during the subsequent period of extended operation. Although Appendix H to 10 CFR Part 50 could allow further extensions of the capsule withdrawal schedule, the staff is concerned that such an additional extension may not provide timely data for managing the effects of aging during the subsequent period of extended operation, as required by 10 CFR 54.29(a), and would increase the uncertainty of the neutron embrittlement projections of the RPV in the intervening time. However, as stated above, withdrawal and testing of Capsule X_4 on the schedule proposed by the applicant in its letter dated October 17, 2018, provides reasonable assurance that the effects of aging will be adequately managed such that the reactor vessel will continue to perform its intended functions during the subsequent period of extended operation.

For the "monitoring and trending" AMP element, the staff determined that it needed additional information, resulting in the issuance of an RAI. RAI B.2.3.19-2 (ADAMS Accession No. ML18292A642).

During its review of the applicant's response to RAI B.2.3.19-2, the staff noted that the applicant indicated that it has standby capsules that will remain in the Turkey Point Units 3 and 4 reactors that contain dosimetry materials that could be used to evaluate and benchmark neutron fluence. The applicant also indicated that its fluence projections for 72 EFPY used NRC-approved methods and are conservative. The applicant also indicated that its Fluence Monitoring program, described in SLRA Section B.2.2.2, monitors changes to plant operating conditions that affect neutron fluence. The applicant stated that if the results of the fluence analyses under the Fluence Monitoring AMP determine that additional fluence measurements are necessary to assure that the fluence estimates remain within the ranges of uncertainty in RG 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," dated March 2001 (ADAMS Accession No. ML010890301), either in-vessel standby capsules or ex-vessel dosimetry can be implemented.

AMP XI.M31 states in the program description that an in-vessel standby capsule, or a standby capsule, which has been retrieved from storage and reinserted, when coupled with the use of an NRC-approved methodology for determining neutron fluence consistent with RG 1.190, provides an acceptable means of dosimetry monitoring.

The staff finds the applicant’s response acceptable because the applicant confirmed that it will have standby capsules remaining in both RPVs and that it will use NRC-approved methods conforming to RG 1.190 to determine RPV fluence in the future, which is consistent with the guidance in the GALL-SLR Report, as stated above.

The staff conducted an audit to verify the applicant’s claim of consistency with the GALL-SLR Report. Based on its review of the SLRA, amendments, and response(s) to RAI B.2.3.19-1 and RAI B.2.3.19-2, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M31. The staff also reviewed the exception associated with the “parameters monitored or inspected” and” “monitoring and trending” program elements, and its justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B2.3.19 summarizes operating experience related to the Reactor Vessel Material Surveillance program. The applicant stated that to date, no enhancements to the AMP have been identified as a result of operating experience. However, operating experience is reviewed such that if there is an indication that the effects of aging are not being adequately managed, a corrective action will be initiated to either enhance the AMP or implement new AMPs, as appropriate. In addition, AMP effectiveness is assessed on a 5-year basis per NEI 14-12, Revision 0, “Aging Management Program Effectiveness,” dated December 2014 (ADAMS Accession No. ML15090A665). For example, the applicant stated that it performed a plant-specific evaluation to ensure that its P-T limits and PTS evaluation remained conservative in response to an industry finding that the orientation of some Charpy specimens used to establish material properties for RPV beltline materials may be unknown.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant’s corrective action program database; and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

Based on its audit and its review of the application and the applicant’s response to RAIs B.2.3.19-1 and B.2.3.19-2, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Reactor Vessel Material Surveillance program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.19 provides the UFSAR supplement for the Reactor Vessel Material Surveillance program. The staff also noted that the applicant committed to ongoing implementation of the existing Reactor Vessel Material Surveillance AMP for managing the effects of aging for applicable components during the subsequent period of extended operation.

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. On the basis of its audit and its review of the applicant's Reactor Vessel Material Surveillance program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. In addition, the staff reviewed the exception and its justification and determined that the AMP, with the exception, is adequate to manage the applicable aging effects. The withdrawal and testing of Capsule X_4 at 41.5 EFPY, as stated by the applicant in its letter dated October 17, 2018, is a necessary part of the staff finding that the applicant's program is acceptable. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3), provided that Capsule X_4 is withdrawn and tested as described in the applicant's Reactor Vessel Material Surveillance program. 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 One-Time Inspection

SLRA Section B.2.3.20 describes the new One-Time Inspection program as consistent with GALL-SLR Report AMP XI.M32, "One-Time Inspection."

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M32.

Based on its audit, the staff finds that program elements 1 through 7 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of the GALL-SLR Report AMP XI.M32. The staff finds that the AMP is adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.20 summarizes operating experience related to the One-Time Inspection program. The applicant stated that the One-Time Inspection program will provide reasonable assurance that the Fuel Oil Chemistry, Lubricating Oil Analysis, and Water Chemistry programs will be effective in managing the effects of aging so that the intended function(s) of components within the scope of those programs will be maintained consistent with the CLB during the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

The staff identified operating experience for which it determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.20-2 and the applicant's various responses are documented in ADAMS Accession Nos. ML18243A005, ML18296A024, ML18352A885, and ML19035A195. The staff notes that the applicant's response dated January 31, 2019 (ADAMS Accession No. ML19035A195), supersedes in its entirety the previous RAI responses discussed during the November 15 and December 20, 2018 NRC public meetings with the applicant.

During its evaluation of the applicant's response to RAI B.2.3.20-2, the staff noted that the applicant revised SLRA Table 3.2.2-2 by deleting the two AMR items associated with loss of material for carbon steel piping internally exposed to treated borated water and revised SLRA Table 17-3 by adding a new commitment. The staff finds the applicant's response and changes to the SLRA acceptable because the applicant committed to replace the portions of the carbon steel piping inside containment that are exposed to treated borated water (corresponding to the water level in the refueling water storage tank of 65 feet elevation) with stainless steel piping, which is not susceptible to loss of material in a treated borated water environment.

Based on its audit and its review of the application and the applicant's response to RAI B.2.3.20-2, 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.

<u>UFSAR Supplement</u>. SLRA Section A.17.2.2.20 provides the UFSAR supplement for the One-Time Inspection 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 address the long-term loss of material for steel components exposed to environments that do not include corrosion inhibitors as a preventive action. The licensing basis for this program for the subsequent period of extended operation may not be adequate if the applicant does not incorporate this information into its UFSAR supplement. This lack of information resulted in the issuance of RAI B.2.3.20-1 and the applicant's subsequent response, which are documented in ADAMS Accession Nos. ML18243A005 and ML18296A024.

During its evaluation of the applicant's response to RAI B.2.3.20-1, the staff noted that the applicant had changed the SLRA AMP to include managing long-term loss of material due to general corrosion in steel components that are in an environment that does not include a corrosion inhibitor. The staff finds the applicant's response and changes to the UFSAR supplement acceptable, because it addresses long-term loss of material in an environment that does not include a corrosion inhibitor, which is consistent with the recommendations of the GALL-SLR Report. Therefore, the UFSAR supplement for the One-Time Inspection program is consistent with the corresponding program description in GALL-SLR Report Table XI-01.

The staff also noted that the applicant committed to implement the new One-Time Inspection program 10 years prior to the subsequent period of extended operation. The staff further noted that FPL committed to completing pre-subsequent period of extended operation inspections no later than 6 months or the last refueling outage (RFO) 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, as amended by letter dated October 16, 2018, is an adequate summary description of the program.

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

3.0.3.1.5 Selective Leaching

SLRA Section B.2.3.21, describes the new Selective Leaching program as consistent with GALL-SLR Report AMP XI.M33, “Selective Leaching.” The applicant amended this SLRA section by letters dated August 31, October 16, and December 12, 2018.

Staff Evaluation. During its audit, the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant’s program to the corresponding program elements of GALL-SLR Report AMP XI.M33.

For the “scope of program” program element, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.21-1 and the applicant’s response are documented in ADAMS Accession Nos. ML18218A198 and ML18248A257.

In its response, the applicant revised SLRA Tables 3.2-1, 3.2.2-2, 3.2.2-4, 3.3.2-16, and 3.3.2-18; and SLRA Sections B.2.3.21 and 17.2.2.21 to state that the Selective Leaching program will be used to manage loss of material due to selective leaching for cast iron components. The staff finds the applicant’s response and its changes to the AMP, UFSAR supplement, and associated SLRA tables acceptable because managing loss of material due to selective leaching for cast iron components using the Selective Leaching program is consistent with GALL-SLR Report AMP XI.M33 recommendations.

For the “scope of program” program element, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.21-2 and the applicant’s response are documented in ADAMS Accession Nos. ML18243A006 and ML18296A024.

In its response, the applicant revised SLRA Table 3.3.2-15 to state that the Selective Leaching program will be used to manage loss of material due to selective leaching for gray cast iron fire hydrants and valve bodies exposed to soil. The staff finds the applicant’s response and its changes to the subject SLRA table acceptable because managing loss of material due to selective leaching for gray cast iron components exposed to soil using the Selective Leaching program is consistent with GALL-SLR Report AMP XI.M33 recommendations.

During its review of the “detection of aging effects” program element, the staff noted that the visual/mechanical inspection quantities for each population comprises of a 3 percent sample or a maximum of 10 components. The staff reviewed NUREG-2221, “Technical Bases for Changes in the Subsequent License Renewal Guidance Documents NUREG-2191 and NUREG-2192,” dated December 2017 (ADAMS Accession No. ML17362A126), and noted that the reduction in the number of visual/mechanical examinations from that in the previous version of AMP XI.M33 (i.e., the GALL Report, Revision 2, recommended a 20 percent sample or a maximum of 25 components) is based in part on the licensee’s one-time inspections conducted for the previous period of extended operation. The staff reviewed the applicant’s initial license renewal application (LRA) and noted that only a single inspection for selective leaching was performed on one of the cast iron bonnets of the auxiliary feedwater pump lube oil coolers. Although the applicant did not perform multiple inspections for selective leaching during the initial period of extended operation, the staff finds the applicant’s approach to use visual/mechanical inspection quantities of 3 percent or a maximum of 10 components acceptable because, due to the size of destructive examinations (i.e., one or two destructive examinations for each of the 10 populations) being conducted at a frequency of every 10 years beginning 10 years prior to the subsequent period of extended operation, the staff has reasonable assurance that loss of material due to selective leaching will be detected prior to a loss of intended function.

For the “detection of aging effects” program element, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.21-3 and the applicant’s responses are documented in ADAMS Accession Nos. ML18243A006, ML18296A024, ML18315A003, and ML18348A580. The staff notes that the applicant’s response to RAI B.2.3.21-3, dated October 16, 2018 (ADAMS Accession No. ML18296A024), was superseded by letter dated December 12, 2018 (ADAMS Accession No. ML18348A580).

In its response, the applicant revised SLRA Section A.17.2.2.21, Table 17-3, and Section B.2.3.21 to reflect that periodic inspections, in lieu of one-time inspections, will be performed for components exposed to treated water. The staff finds the applicant’s response and changes to the SLRA and UFSAR supplement acceptable because performing periodic inspections for components exposed to treated water, when plant-specific operating experience of selective leaching exists in a treated water environment, is consistent with GALL-SLR Report AMP XI.M33 recommendations.

For the “corrective actions” program element, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.21-4 and the applicant’s response are documented in ADAMS Accession Nos. ML18243A006 and ML18296A024.

In its response, the applicant revised SLRA Section B.2.3.21 to state that if acceptance criteria are not met and there are not a sufficient number of components that are not difficult-to-access to meet the additional inspection population criteria, then heat exchanger surfaces most susceptible to selective leaching will be made available for inspection. The staff finds the applicant’s response and changes to the AMP acceptable because the program includes a process to evaluate difficult-to-access surfaces (e.g., heat exchanger shell interiors, exterior of heat exchanger tubes) if unacceptable inspection findings occur within the same material and environment population, which is consistent with GALL-SLR Report AMP XI.M33 recommendations.

The staff conducted an audit to verify the applicant’s claim of consistency with the GALL-SLR Report. Based on its review of the SLRA and responses to RAIs B.2.3.21-1, B.2.3.21-2, B.2.3.21-3, and B.2.3.21-4, the staff finds that the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M33.

Operating Experience. SLRA Section B.2.3.21 summarizes operating experience related to the Selective Leaching program. The applicant stated that this is a new program that will be implemented before the subsequent period of extended operation. Therefore, there is no existing site-specific operating experience to validate the effectiveness of this program; however, the applicant provided a summary of site-specific operating experience relevant to inspection, evaluation, and corrective action methods that will be used by the new 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. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant’s corrective action program database;

and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

The staff identified operating experience for which it determined that it needed additional information, which resulted in the issuance of RAI B.2.3.21-3. The staff's evaluation of the applicant's response to this RAI is documented in the Staff Evaluation section above.

Based on its audit and its review of the application and the applicant's response to RAI B.2.3.21-3, 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. As amended by letters dated August 31, October 16, and December 12, 2018, SLRA Section A.17.2.2.21 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 that the applicant committed to (a) implement the Selective Leaching program and start inspections no earlier than 10 years prior to the subsequent period of extended operation, and (b) complete the first periodic inspection no later than 6 months or the last RFO prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement, as amended by letters dated August 31, October 16, and December 12, 2018, is an adequate summary description of the program.

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

3.0.3.1.6 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

SLRA Section B.2.3.25, as amended, describes the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program as consistent, with enhancement, with GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components." The applicant amended this SLRA section by letters dated October 16, and December 14, 2018.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M38.

For the "parameters monitored or inspected" program element, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.25-1 and the applicant's response are documented in ADAMS Accession Nos. ML18243A006 and ML18296A024.

In its response, the applicant revised SLRA Tables 3.3.2-8 and 3.3.2-15 to include flow blockage due to fouling as an AERM for gray cast iron drains exposed to waste water and elastomeric expansion joints exposed to raw water. The staff finds the applicant's response and changes to the subject SLRA tables acceptable because managing flow blockage due to fouling for gray cast iron drains exposed to waste water and elastomeric expansion joints exposed to raw water is consistent with SRP-SLR Table 3.3-1, items 3.3-1-085 and 3.3-1-091.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA and response to RAI B.2.3.25-1, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M38.

By letter dated December 14, 2018, in response to RAI 4.7.2-1 regarding the TLAA for emergency containment cooler tube wear (ADAMS Accession No. ML18352A885), the applicant provided "additional requirements" for this program beyond the guidance described in GALL-SLR Report AMP XI.M38. See SER Section 4.7.2 for additional discussion. The staff evaluated these "additional requirements" as an enhancement to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff's evaluation of the enhancement follows.

Enhancement 1. As amended by letter dated December 14, 2018, SLRA Section B.2.3.25 includes an enhancement to the "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements. The enhancement includes specific aspects of the periodic ultrasonic thickness measurements of the emergency containment cooler tubes for (a) determining the inspection frequency, (b) applying the calculated wear rate to the limiting locations, (c) considering additional thinning during off-normal conditions, (d) considering instrument uncertainty in the calculated wear rate, and (e) including a 10 percent safety factor on the calculated wear rate. The staff reviewed this enhancement in consideration of managing wall thinning due to erosion and impingement from high flow rates on the intended functions of the containment cooling system and finds it acceptable because the specified periodic inspections can ensure that pressure boundary integrity will be maintained for the emergency containment cooler tubes.

Operating Experience. SLRA Section B.2.3.25 summarizes operating experience related to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The applicant stated that this new program will be implemented before the subsequent period of extended operation. Therefore, there is no existing program-specific operating experience to validate the effectiveness of this program; however, the applicant provided operating experience relevant to components within the scope of 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. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 A.17.2.2.25 provides the UFSAR supplement for the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program.

The staff reviewed this program description against the description recommended in GALL-SLR Report Table XI-01 and noted that SLRA Section A.17.2.2.25 does not include a statement that (a) surface examinations or ASME Section XI VT-1 examinations are conducted to detect cracking of stainless steel and aluminum components, and (b) opportunistic inspections continue in each period despite meeting the sampling limit. The licensing basis for this program, for the subsequent period of extended operation, may not be adequate if the applicant does not incorporate this information into its UFSAR supplement, which resulted in the issuance of an RAI. RAI B.2.3.25-2 and the applicant's response are documented in ADAMS Accession Nos. ML18243A006 and ML18296A024.

During its evaluation of the applicant's response to RAI B.2.3.25-2, the staff noted that the applicant revised SLRA Section A.17.2.2.25 to include a statement that (a) surface examinations or ASME Section XI VT-1 examinations are conducted to detect cracking of stainless steel and aluminum components, and (b) opportunistic inspections continue in each period despite meeting the sampling limit. The staff finds the applicant's response acceptable because the UFSAR supplement for the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is consistent with the corresponding program description in GALL-SLR Report Table XI-01.

The staff also noted that the applicant committed to implement the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement, as amended by letter dated October 16, 2018, is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.7 Buried and Underground Piping and Tanks

SLRA Section B.2.3.28 describes the new Buried and Underground Piping and Tanks program as consistent with GALL-SLR Report AMP XI.M41, "Buried and Underground Piping and Tanks." The applicant amended this SLRA section by letters dated October 16, 2018, April 10, 2019, May 21, 2019, and June 4, 2019. The staff noted that with the exception of the expanded discussion of the plant-specific operating experience in the letter dated May 21, 2019, the letter dated June 4, 2019, supersedes the previous changes in the May 21, 2019, letter to SLRA Section B.2.3.28.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M41.

For the "preventive actions" and "detection of aging effects" program elements, the staff determined that it needed additional information regarding why additional inspections, beyond those recommended in GALL-SLR Report Table XI.M41-2, "Inspection of Buried and Underground Piping and Tanks," are not appropriate for buried steel and cementitious piping during the 10-year period prior to the subsequent period of extended operation, which resulted in the issuance of an RAI. RAI B.2.3.28-1, RAI B.2.3.28-1a, RAI B.2.3.28-1b, and the applicant's responses are documented in ADAMS Accession Nos. ML18243A006, ML18296A024, ML19037A398, ML19070A113, ML19087A211, ML19102A065, ML19143A092, and ML19157A028.

The technical basis for issuing RAI B.2.3.28-1 and subsequent followup RAIs was based on the following: (a) the timing for the installation of cathodic protection in SLRA Section B.2.3.28 was not consistent with GALL-SLR Report AMP XI.M41; (b) SLRA Section B.2.3.28 stated that there have been instances of breaks in buried piping; and (c) based on its audit, the staff noted that several leaks have occurred in buried steel piping. The staff's evaluation of each of these three technical areas is documented as follows:

(a) SLRA Section B.2.3.28 stated that cathodic protection will not be operational during the 10-year period prior to the subsequent period of extended operation; however, GALL-SLR Report AMP XI.M41 recommends that cathodic protection be installed at least 5 years prior to the subsequent period of extended operation.

    By letter dated June 4, 2019, (ADAMS Accession No. ML19157A028), the applicant revised SLRA Section B.2.3.28 and SLRA Table 17-3, "List of Subsequent License Renewal Commitments and Implementation Schedule," to state that cathodic protection will be installed at least 9 years prior to the subsequent period of extended operation. The staff finds the applicant's revisions to SLRA Section B.2.3.28 and SLRA Table 17-3 acceptable because the timing for the installation of cathodic protection is now consistent with GALL-SLR Report AMP XI.M41.

(b) SLRA Section B.2.3.28 stated that there has been one or more instances of buried piping breaks at Turkey Point. The staff noted that the utilization of the term "break" implies that the buried pipe segment would not have the ability to deliver flow at required flow rate and pressure.

    By letter dated April 10, 2019 (ADAMS Accession No. ML19102A065), the applicant revised SLRA Section B.2.3.28 to clarify that there has only been one pipe break, which was due to construction excavation activities. The staff finds the applicant's response and revision to SLRA Section B.2.3.28 acceptable because there have not been instances of buried piping breaks due to age-related degradation.

(c) During the audit, the staff noted that several leaks have occurred in buried steel piping. As documented in followup RAI B.2.3.28-1a (ADAMS Accession No. ML19037A398), the applicability of Preventive Action Category F 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.

    In its response to followup RAI B.2.3.28-1a (ADAMS Accession No. ML19070A113), the applicant stated that the majority of leaks in buried steel piping are not within the scope of subsequent license renewal and are therefore not related to the Buried and

Underground Piping and Tanks program. As documented in RAI B.2.3.28-1b (ADAMS Accession No. ML19087A211), the staff did not agree with the applicant's claim that leaks in out-of-scope buried steel piping are not relevant to the Buried and Underground Piping and Tanks program unless a technical justification is provided for why in-scope and out-of-scope buried steel piping are not representative of each other (e.g., similar material composition, degradation mechanisms, coatings, and soil conditions).

By letter dated June 4, 2019 (ADAMS Accession No. ML19157A028), the applicant revised SLRA Sections B.2.3.28 and A.17.2.2.28, and SLRA Appendix A Table 17-3 to reflect that additional inspections, beyond those recommended in GALL-SLR Report Table XI.M41-2, would be performed in the 10-year period prior to the subsequent period of extended operation based on the effectiveness of cathodic protection and the results of soil corrosivity testing. The staff's evaluation of these three scenarios to perform additional inspections, in lieu of the applicant providing additional technical justification for why in scope and out of scope buried steel piping are not representative of each other, follows.

(1) By letter dated June 4, 2019, the applicant stated that 11 inspections will be performed in the 10-year period prior to the subsequent period of extended operation if, after 5 years of operation, the cathodic protection system has operated for at least 85 percent of the time and has met the acceptance criteria of GALL-SLR Report Table XI.M41-3, "Cathodic Protection Acceptance Criteria," (i.e., -850 mV relative to a copper/copper sulfate reference (CSE) electrode, instant off) for at least 80 percent of the time.

    During its review, the staff noted the following: (a) a cathodic protection system operating at least 85 percent of the time and meeting the acceptance criteria at least 80 percent of the time meet the intent of Preventive Action Category C in GALL-SLR Report Table XI.M41-2, which recommends four inspections for a two-unit site where two additional inspections are performed in lieu of fire main testing; and (b) the "corrective actions" program element of GALL-SLR Report AMP XI.M41 states that five additional inspections are performed when the depth or extent of degradation of the base metal could have resulted in a loss of pressure boundary function when the loss of material is extrapolated to the end of the subsequent period of extended operation. Although the recommendation to perform five additional inspections in GALL-SLR Report AMP XI.M41 is not directly applicable to the operating experience at Turkey Point (i.e., leakage is not necessarily equivalent to degradation that could be a potential challenge to the pressure boundary), the staff finds that performing seven additional inspections to account for plant-specific operating experience provides the staff reasonable assurance that the intended functions of buried steel piping will be maintained for the subsequent period of extended operation.

(2) By letter dated June 4, 2019, the applicant stated that 13 inspections will be performed in the 10-year period prior to the subsequent period of extended operation under the following conditions: (a) if, after 5 years of operation, the cathodic protection system has not operated for at least 85 percent of the time or has not met the acceptance criteria of GALL-SLR Report Table XI.M41-3 for at least 80 percent of the time; (b) soil is determined to be non-corrosive per item E.b.iii of GALL-SLR Report Table XI.M41-2; and (c) soil testing determines a minimum soil resistivity of 10,000 ohm-cm.

During its review, the staff noted the following: (a) GALL-SLR Report Table XI.M41-2 recommends a maximum of 11 inspections for a two-unit site where two additional inspections are performed in lieu of fire main testing; (b) the method to determine if soil is non-corrosive is consistent with GALL-SLR Report AMP XI.M41; and (c) *Pipeline Corrosion and Cathodic Protection: A Practical Manual for Corrosion Engineers, Technicians, and Field Personnel* states "[s]oils above 10,000 ohm-cm are generally considered to be noncorrosive." The staff finds that the combination of (a) performing two additional inspections beyond those recommended in GALL-SLR Report Table XI.M41-2; (b) the determination that soil is not corrosive consistent with GALL-SLR Report AMP XI.M41 recommendations; and (c) the determination of a minimum soil resistivity of 10,000 ohm-cm provides the staff reasonable assurance that the intended functions of buried steel piping will be maintained for the subsequent period of extended operation.

(3) By letter dated June 4, 2019, the applicant stated that 16 inspections will be performed in the 10-year period prior to the subsequent period of extended operation if, after 5 years of operation, the cathodic protection system has not operated for at least 85 percent of the time or has not met the acceptance criteria of GALL-SLR Report Table XI.M41-3 for at least 80 percent of the time and soil corrosivity or soil resistivity does not meet the above acceptance criteria.

During its review, the staff noted the following: (a) GALL-SLR Report Table XI.M41-2 recommends a maximum of 11 inspections for a two unit site where two additional inspections are performed in lieu of fire main testing; and (b) the "corrective actions" program element of GALL-SLR Report AMP XI.M41 states that five additional inspections are performed when the depth or extent of degradation of the base metal could have resulted in a loss of pressure boundary function when the loss of material is extrapolated to the end of the subsequent period of extended operation. Although the recommendation to perform five additional inspections in GALL-SLR Report AMP XI.M41 is not directly applicable to the operating experience at Turkey Point, the staff finds that performing five additional inspections to account for plant-specific operating experience provides the staff reasonable assurance that the intended functions of buried steel piping will be maintained for the subsequent period of extended operation.

For the "parameters monitored or inspected" program element, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.28-2 and the applicant's response are documented in ADAMS Accession Nos. ML18243A006, ML18296A024, and ML18348A580. The staff noted that the applicant's response to RAI B.2.3.28-2, dated October 16, 2018 (ADAMS Accession No. ML18296A024), was superseded by letter dated December 12, 2018 (ADAMS Accession No. ML18348A580).

In its response, the applicant revised SLRA Tables 3.3-1 (item 3.3-1-144), 3.4-1 (item 3.4-1-72), 3.3.2-1, 3.3.2-9, 3.3.2-12, 3.3.2-15, and 3.4.2-2 to state that the Buried and Underground Piping and Tanks program will be used to manage cracking due to stress corrosion cracking (SCC) for steel and stainless steel components exposed to soil. The staff finds the applicant's response and changes to the subject SLRA tables acceptable because managing cracking due to SCC for steel and stainless steel components exposed to soil using the Buried and Underground Piping and Tanks program is consistent with GALL-SLR Report AMP XI.M41 recommendations.

For the "detection of aging effects" program element, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.28-3 and the applicant's response are documented in ADAMS Accession Nos. ML18243A006 and ML18296A024.

In its response, the applicant revised SLRA Sections B.2.3.28 and 17.2.2.28 to clarify that two inspections will be conducted for stainless steel exposed to soil and two inspections will be conducted for stainless steel in an underground environment during each 10-year inspection period. The staff finds the applicant's response and changes to the SLRA and UFSAR acceptable because for two-unit sites, GALL-SLR Report AMP XI.M41 recommends two inspections for stainless steel in a buried environment and two inspections for stainless steel in an underground environment during each 10-year inspection period.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, and responses to RAIs B.2.3.28-1, B.2.3.28-2, and B.2.3.28-3, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M41.

Operating Experience. As amended by letter dated June 4, 2019, SLRA Section B.2.3.28 summarizes operating experience related to the Buried and Underground Piping and Tanks program. The applicant stated that this is a new program to be implemented prior to the subsequent period of extended operation. Therefore, there is no existing program-specific operating experience to validate the effectiveness of this program; however, the applicant provided operating experience relevant to components within the scope of 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. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff identified operating experience for which it determined that it needed additional information, which resulted in the issuance of RAI B.2.3.28-1. The staff's evaluation of the applicant's response to this RAI is documented in the Staff Evaluation section above.

Based on its audit and review of the application, and review of the applicant's response to RAI B.2.3.28-1, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Buried and Underground Piping and Tanks program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.28 provides the UFSAR supplement for the Buried and Underground Piping and 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 SLRA Section A.17.2.2.28 does not state that (a) annual cathodic protection surveys are conducted; (b) for steel components, where the acceptance criteria for the effectiveness of the cathodic protection is other than -850 mV instant off, loss of material rates are measured; and (c) if a reduction in the number of inspections recommended in GALL-SLR Report AMP XI.M41, Table XI.M41-2 is claimed based on a lack of soil corrosivity as determined by soil testing, then soil testing is conducted once in each 10-year period starting 10 years prior to the subsequent period of extended operation. The licensing basis for this program for the period of extended operation may not be adequate if the applicant does not incorporate this information into its UFSAR supplement, which resulted in the issuance of an RAI. RAI B.2.3.28-4 and the applicant's response are documented in ADAMS Accession Nos. ML18243A006 and ML18296A024.

During its evaluation of the applicant's response to RAI B.2.3.28-4, the staff noted that (a) annual cathodic protection surveys will be conducted once cathodic protection is installed for steel piping; and (b) for steel components, the cathodic protection acceptance criterion will be -850 mV relative to a copper/copper sulfate reference electrode instant-off. In addition, in its letter dated June 4, 2019, in response to RAI B.2.3.28-1b, the applicant clarified that soil corrosivity and resistivity testing will be used as a factor in determining the number of inspections in the 10-year period prior to the subsequent period of extended operation for buried steel piping. The staff finds the applicant's response and changes to the UFSAR supplement acceptable because the revised UFSAR supplement for the program is consistent with the corresponding program description in GALL-SLR Report Table XI-01.

The staff also noted that the applicant committed to (a) implement the Buried and Underground Piping and Tanks program and start inspections no earlier than 10 years prior to the subsequent period of extended operation; (b) complete pre-subsequent period of extended operation inspections no later than 6 months or the last refueling outage prior to subsequent period of extended operation; and (c) as stated in its letter dated June 4, 2019, install a cathodic protection system no later than 9 years prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement, as amended by letter dated June 4, 2019, is an adequate summary description of the program.

Conclusion. On the basis of 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 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).

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

SLRA Section B.2.3.29 describes the new Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program as consistent with GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks." The applicant amended this SLRA section by letter dated August 31, 2018.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M42.

For the “scope of program,” “detection of aging effects,” and “acceptance criteria” program elements, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.29-1 and the applicant’s response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257.

In its response, the applicant:

- Revised SLRA Section B.2.3.29 and SLRA Section A.17.2.2.29 to reflect that the scope of the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program included all those internal coatings that could lead to loss of material of base materials or (in lieu of and) downstream affects (e.g., reduction in flow).
- Revised SLRA Section B.2.3.29 and SLRA Section A.17.2.2.29 to remove the term “active” in relation to the acceptance criterion for peeling.
- Revised SLRA Section B.2.3.29 to remove the term “active and/or significant” in relation to the acceptance criterion for peeling and delamination.
- Revised SLRA Section B.2.3.29 to state qualification requirements for cementitious coating and lining inspectors consistent with GALL-SLR Report AMP XI.M42.

The staff finds the applicant’s response and changes described above acceptable because the scope of the program, acceptance criteria for peeling and delamination, and inspector qualifications will be consistent with the corresponding portions of GALL-SLR Report AMP XI.M42.

For the “detection of aging effects” and “acceptance criteria” program elements, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.29-2 and the applicant’s response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257.

In its response, the applicant stated that plant-specific implementing procedures will be revised to: (a) specify qualification requirements for coatings inspectors that are consistent with the requirements of the ASTM standards referenced in RG 1.54; (b) state that indications such as cracking, flaking, and rusting are to be evaluated by a coatings specialist; and (c) require additional inspections when degraded coatings do not meet acceptance criteria in accordance with the “corrective actions” program element of GALL-SLR Report AMP XI.M42. These changes will be incorporated as part of completing Commitment Nos. 15 and 33. By letter dated April 10, 2019 (ADAMS Accession No. ML19102A065), the applicant revised SLRA Section B.2.3.11, Enhancement No. 2 to state that inspection intervals are established by a coatings specialist who has been qualified in accordance with the standards cited in RG 1.54; however, the inspection intervals should not exceed those cited in GALL-SLR Report Table XI.M42-1, “Inspection Intervals for Internal Coatings/Linings for Tanks, Piping, Piping Components, and Heat Exchangers.”

The staff finds the applicant’s response and changes described above acceptable because the qualification level of the individual evaluating degraded coatings, interval between inspections of the internal coatings on the ICW system, and additional inspections when degraded coatings do not meet acceptance criteria will be consistent with the corresponding portions of GALL-SLR Report AMP XI.M42.

For the “detection of aging effects,” “parameters monitored or inspected,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.29-3 and the applicant’s response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257.

In its response, the applicant revised: (a) SLRA Table 3.3-1, item 3.3-1-138 to cite fuel oil as an applicable environment; and (b) SLRA Tables 3.3.2-18 and 3.5.2-9 to cite the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program to manage loss of coating or lining integrity for tanks and the Unit 4 diesel oil storage tank (DOST) liner where exposed to fuel oil.

The staff finds the applicant’s response and changes described above acceptable because loss of coating integrity for tanks and tank liners exposed to fuel oil will be managed consistent with GALL-SLR Report AMP XI.M42.

Based on its audit and its review of the applicant’s responses to RAI B.2.3.29-1, RAI B.2.3.29-2, and RAI B.2.3.29-3, the staff finds that program elements 1 through 7 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M42. The staff finds that the AMP is adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.29 summarizes operating experience related to the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program. The applicant stated that the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program is a new program that will provide reasonable assurance that the effects of aging will be managed so that the intended function(s) of components within the scope of the program will be maintained consistent with the CLB during the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant’s corrective action program database; and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.29 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 against the recommended description for this type of program as described in GALL-SLR Report Table XI-01 and noted that: (a) the program will manage degradation of coating or lining integrity that can lead to loss of material and downstream aging effects; and (b) active peeling and delamination are not acceptable. The licensing basis for this program for the subsequent period of extended operation may not be adequate if the applicant does not revise these statements in its UFSAR supplement, which resulted in the issuance of an RAI. RAI B.2.3.29-1 and the applicant's response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257.

The staff's evaluation of the UFSAR changes described in RAI B.2.3.29-1 is documented in the above Staff Evaluation. The UFSAR supplement for the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program is consistent with the corresponding program description in GALL-SLR Report Table XI-01. By letter dated April 10, 2019, the applicant further revised the UFSAR supplement description by noting that applicable elements of this AMP are included in the Open Cycle Cooling Water System program to manage loss of coating integrity for internal coatings in the intake cooling water system piping.

The staff also noted that the applicant committed to implement the new Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program and start inspections no earlier than 10 years prior to the subsequent period of extended operation; and complete pre-subsequent period of extended operation inspections no later than 6 months or the last RFO 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, as amended by letters dated August 31, 2018, and April 10, 2019, is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's new Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.9 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements used in Instrumentation Circuits

SLRA Section B.2.3.39 describes the new Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements used in Instrumentation Circuits consistent with GALL-SLR Report AMP XI.E2, "Electrical Insulation for Electrical Cables and Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits."

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.E2.

Based on its audit, the staff finds that program elements 1 through 7 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E2. The staff finds that the AMP is adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.39 summarizes operating experience related to the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements used in the Instrumentation Circuits AMP. The applicant stated that the plant-specific operating experience will be informed and enhanced when necessary through the systematic and ongoing review of both site-specific and industry operating experience to ensure program effectiveness consistent with the discussion in Appendix B of NUREG-2191. The applicant further stated that operating experience will be reviewed such that if there is an indication that the effects of aging are not being adequately managed, a corrective action will be initiated to either enhance the AMP or implement new AMPs, as appropriate. In addition, AMP effectiveness will be assessed on a 5-year basis per NEI 14-12.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 EQ Requirements used in Instrumentation Circuits AMP was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.39 provides the UFSAR supplement for the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements used in the Instrumentation Circuits 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 the applicant committed to implement the new Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements used in Instrumentation Circuits AMP with inspections completed no later than 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements used in Instrumentation Circuits AMP, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements

SLRA Section B.2.3.40 describes the new Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements program as consistent with GALL-SLR Report AMP XI.E3A "Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements." The applicant amended this SLRA section by letter dated October 16, 2018.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.E3A.

Based on its audit, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E3A. The staff finds that the AMP is adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.40 summarizes operating experience related to the Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements program. The applicant stated that the Turkey Point Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements AMP is a new program for Turkey Point to be implemented prior to the subsequent period of extended operation. Therefore, there is no existing program-specific operating experience to validate the effectiveness of this program. The Turkey Point Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements AMP will provide reasonable assurance that the effects of aging will be managed so that the intended function(s) of components within the scope of the AMP will be maintained consistent with the CLB during the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.40 provides the UFSAR supplement for the Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements program. The staff reviewed this UFSAR supplement description of the program against the recommended description for this type of program as described in GALL-SLR Report Table XI-01 and noted that it stated that inaccessible medium-voltage cables designed for continuous wetting or submergence are also included in this AMP for a one-time inspection and test. However, it did not state that “the need for additional tests and inspections is determined by the test/inspection results as well as industry and plant-specific operating experience.”

GALL-SLR Report Table XI-01, “FSAR Supplement Summaries for GALL-SLR Report Chapter XI Aging Management Programs,” for AMP XI.E3A recommends that the UFSAR supplement include a statement about the need for additional test and inspection. Specifically, it states, “submarine or other cables designed for continuous wetting or submergence are also included in this AMP as a one-time inspection and test with additional periodic tests and inspections determined by one-time inspection results and industry and plant-specific operating experience.”

The licensing basis for this program for the subsequent period of extended operation may not be adequate if the applicant does not incorporate this information into its UFSAR supplement, which resulted in the issuance of an RAI. RAI B.2.3.40-1 and the applicant’s response is documented in ADAMS Accession No. ML18296A024.

During its evaluation of the applicant’s response to RAI B.2.3.40-1, the staff noted that the applicant will revise the UFSAR supplement to state that additional periodic tests and inspections will be determined based on the one-time inspection results and industry and plant-specific operating experience as described in the GALL-SLR Report AMP XI.E3A. The staff finds the applicant’s response and changes to the UFSAR supplement acceptable because the need for additional tests and inspections will be determined by the test/inspection results as well as industry and plant-specific operating experience. Therefore, the UFSAR supplement for the Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements program is consistent with the corresponding program description in GALL-SLR Report Table XI-01.

The staff also noted that the applicant committed to implement the new Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements program and complete initial inspection no later than 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

<u>Conclusion</u>. On the basis of its audit and its review of the applicant’s Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.11 Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 EQ Requirements

SLRA Section B.2.3.41 describes the new Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 EQ Requirements program as consistent with GALL-SLR Report AMP XI.E3B “Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.”

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.E3B. Based on its audit, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E3B. The staff finds that the AMP is adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.41 summarizes operating experience related to the Electrical Insulation for Inaccessible Instrumentation and Control Cables Not Subject to 10 CFR 50.49 EQ Requirements program. FPL stated that it reviewed site-specific operating experience during the first period of extended operation, including past corrective actions, and it provides reasonable assurance that the cable AMP effectively manages insulation aging effects so that intended functions will be maintained during the subsequent period of extended operation. This new program will be implemented at Turkey Point prior to the subsequent period of extended operation; therefore, there is no existing program-specific operating experience. However, there is operating experience relevant to components within the scope of the Turkey Point Electrical Insulation for Inaccessible Instrumentation and Control Cables Not Subject to 50.49 EQ Requirements program. While performing inspection of Manhole (MH) 427 on June 6, 2013, water was discovered inside, about ½ inch above sump level. The sump pump did not appear to be working properly. Upon further investigation, there was less than ½ inch of water in the MH and no cables were submerged. This condition was entered into the corrective action program to check the sump pump float switch or replace the sump pump. The sump pump was replaced. This manhole is inspected on an annual basis in accordance with the Turkey Point manhole inspection procedure. Review of the cable program health report indicates no subsequent flooding issues for MH 427.

The applicant further stated that the above example of site-specific operating experience demonstrates that when water inside a manhole has been identified at Turkey Point, appropriate corrective measures are taken in a timely fashion to keep the cables free from significant moisture. The manholes within the scope of this new AMP are to be visually inspected periodically based on water accumulation over time. Inspection frequencies are adjusted based on inspection results including site-specific operating experience but with a minimum inspection frequency of at least once annually. Site-specific operating experience, similar to this, will be used in the adjustment of the inspection frequency of this new AMP. This new AMP will be informed and enhanced as additional site-specific operating experience is accumulated to ensure cables are kept free from significant moisture.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 EQ Requirements program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.41 provides the UFSAR supplement for the Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 EQ 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 finds that the information in the UFSAR supplement is an adequate summary description of the program. The staff also noted that the applicant committed to implement the new Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 EQ Requirements program and complete initial inspection no later than 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

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

3.0.3.1.12 Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements

SLRA Section B.2.3.42 describes the new Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements program as consistent with GALL-SLR Report AMP XI.E3C "Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.E3C.

Based on its audit, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E3C. The staff finds that the AMP is adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.42 summarizes operating experience related to the Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements program. FPL stated that it is a new program for Turkey Point that will be implemented prior to the subsequent period of extended operation. Therefore, there is no existing program-specific operating experience to validate the effectiveness of this program at Turkey Point; however, there is operating experience relevant to components within the scope of the Turkey Point Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements AMP. While performing inspection of MH 427 on June 6, 2013, water was discovered inside, about ½ inch above sump level. The sump pump did not appear to be working properly. Upon further investigation, there was less than ½ inch of water in the manhole and no cables were submerged. This condition was entered into the corrective action program to check the sump pump float switch or to replace the sump pump. The sump pump was replaced. This manhole is inspected on an annual basis in accordance with the Turkey Point manhole inspection procedure. Review of the cable program health report indicates no subsequent flooding issues for MH 427.

The applicant further stated that the above example of site-specific operating experience demonstrates that when water inside a manhole has been identified at Turkey Point, appropriate corrective measures are taken in a timely fashion to keep the cables free from significant moisture. The manholes within the scope of this new AMP are to be visually inspected periodically based on water accumulation over time. Inspection frequencies are adjusted based on inspection results including site-specific operating experience but with a minimum inspection frequency of at least once annually. Site-specific operating experience, similar to this, will be used in the adjustment of the inspection frequency of this new AMP. This new AMP will be informed and enhanced as additional site-specific operating experience is accumulated to ensure cables are kept free from significant moisture.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 10 CFR 50.49 EQ Requirements program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.42 provides the UFSAR supplement for the Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ 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 the applicant committed to implement the new Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements program and complete initial inspection no later than 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

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

3.0.3.1.13 Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements

SLRA Section B.2.3.43 describes the new Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements program as consistent with GALL-SLR Report AMP XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

<u>Staff Evaluation</u>. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.E6.

For the "monitoring and trending," program element, the staff determined that it needed additional information because it was not clear whether this program included trending when results are trendable, as recommended in GALL-SLR Report AMP XI.E6. This resulted in the issuance of an RAI. RAI B.2.3.43-1 and the applicant's response are documented in ADAMS Accession No. ML18296A024.

During its evaluation of the applicant's response to RAI B.2.3.43-1, the staff noted that if one-time test findings lead to periodic testing, in accordance with the corrective actions and Turkey Point's QA program (10 CFR 50, Appendix B), inspection and test results shall be trended to provide additional information on the rate of electrical cable connection degradation. The staff finds the applicant's response acceptable because implementation of trending, when possible, is consistent with GALL-SLR Report AMP XI.E6 recommendations.

During the audit, the staff also noted the use of split-bolt connections at Turkey Point. However, it was not clear to the staff whether these connections were incorporated into the sampling population basis of the proposed AMP. This resulted in the issuance of an RAI. RAI B.2.3.43-1 and the applicant's response is documented in ADAMS Accession No. ML18296A024.

During its evaluation of the applicant's response to RAI B.2.3.43-1, the staff noted that Turkey Point only uses these types of connections on ground cables and temporary power cable connections (e.g., for outage work). The staff finds the applicant's response acceptable because split-bolt connections are not utilized for in-scope cable connections and do not need to be included in the sample population for implementation of this AMP.

Based on its audit and its review of the applicant's response to RAI B.2.3.43-1, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E6. The staff finds that the proposed AMP is adequate to manage the applicable aging effects.

<u>Operating Experience</u>. SLRA Section B.2.3.43 summarizes operating experience related to the Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements program. The applicant stated that there have been limited numbers of age-related failures of cable connections reported at Turkey Point, and existing maintenance practices have proven to be effective.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database;

and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 EQ Requirements program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.43 provides the UFSAR supplement for the Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ 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 the applicant committed to implement the new Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements program 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its audit and review of the applicant's Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.14 High-Voltage Insulators

SLRA Section B.2.3.44 describes the new High-Voltage Insulators program as consistent with GALL-SLR Report AMP XI.E7, "High-Voltage Insulators."

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.E7. In reviewing the applicant's SLRA Section B.2.3.44, the staff noted that Turkey Point utilizes polymer high-voltage insulators that are not addressed in the proposed program. The staff issued RAI B.2.3.44-1 requesting that the applicant include and evaluate polymer high-voltage insulators. In its response, documented in ADAMS Accession No. ML18296A024, the applicant revised the SLRA and added a new plant-specific AMP under SLRA Section B.2.4.2, "Polymer High-Voltage Insulators." The staff evaluated the new plant-specific AMP in the amended SLRA, dated October 16, 2018, in Section B.2.4.2, per the RAI B.2.3.44-1 response. The results of the staff's findings of the new plant-specific AMP are separately documented under SER Section 3.0.3.3.2. The evaluation in this SER section, 3.0.3.1.14, pertains only to the applicant's High-Voltage Insulators program.

Based on its audit and its review of the applicant's response to RAI B.2.3.44-1, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E7. The staff finds that the AMP is adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.44 summarizes operating experience related to the High-Voltage Insulators program. The applicant stated that although this is a new program at Turkey Point, previous potential damages to high-voltage insulators have been identified and measures taken to prevent loss of intended function. Additionally, this AMP will be informed and enhanced as additional site-specific operating experience is accumulated to ensure that the effects of aging will be adequately managed to maintain the intended functions of the in-scope high-voltage insulators.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.44 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. The staff also noted that the applicant committed to implement the new high-voltage insulators program 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

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

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

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

- Fatigue Monitoring
- Neutron Fluence Monitoring
- Concrete Containment Unbonded Tendon Prestress
- Environmental Qualification of Electric Equipment
- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

- Reactor Head Closure Stud Bolting
- Boric Acid Corrosion
- Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components
- Reactor Vessel Internals
- Flow-Accelerated Corrosion
- Bolting Integrity
- Steam Generators
- Open-Cycle Cooling Water System
- Closed Treated Water Systems
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems
- Compressed Air Monitoring
- Fire Protection
- Fire Water System
- Outdoor and Large Atmospheric Metallic Storage Tanks
- Fuel Oil Chemistry
- ASME Code Class 1 Small-Bore Piping
- External Surfaces Monitoring of Mechanical Components
- Flux Thimble Tube Inspection
- Lubricating Oil Analysis
- Monitoring of Neutron-Absorbing Materials other than Boraflex
- ASME Section XI, Subsection IWE
- ASME Section XI, Subsection IWL
- ASME Section XI, Subsection IWF
- 10 CFR Part 50, Appendix J
- Masonry Walls
- Structures Monitoring
- Inspection of Water-Control Structures Associated with Nuclear Power Plants
- Protective Coating Monitoring and Maintenance
- Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements

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 Fatigue Monitoring

SLRA Section B.2.2.1 describes the existing Fatigue Monitoring program as consistent, with enhancements, with GALL-SLR Report AMP X.M1, "Fatigue Monitoring." The applicant amended this SLRA section by letter dated October 16, 2018.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP X.M1.

For the "scope of program," and "parameters monitored or inspected" program elements, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.2.1-1 and the applicant's response are documented in ADAMS Accession No. ML18296A024. During its evaluation of the applicant's response to RAI B.2.2.1-1, the staff noted that the applicant clarified the discrepancy between its SLRA and supporting fatigue calculations, confirmed the components reevaluated for environmentally assisted fatigue, and confirmed that the number of cycles used in its environmentally assisted fatigue calculations will be incorporated into its Fatigue Monitoring program. The staff finds the applicant's response acceptable because it confirmed the components, including cycle limits, within the scope of its Fatigue Monitoring program and confirmed that its implementing procedures will incorporate these cycle limits established in its environmentally assisted fatigue calculations, such that the program can verify continued acceptability of these analyses through the subsequent period of extended operation or initiate corrective actions before exceeding cycle limits.

The staff also reviewed the portions of the "parameters monitored or 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 enhancements follows.

Enhancement 1. SLRA Section B.2.2.1 includes an enhancement to the "parameters monitored or inspected" program element. In this enhancement, the applicant stated that it will update the AMP governing procedure to monitor the chemistry parameters that provide inputs to environmental fatigue life correction factors ($F_{en)}$ used in environmentally adjusted CUF (CUF_{en}) calculations. These chemistry parameters include dissolved oxygen and sulfate and are controlled and tracked in accordance with the Water Chemistry program.

As described in SLRA Section 4.3.3, the licensee's approach to calculate the F_{en} factor in its refined CUF_{en} calculations relied on NUREG/CR-6909, Revision 1, "Effect of LWR Coolant Environments on the Fatigue Life of Reactor Materials, Draft Report for Comment" dated March 2014 (ADAMS Accession No. ML14087A068). The applicant's use of the draft for comment report is addressed in SER Section 4.3.3. Per NUREG/CR-6909, the F_{en} factor for carbon and low-alloy steel, austenitic stainless steels, and nickel alloy components is, in part, dependent on dissolved oxygen content in the coolant water. During its review of the refined CUF_{en} analyses, the staff noted that the applicant assumed that the dissolved oxygen content is less than the 0.1 ppm threshold established in NUREG/CR-6909, which is consistent with the PWR coolant water.

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 the applicant's program will be consistent with the recommendations in the GALL-SRP Report, such that the chemistry parameters that are inputs in CUF_{en} analyses (i.e., dissolved oxygen) will be monitored to verify continued acceptability of these analyses through the subsequent period of extended operation or initiate corrective actions before these analyses becoming invalid.

Enhancement 2. SLRA Section B.2.2.1 includes an enhancement to the "parameters monitored or inspected" program element. In this enhancement, the applicant stated that it will update the AMP governing procedure to identify and require monitoring of the 80-year plant design cycles, or projected cycles that are utilized as inputs to component CUF_{en} calculations, as applicable.

The staff noted that one of the fundamental aspects of GALL-SLR Report AMP X.M1 is the verification for continued acceptability of existing fatigue analyses through the use of cycle counting. Cycle counting assures that the number of occurrences and severity of each transient remains within the limits of the fatigue analyses and, in turn, ensures that the analyses remain valid.

The staff reviewed this enhancement and the licensee's response to RAI B.2.2.1-1 against the corresponding program elements in GALL-SLR Report AMP X.M1 and finds it acceptable because when it is implemented the applicant's program will be consistent with the recommendations in the GALL-SLR Report, such that transient cycle limits associated with the refined CUF_{en} calculations will be captured so that the program can verify continued acceptability of these analyses through the subsequent period of extended operation or initiate corrective actions prior to exceeding cycle limits.

Enhancement 3. SLRA Section B.2.2.1 includes an enhancement to the "monitoring and trending" program element. In this enhancement, the applicant stated that it will update the AMP governing procedure to identify the corrective action options if the values assumed for fatigue parameters are approached, transient severities exceed the design or assumed severities, transient counts exceed the design or assumed quantities, transient definitions have changed, unanticipated new fatigue loading events are discovered, or the geometries of components are modified.

The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP X.M1 and finds it acceptable because when it is implemented the applicant's program will be consistent with the recommendations in the GALL-SLR Report, such that explicit and appropriate corrective actions are identified in the applicant's program if it is determined that any assumptions used in the applicant's fatigue analyses become invalid.

Based on its audit and its review of the applicant's response to RAI B.2.2.1-1, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP X.M1. In addition, the staff reviewed the enhancements associated with the "parameters monitored or 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 B.2.2.1 summarizes operating experience related to the Fatigue Monitoring program. The applicant stated that the operating experience for this program shows that the existing program will effectively manage aging effects associated with material fatigue or cyclic loading and that appropriate guidance for re-evaluation, repair, or replacement is provided for locations where cycle limits are challenged. The applicant stated that continued implementation of the Fatigue Monitoring AMP will effectively identify age-related degradation prior to failure or loss of intended function during the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

The staff noted that the applicant evaluated applicable NRC generic communications (i.e., Regulatory Issue Summary (RIS) 2008-30 and RIS 2011-14) and more recent guidance, as documented in NUREG/CR-6909, for determining F_{en} factors. The applicant also provided examples of plant-specific operating experience that demonstrated that it is capable of (1) identifying plant modifications that impact fatigue analyses, (2) implementing required procedural changes to adequately manage component aging effects, (3) assessing severity of design transients to ensure the validity of component fatigue analyses, and (4) identifying and resolving inconsistencies in transient cycle limits. The staff did not identify any operating experience that would indicate that the applicant should consider modifying its proposed program beyond that 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 Fatigue Monitoring program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.1.1 provides the UFSAR supplement for the Fatigue 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 the applicant 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 the applicant committed to implement the enhancements to the program no later than 6 months prior to the subsequent period of extended operation . The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

The staff also noted that the applicant committed to enhance the existing program by:

- updating the appropriate plant procedures to monitor chemistry parameters that provide inputs to F_{en} factors used in CUF_{en} calculations
- updating the appropriate plant procedures to identify and requiring monitoring of the 80-year projected plant transients that are utilized as inputs to CUF_{en} calculations
- updating the appropriate plant procedures to identify the corrective action options to take if component specific fatigue limits are approached.

Conclusion. On the basis of its audit and its review of the applicant's Fatigue Monitoring program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with GALL-SLR Report AMP X.M1. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Neutron Fluence Monitoring

SLRA Section B.2.2.2 describes the existing Neutron Fluence Monitoring program as consistent, with enhancements, with GALL-SLR Report AMP X.M.2, "Neutron Fluence Monitoring." The applicant stated that Turkey Point's Neutron Fluence Monitoring program, previously the fluence and uncertainty calculation portion of the Turkey Point Reactor Vessel Integrity program, is an existing program that ensures the continued validity of the neutron fluence analyses and neutron fluence-based TLAA and related analyses involving time-dependent neutron irradiation through monitoring and periodic updates.

The applicant stated that fluence projections performed in support of, and monitored by, the Neutron Fluence Monitoring program, are performed using the methods described in NRC-approved licensing topical report Westinghouse Commercial Atomic Power (WCAP)-14040-A. These methods comply with RG 1.190. The applicant also stated that the Neutron Fluence Monitoring program evaluates the RPV surveillance capsule dosimetry data and updates the fluence projections in the cylindrical RPV locations, as needed.

The applicant identified three main purposes of the Neutron Fluence Monitoring program, insofar as these purposes define the program scope, namely: (1) to assess the reactor vessel integrity in concert with the reactor vessel embrittlement TLAAs; (2) to assess susceptibility of Reactor Vessel Internals (RVI) components to neutron irradiation-related damage; and (3) to determine the extent of the RPV beltline region in accordance with RIS 2014-11. The applicant noted that neutron fluence was within the scope of the Neutron Fluence Monitoring program, and further stated that PTS, USE, and associated equivalent margins analyses (EMA), and P-T curves were in the scope of the program. In addition, the applicant stated that neutron fluence is a time-dependent input parameter for evaluating the loss of fracture toughness of RVI components due to neutron irradiation embrittlement (IE), irradiation-assisted stress corrosion cracking (IASCC), irradiation-enhanced stress relaxation or creep (IESRC), and void swelling (VS) or distortion. The applicant noted that fluence estimates for RVI components are addressed in, among other locations within the SLRA, Section C.2.2. Finally, as noted above, the applicant noted that fluence estimates were used to determine the RPV regions where neutron fluence would exceed 1×10^{17} n/cm^2, and, therefore, require consideration as the RPV beltline, in accordance with the information provided in RIS 2014-11.

The applicant did not identify or describe any preventive actions associated with the Neutron Fluence Monitoring program.

The applicant identified the parameters monitored or inspected by the Neutron Fluence Monitoring program. The applicant stated that the calculational methods, benchmarking, qualification, and surveillance data, as described above, are monitored to maintain the adequacy and ascribed uncertainty of the RPV beltline neutron fluence calculations and corresponding RPV integrity analyses. The applicant also noted that surveillance data associated with the RPV surveillance program are used for the qualification of the fluence calculation, and that the fluence calculations specifically incorporate the effects of the Turkey Point Units 3 and 4 EPUs. The applicant will also apply an enhancement to the "parameters monitored or inspected" program element. The applicant will follow related industry efforts and use such information to confirm the adequacy of fluence estimates, performed in accordance with RG 1.190 guidance, for RPV areas outside the RPV beltline region immediately adjacent to the core.

The applicant stated that neutron fluence calculations are updated periodically, as needed to support licensing actions and surveillance capsule evaluations. The applicant also noted that the Turkey Point surveillance capsule withdrawal schedule has been adjusted to provide for capsule withdrawal equivalent to 80-year exposure. This schedule is evaluated further in SER Section 3.0.3.1.3.

While the applicant stated that there are no specific acceptance criteria values for neutron fluence, the applicant also noted that the fluence for the Turkey Point units has been projected using RG 1.190-adherent methods. The applicant also adopted an enhancement to the "acceptance criteria" program element to include existing information from UFSAR Appendix 4A to justify the methods used to evaluate fluence for RPV regions other than that adjacent to the active fuel.

<u>Staff Evaluation</u>. During its review, the staff evaluated the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP X.M.2.

The staff reviewed the applicant's scope of the Neutron Fluence Monitoring program and determined that it was consistent with GALL-SLR Report AMP X.M.2, insofar as RPV beltline and extended beltline fluence estimates are concerned. The staff reached this determination because fluence was calculated using NRC-approved, RG 1.190-adherent methods to determine fluence in these regions, to determine where fluence exceeds 1×10^{17} n/cm^2, and as input to the RPV TLAAs as appropriate. This treatment is consistent with GALL-SLR Report AMP X.M.2, insofar as it identifies the scope of a neutron fluence monitoring program with respect to RPV fluence estimates, in regions adjacent to the core, or significantly above or below the core, such as the RPV nozzle region.

However, the staff was not able to determine that the applicant's treatment of fluence for RVI components is consistent with the scope of GALL-SLR Report AMP X.M.2. Whereas, in GALL-SLR Report AMP X.M.2, RVI fluence is treated the same as RPV fluence (i.e., monitored and trended, adjusted if changes warranted, and subject to additional justification if RG 1.190-adherent methods are used to estimate RVI fluence), the applicant defers to GALL-SLR Report AMP XI.M16a for the determination of RVI fluence estimates. In SLRA Section C.2.2, which describes aging management of RVI components, the applicant did not describe, in adequate detail, how fluence values supporting the RVI component aging management were estimated, and the staff was unable to determine whether the fluence estimates for the RVI components were adherent to RG 1.190 or otherwise acceptable. In addition, the applicant proposed no enhancements to ensure that additional justification for fluence estimates for the RVI components, if determined using RG 1.190-adherent methods, would be provided in concert with any generic industry initiatives.

Therefore, for the “scope of program” program element, the staff determined that it needed additional information, which resulted in the issuance of RAIs. RAI B.2.2.2-1 and the applicant’s response are documented in ADAMS Accession No. ML18296A024. In the RAI response, the applicant stated that the RVI fluence evaluation was a generic evaluation performed for the EPRI Materials Reliability Program (MRP)-191 representative of three-loop Westinghouse PWRs using the three-dimensional fluence rate synthesis methodology described in WCAP-14040-A. The applicant also stated that WCAP-14040-A adheres to the guidance contained in RG 1.190. Finally, the applicant clarified that the RVI fluence estimates are considered a part of the Neutron Fluence Monitoring program, and therefore subject to the remaining program elements.

In evaluating the response to RAI B.2.2.2-1, the staff determined that the applicant did not provide adequate detail concerning the MRP-191 representative three-loop Westinghouse PWR fluence evaluation for the staff to reach an independent determination regarding the adherence of that fluence evaluation either to the methods described in WCAP-14040-A or to RG 1.190. This issue is addressed in the staff’s evaluation of SLRA Section C.2.2, during which it issued RAI B.2.3.7-F requesting a detailed description of these calculations since they form part of the basis for the aging management of RVI components. The staff’s evaluation of the applicant’s response to RAI B.2.3.7-F is documented in SER Section 3.0.3.2.9. This issue has been resolved for the purposes of the staff’s evaluation of the Neutron Fluence Monitoring program.

The staff considered the clarification provided by the applicant, which states that the RVI fluence evaluations are considered within the scope of the Neutron Fluence Monitoring program and concluded that this portion of the RAI response is acceptable because it confirms that RVI fluence estimates would be subject to the remaining program elements of the Neutron Fluence Monitoring program.

For the “preventive actions” element, the staff determined that the applicant’s Neutron Fluence Monitoring program is consistent with GALL-SLR Report AMP X.M2, because neither AMP identifies specific, preventive actions.

The staff determined that the “parameters monitored or inspected” element of the Neutron Fluence Monitoring program was consistent with GALL-SLR Report AMP X.M2 for the RPV. The applicant included the appropriate citation of the RPV surveillance program and indicated that fluence calculations are updated as needed. Both of these items are included in the GALL-SLR Report. GALL-SLR Report AMP X.M2 notes that the use of RG 1.190-adherent methods to estimate fluence for RPV beltline regions significantly above and below the active fuel region of the core, and for RVI components, may require additional justification. The applicant provided a program enhancement to follow industry trending in this regard for RPV fluence significantly above or below the active fuel region of the core. Because the applicant’s enhancement does not include RVI component fluence estimates, the staff issued RAI B.2.3.7-F under the “scope of program” program element, as discussed and evaluated above.

As written in GALL-SLR Report AMP X.M2, aging effects could be detected, and fluence can be monitored and trended, through the use of the reactor vessel material surveillance program in accordance with the requirements of Appendix H to 10 CFR Part 50. Because the applicant’s Neutron Fluence Monitoring program includes the same provision, the staff determined that the applicant’s AMP is consistent with GALL-SLR Report AMP X.M2 for the “detection of aging effects” and “monitoring and trending” program elements.

Similar to the “preventive actions” program element, the “acceptance criteria” program element in GALL-SLR Report AMP X.M2 contains no specified acceptance values for neutron fluence. The program element refers to the guidance contained in RG 1.190 as specifying elements of methods used to estimate RPV fluence that are considered acceptable to the staff, and notes that such guidance may not be appropriate for RPV extended beltline or RVI components. The staff determined that the application is consistent with the GALL-SLR because it also includes no specific acceptance criteria, refers to the use of RG 1.190-adherent fluence calculations, and included an enhancement to draw on existing UFSAR information to provide additional justification for RPV fluence values calculated in regions other than the active fuel region.

SLRA Section B.2.2.2 includes enhancements to the “parameters monitored or inspected” and “acceptance criteria” program elements.

Enhancement 1. The staff reviewed the “parameters monitored or inspected” enhancement against the corresponding program elements in GALL-SLR Report AMP XM2 and finds it acceptable because when it is implemented it will provide additional justification for the use of WCAP-14040-A, or similar methods, for determining fluence in the extended beltline region of the reactor vessel. As noted in the GALL-SLR Report, methods such as WCAP-14040 are adherent to RG 1.190, but RG 1.190 does not provide guidance for determining the fluence for regions outside the traditional beltline.

Enhancement 2. The staff reviewed the “acceptance criteria” enhancement against the corresponding program element in GALL-SLR Report AMP X.M2 and finds it acceptable because when it is implemented it will ensure that the applicant’s existing fluence methods are appropriately applied to determine fluence outside the RPV region directly adjacent to the fuel, once generic industry initiatives provide confirmation that such existing methods remain adequate for these locations, in concert with the “parameters monitored or inspected” program element described above.

Operating Experience. SLRA Section B.2.2.2 summarizes operating experience related to the Neutron Fluence Monitoring program. The applicant stated that recent industry licensing actions that affect plant life and/or power level confirm appropriate fluence evaluations by demonstrating that nozzle fluence evaluations are conservative, or that the fluence in the nozzle region does not exceed 1×10^{17} n/cm^2. The applicant also noted that plant-specific licensing actions that impact CLB information consider recent utility licensing submittals, staff RAIs, and utility responses.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant’s corrective action program database; and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

The staff did not identify any operating experience that would indicate that the applicant should consider modifying its proposed program beyond that incorporated during the development of the SLRA. In particular, the staff’s independent search identified additional correspondence beyond those referenced by the applicant, but the staff determined that that correspondence demonstrated that the RPV nozzle fluence determinations were conservative, or that the nozzle regions were not sufficiently exposed as to be of concern. Such evaluations and conclusions are essentially the same as those contained in the references that the applicant cited.

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 GALL-SLR Report AMP X.M2 was evaluated.

UFSAR Supplement. SLRA Section A.17.2.1.2 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. Therefore, the staff concluded that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's Neutron Fluence Monitoring program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancements and confirmed that their implementation before the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Concrete Containment Unbonded Tendon Prestress

SLRA Section B.2.2.3, as amended, describes the existing Concrete Containment Unbonded Tendon Prestress program as consistent, with enhancements, with GALL-SLR Report AMP X.S1, "Concrete Containment Unbonded Tendon Prestress," with exceptions. The applicant amended this SLRA section by letters dated October 17, 2018 (ADAMS Accession No. ML18292A641), November 28, 2018 (ADAMS Accession No. ML18334A182), December 14, 2018 (ADAMS Accession No. ML18352A885), March 1, 2019 (ADAMS Accession No. ML19064A824), and May 6, 2019 (ADAMS Accession No. ML19128A149).

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP X.S1.

For the "parameters monitored or inspected" and "monitoring and trending" program elements, the staff determined the it needed additional information, which resulted in the issuance of RAIs. RAIs B.2.2.3-1, 4.5-3, 4.5-4, and the applicant's responses are documented in ADAMS Accession No. ML19064A824. RAI B.2.2.3-1a (follow-up) and the applicant's response is documented in ADAMS Accession No. ML19128A149. Parts of RAIs B.2.2.3-1, 4.5-3, and 4.5-4 also identify and address concerns associated with the TLAA description provided in SLRA Section 4.5 for the prestressed tendons. The staff's evaluation of information provided in the applicant's responses to RAIs B.2.2.3-1, 4.5-3, and 4.5-4 that pertain to SLRA Section 4.5 is documented in SER Section 4.5. The staff's evaluation of information that pertains to the Concrete Containment Unbonded Tendon Prestress program is documented in this SER section.

During its evaluation of the applicant's response to RAI B.2.2.3-1 regarding the "parameters monitored or inspected" program element, the staff noted that the applicant referenced the staff's Audit Report dated April 13, 1992 (ADAMS Accession No. ML17348B474), which states that the original plant Technical Specifications (TS) called for nine preselected tendons (three hoop, three vertical, and three dome) to be inspected. The applicant's response states that from the 1st through the 15th year surveillances, selected tendons for lift off force measurements were detensioned for wire inspection and subsequently retensioned, which disqualified them to serve as common (historical) tendons. The staff identified the lack of common tendons from the 1st through the 15th year as a difference between the applicant's "parameters monitored or inspected" program element and that of GALL-SLR Report AMP X.S1. This staff-identified difference is reviewed and dispositioned below as Exception 1.

The applicant's response to RAI B.2.2.3-1 also states that starting with the 20th year surveillance, new Turkey Point TSs required 12 random tendons to be evaluated (five horizontal "H," four vertical "V," and three dome "D" tendons), with one from each group designated as a common (historical) tendon. The applicant also stated that starting with the 20th year surveillance and continuing through the subsequent period of extended operation, the selected common/historical tendons are 51H18, 12V22, and 3D08 for Unit 3 and 62H82, 45V10, and 3D20 for Unit 4, which would provide 60 years (1992–2052) of trended tendon prestress force history. Turkey Point further stated that subsequent surveillances performed in accordance with ASME Code Section XI, Subsection IWL continued the inspection of these historical tendons as summarized in the staff's January 31, 2001 (ADAMS Accession No. ML010360301) issuance of amendment numbers 210 and 204 to the Turkey Point Units 3 and 4 operating licenses, respectively.

The staff confirmed that the current Turkey Point TSs, (ADAMS Accession Nos. ML052790649 and ML052790652 for Unit 3 and Unit 4, respectively) consistent with ASME Code, Section XI, Subsection IWL, require continuity in common containment prestress tendon examinations. The staff, however, noted a discrepancy in the selection of the common tendons. Specifically, the staff noted that, contrary to IWL-2521(b), which is required by 10 CFR 50.55a, common tendon 3D08 of Unit 3 was detensioned (ADAMS Accession No. ML19064A824) for wire inspection/testing and subsequently retensioned. In addition, audited information from the 45th year tendon surveillance identified the Unit 3 common tendon to be 15H18 whereas the applicant's response to RAI B.2.2.3-1 identified the Unit 3 common tendon to be 51H18. By letter dated April 11, 2019, the staff issued follow-up RAI B.2.2.3-1a to resolve these discrepancies.

During its evaluation of the applicant's response to RAI B.2.2.3-1a (follow-up) the staff noted that the applicant revised the SLRA to add an exception and an enhancement to the "monitoring and trending" program element for this AMP to address the issue associated with the incorrect selection of tendon 3D08 as a common tendon. The staff evaluations of this additional exception and this additional enhancement are below under Exception 3 and Enhancement 2. The staff finds the applicant's responses to RAI B.2.2.3-1 and RAI B.2.2.3-1a (follow-up) acceptable and finds the applicant's sampling method of common and randomly selected tendons starting with the 20th year surveillance to be adequate, because:

(1) Although the staff identified Exception 1, noted above and evaluated below, the applicant's methodology follows IWL-2521(b), which is required by 10 CFR 50.55a.

(2) Prior to the 20th year surveillance, the applicant instituted a rigorous tendon surveillance program summarized in NRC Audit Report, dated April 13, 1992 (ADAMS

Accession No. ML17348B474. While the program did not include common tendons and was different from that of ASME Code, Section XI, Subsection IWL, it selected tendons for inspection to "maintain confidence in the integrity of the containment structure" consistent with the Turkey Point TSs and in Section 5.1.7.4 of the UFSAR.

(3) The applicant clarified, and the staff confirmed through its review of the audited 45th year surveillance records, that 15H18 and 51H18 refer to the same tendon.

(4) When the applicant realized that tendon 3D08 could no longer serve as the Unit 3 common dome tendon, it addressed the non-compliance through its corrective action program, and proposed an acceptable alternate common tendon.

(5) The applicant performed an additional regression analysis which omitted the lift-off data of the incorrectly selected common tendon 3D08. The staff finds that the applicant's approach demonstrated that the error associated with the selection of tendon 3D08 has a minimal impact on the Unit 3 dome tendon regression curve and supports the applicant's predictions for the Unit 3 dome tendon loss of prestress before there is a loss of intended function of the prestress tendon system.

During its evaluation of the applicant's response to RAI 4.5-3 regarding the development of the predicted lower limit (PLL), the minimum required value (MRV), and trend lines as outlined in the "monitoring and trending" program element, the staff noted that the applicant summarized in the audited document PTN/PSC REP-1130-300, dated March 2, 2017, its past, present, and planned future methodologies for predicting prestress forces. Specifically, the staff noted that Turkey Point used PLL methodology from the 15th through 35th surveillance years, and the baseline predicted force (BPF) methodology starting from the 40th year surveillance and plans to use the BPF methodology in surveillance during the subsequent period of extended operation to timely identify tendon prestress force losses when trend lines cross the PLL or BPF as discussed in the "acceptance criteria" program element.

The staff reviewed the applicant's response to RAI 4.5-3 and found it acceptable, because:

(1) BPF and PLL are both acceptable methodologies delineated in RG 1.35.1, "Determining Prestressing Forces for Inspection of Prestressed Concrete Containments," dated July 1990 (ADAMS Accession No. ML003740040), and have been used by the applicant to predict prestress force lift-off values prior to each required surveillance.

(2) The BPF at Turkey Point is based on design-based conservatively estimated losses due to creep, shrinkage, and tendon wire relaxation, as discussed in Chapter 5 of the Turkey Point UFSAR, to predict time-dependent losses for each group's sampled and common tendons prior to any mandated ASME Section XI prestress lift-off force measurements.

(3) The applicant plans to continue using the BPF methodology to trend prestress tendon forces so that it can timely identify structural integrity issues when trend force lines cross the PLL or BPF during the subsequent period of extended operation.

During its evaluation of the applicant's response to RAI 4.5-4 regarding the "monitoring and trending" program element, the staff also noted that some preselected tendon force measurements from the 1st through the 15th tendon surveillance years have an increased value over time due to detensioning for wire inspection, testing, and retensioning to "a force equal to or greater than the measured liftoff force." The staff found the inclusion of such data in trending acceptable, because for each group of tendons (horizontal, vertical, dome) the applicant's developed trend lines, consistent with IN 99-10 and the GALL-SLR Report AMP's "monitoring and trending" program element, included all actual measured tendon prestress forces from all previous examinations to indicate each group's existing state of prestressing forces prior to crossing the MRV. The staff's evaluation and its basis for accepting the applicant's response to RAI 4.5-4 is documented in SER Section 4.5.

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

Exception 1. During its review of SLRA Section B.2.2.3, as revised by letters dated March 1, 2019, and May 6, 2019, the staff identified a difference in the "parameters monitored or inspected" program element. Specifically, the staff noted that the common tendon prestress lift-off force data in TLAA Figures 4.5-1 through 4.5-6 and Tables 4.5-1 through 4.5-6 for the Unit 3 and Unit 4 containment structures are limited from the 20th year and are on surveillances instead of being obtained from the 1st-year sampled tendons as required by IWL-2521(b). The staff reviewed this difference against the corresponding program element in GALL-SLR Report AMP X.S1 and finds it acceptable because:

(1) The original dome, horizontal, and vertical surveillance tendons were not random but were uniquely defined, and although re-tensioned during each surveillance subsequent to the 1st year surveillance as noted in SLRA Tables 4.5-1 through 4.5-6, can still provide reliable, reasonable, and adequate data on the amount of losses experienced during the early years of plant operation.

(2) The initial program, although different from that required by ASME Section XI, Subsection IWL, provided a continuous monitoring of containment tendon prestress forces from the 1st through the 15th surveillance year by targeting specific segments of the containment to ensure that, for continuity of containment structural integrity, tendon prestress forces remain above the MRV.

(3) The dome, horizontal, and vertical historical tendon lift-off force datapoints in conjunction with those obtained from the 20th year surveillance and beyond are adequate to define the recent trend in prestress tendon forces losses.

Exception 2. During its review of SLRA Section B.2.2.3, Enhancement 1, and letters dated March 1, 2019, and May 6, 2019, the staff identified a difference in the "monitoring and trending" program element regarding estimating prestress forces for the dome tendons during the subsequent period of extended operation. Specifically, the staff noted that, for predicting prestress force losses, instead of using the guidance in RG 1.35.1 for the development of PLL or BPF as a measure of acceptance of dome tendon measured prestress forces, the applicant set the lower limit of estimated (predicted) tendon prestress force line to intercept the MRV at the end of the subsequent period of extended operation. The staff reviewed this difference against the corresponding program element in GALL-SLR Report AMP X.S1 and finds it acceptable because:

(1) RG 1.35.1 defines a maximum tolerance band (MTB) that includes all projected prestress tendon force losses (i.e., due to creep, shrinkage, steel relaxation, and wire breakage) and intercepts the MRV at the end of plant life, and the applicant's assumed tolerance band could serve as a predictor for dome trend lines prior to crossing the MRV during the subsequent period of extended operation.

(2) As required by Turkey Point Units 3 and 4 TSs, the average of all lift-off forces for each dome for the last three dome surveillances (i.e., 25th, 30th, and 40th for Unit 3, and 25th, 35th, and 45th for Unit 4) remained above the MRV, and trend lines of SLRA Figures 4.5-1 through 4.5-6 show that sampled and historical tendon prestress force data will continue to remain above the MRV.

(3) The applicant's proposed program, which it stated is consistent with the GALL-SLR Report AMP X.S1, is committed to systematically retensioning tendons or performing re-analyses of the concrete containment when warranted, consistent with the "corrective actions" program element of GALL-SLR Report AMP X.S1. Therefore, the design adequacy and CLB intended function of the containment and its prestressing tendon system will be maintained during the subsequent period of extended operation.

(4) If multiple sequential tendon breakage were to occur, the structural integrity of the shell would still be maintained as noted in Chapter 5 of the Turkey Point UFSAR, which states that, "[a]ny three adjacent tendons in any of these groups [horizontal, vertical, dome] can be lost without significantly affecting the strength of the structure due to the load redistribution capabilities of the shell."

Exception 3. SLRA Section B.2.3.3, as revised by letter dated May 6, 2019, includes an exception to the "monitoring and trending" program element related to an identified 10 CFR Part 50 non-compliance described in the applicant's response to RAI B.2.2.3-1a. This non-compliance rendered the applicant's AMP inconsistent with the GALL-SLR Report AMP X.S1. To provide justification for this inconsistency, the applicant revised the SLRA to include this exception and an enhancement (Enhancement 2 evaluated below) to the "monitoring and trending" program element. The staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP X.S1 and finds it acceptable because the applicant re-evaluated the contribution of tendon 3D08 to the regression analysis by omitting its lift-off force data as shown in Figure 4.5-3a for all applicable physical inspections past the 20th year surveillance and found there to be little variance in the slope of the trend line as compared to that of Figure 4.5-3, which included the 3D08 lift-off force data.

Enhancement 1. SLRA Section B.2.2.3 includes an enhancement to the "scope of program" program element, which verifies implementation of RG 1.35.1 guidance and states that, for each 10-year interval within the subsequent period of extended operation, the applicant will update trend lines and implementing documents consistent with RG 1.35.1. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.S1 and finds it acceptable because the implementation of RG 1.35.1 with 10-year updates to trend lines and other implementing documents will render the applicant's Concrete Containment Unbonded Tendon Prestress program consistent with GALL-SLR Report AMP X.S1 during the subsequent period of extended operation.

Enhancement 2. SLRA Section B.2.2.3, as revised by letter dated May 6, 2019, includes an enhancement to the "monitoring and trending" program element which relates to the selection of an alternate historical common dome tendon to 3D08 for the Unit 3 dome. In its response to RAI B.2.2.3-1a (follow-up) dated May 6, 2019, the applicant proposed for trending purposes to continue monitoring the loss of prestress force experienced by tendon 3D08 and designated one of the undetensioned lift-off tested tendons of the 20th year surveillance, 1D50 or 2D09, as a new common dome tendon for the 50th and subsequent year surveillances to the end of the subsequent period of extended operation. The staff reviewed the enhancement against the corresponding program element in GALL-SLR Report AMP X.S1 and finds it acceptable because:

(1) Even though the 3D08 tendon has been detensioned and retensioned, its continued monitoring would yield, in association with the 20th, 50th, and subsequent years of surveillance of 1D50 or 2D09, sufficient prestress tendon lift-off force data to adequately establish, for trending purposes, the historical performance of the Unit 3 dome structural integrity.

(2) The proposed common dome tendons 1D50 or 2D09 have been qualified to be used as dome tendons despite experiencing some damage during concrete dome reconstruction as noted in the audited 20th year surveillance and the applicant's "Containment Dome Concrete Replacement Report," dated January 26, 1972 (ADAMS Legacy Accession No. 3000004630).

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, amendments, and responses to RAIs B.2.2.3-1, B.2.2.3-1a (follow-up), 4.5-3, and 4.5-4, the staff finds that the "scope of program," "preventive actions," "detection of aging effects," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP X.S1, with the exception of staff-identified differences between the applicant's program and GALL-SLR Report AMP X.S1. The staff also reviewed the exceptions and staff-identified differences between the applicant's program and GALL-SLR Report AMP X.S1 associated with the "parameters monitored or inspected" and "monitoring and trending" 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" 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 B.2.2.3, as revised by letter dated May 6, 2019, summarizes operating experience related to the Concrete Containment Unbonded Tendon Prestress program. The applicant stated that site-specific operating experience during the initial period of extended operation, including past corrective actions, provides reasonable assurance that activities affecting the Concrete Containment Unbonded Tendon Prestress program are timely addressed, and that immediate actions are taken for their resolution to help effectively manage loss of tendon prestress forces. Site-specific operating experience shows that conditions are identified and evaluated in a timely manner through the ASME Section XI, Subsection IWL program, which is reviewed and evaluated in SER Section 3.0.3.2.27.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 Concrete Containment Unbonded Tendon Prestress program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.1.3, as amended by letter dated May 6, 2019, provides the UFSAR supplement for the Concrete Containment Unbonded Tendon Prestress 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 the applicant committed (SLRA revised Commitment No. 3) to implement the existing Concrete Containment Unbonded Tendon Prestress program with enhancements no later than the 50th year surveillance for Unit 3 and the 55th year surveillance for Unit 4. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's Concrete Containment Unbonded Tendon Prestress program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report AMP X.S1 are consistent, with the exception of applicant and staff-identified differences between the applicant's program and GALL-SLR Report AMP X.S1. In addition, the staff reviewed the exceptions and justifications, and the staff-identified difference between the applicant's program and GALL-SLR Report AMP X.S1 and determined that the AMP, with the exceptions, is adequate to manage the applicable aging effects. The staff also reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Environmental Qualification of Electric Equipment

SLRA Section B.2.2.4 describes the existing Environmental Qualification of Electric Equipment program as consistent, with enhancement, with GALL-SLR Report AMP X.E1, "Environmental Qualification of Electric Equipment." The applicant amended this SLRA section by letter dated October 16, 2018.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP X.E1.

For the "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "corrective actions" program elements, the staff determined that it needed additional information, which resulted in the issuance of an RAI. During the in-office audit of the applicant's Basis Document FLCORP 020-REPT-109, "Aging Management Program Basis Document – Environmental Qualification of Electric Equipment," the staff noted that adverse localized environments (ALE) were not considered in the above program elements as described in GALL-SLR Report AMP X.E1. As a result, the staff issued RAI B.2.2.4-1. The applicant's response to RAI B.2.2.4-1 is documented in ADAMS Accession No. ML18296A024.

During its evaluation of the applicant's response to RAI B.2.2.4-1, the staff noted that the applicant revised the basis document as well as SLRA Section B.2.2.4 to include consideration and discussions of ALE consistent with GALL-SLR Report AMP X.E1. The staff finds the applicant's response and changes to the basis document as well as the amended SLRA Section B.2.2.4 acceptable, because adding the revised ALE discussions to these documents is appropriate and consistent with GALL-SLR Report AMP X.E1.

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

Enhancement. SLRA Section B.2.2.4 includes an enhancement to the "detection of aging effects" program element. The enhancement of the existing environmental qualification (EQ) program adds visual inspection of the accessible, passive EQ equipment at least once every 10 years with the first inspection to be performed prior to the subsequent period of extended operation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP X.E1 and finds it acceptable because when implemented, the AMP will be consistent with GALL-SLR Report AMP X.E1.

Based on its audit and its review of the applicant's response to RAI B.2.2.4-1, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP X.E1. In addition, the staff reviewed the enhancement associated with the "detection of aging effects" program element and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.2.4 summarizes operating experience related to the Environmental Qualification of Electric Equipment program. The applicant stated that the initiation of corrective action, along with identification of program deficiencies and subsequent corrective actions prior to loss of intended function, demonstrate that the Turkey Point Environmental Qualification of Electric Equipment AMP, with the correction of the identified deficiencies, will continue to be effective. The continued application of these proven methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the CLB through the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 A.17.2.1.4 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 noted that the applicant committed to ongoing implementation of the existing Environmental Qualification of Electric Equipment program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implement the enhancement to the program no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's Environmental Qualification of Electric Equipment program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancement and confirmed that its implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended 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).

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

SLRA Section B.2.3.1 describes the existing ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program as consistent, with enhancements, with GALL-SLR Report AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD."

Staff Evaluation. During its audit, the staff reviewed the applicant's AMP for consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M1.

For program elements 1 through 7, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.1-2 and the applicant's response are documented in ADAMS Accession No. ML18311A299. During its evaluation of the applicant's response to RAI B.2.3.1-2, the staff noted that the applicant revised the SLRA to include the CRDM thermal sleeves in the scope of SLRA Section B.2.3.1, in accordance with 10 CFR 54.4(a)(2), and to manage the aging effect of loss of material of the CRDM thermal sleeves due to wear by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program as discussed in this section. Based on this, the staff confirmed that program elements 1 through 6 were appropriately determined.

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

Enhancement 1. SLRA Section B.2.3.1 includes an enhancement to the "detection of aging effects" program element to develop a wear-depth measurement process to detect the aging effect of wear in control rod drive mechanism (CRDM) housing penetration wall. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M1 and finds it acceptable because when it is implemented the program will include procedures to detect the aging effect of wear in CRDM housing penetration wall.

Enhancement 2. SLRA Section B.2.3.1 includes an enhancement to the "operating experience" program element to evaluate industry operating experience related to wear in CRDM housing penetration wall, and industry initiatives to manage this new aging effect. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M1 and finds it acceptable because when it is implemented the program will include processes to incorporate industry operating experience and initiatives in managing the effect of wear in CRDM housing penetration wall.

Based on its audit, the staff finds that program elements 1 through 7 are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M1. The staff also reviewed the enhancements associated with the "detection of aging effects" and "operating experience" program elements and finds that, when implemented, the AMP will be adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.1 summarizes operating experience related to the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program. The applicant stated that the program will be effective in ensuring that component intended functions are maintained consistent with the CLB during the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 A.17.2.2.1 provides the UFSAR supplement for the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff noted that the applicant 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 further noted that the applicant committed to implementing the enhancements to the program no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff reviewed the enhancements and confirmed that the implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Reactor Head Closure Stud Bolting

SLRA Section B.2.3.3 describes the existing Reactor Head Closure Stud Bolting program as consistent, with enhancements, with GALL-SLR Report AMP XI.M3, "Reactor Head Closure Stud Bolting," with one exception.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M3.

The staff also reviewed portions of the "preventive actions" and "corrective actions" program elements associated with the exception and 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 exception and enhancements is as follows.

Enhancement 1. SLRA Section B.2.3.3 includes an enhancement to the "preventive actions" program element. The applicant has implemented procurement requirements in its program to ensure replacement studs are fabricated from bolting materials with actual measured yield strength less than 150 ksi, as well as requirements to preclude the use of sulfide-containing lubricant, as consistent with the GALL-SLR Report program guidance. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M3 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report AMP XI.M3 guidance.

Enhancement 2. SLRA Section B.2.3.3 includes an enhancement to the "corrective actions" program element. The applicant stated that if any examination results do not meet acceptance standards, they will be subject to acceptance by evaluation, repair, or replacement in accordance with the ASME Section XI, Inservice Inspection, Subsections IWB, IWC, and IWD program. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M3 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report AMP XI.M3 guidance.

Exception. SLRA Section B.2.3.3 includes an exception to the "preventive actions" program element. The GALL-SLR program recommends that stud materials have a yield strength less than 150 ksi because these materials are known to be resistant to SCC. The applicant's program states that its stud bolting is considered high strength steel that may exceed 150 ksi in yield strength. Therefore, the applicant's program takes exception to this program element. The applicant's program also indicates that it performs volumetric examinations of stud bolting for cracking in accordance with the ASME Section XI, Subsections IWB, IWC, and IWD program.

The staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP XI.M3. The staff noted that based on industry operating experience and research, bolting materials with yield strength higher than the 150 ksi criterion may be susceptible to SCC degradation. The staff also noted that the applicant completed a review of site operating experience, including site condition reports, and did not find degradation that has impacted the intended functions of the studs. In addition, the applicant provided enhancements to the program that will: (1) ensure in its procurement of new bolting materials that the yield strength will meet the 150 ksi criterion, and (2) exclude the use of molybdenum disulfate thread lubricants to inhibit SCC. Additionally, the volumetric examinations performed are capable of detecting degradation due to SCC. Therefore, the staff finds this exception acceptable because there will be reasonable assurance that the intended functions of the stud bolting will be maintained.

Based on its audit, the staff finds that program elements 1 through 7 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M3. The staff also reviewed the exception associated with the “preventive actions” program element and its justification and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the “preventive actions” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.3 summarizes operating experience related to the Reactor Head Closure Stud Bolting program. The applicant stated that the Reactor Head Closure Stud Bolting program will be effective in ensuring that intended functions will be maintained consistent with the CLB through the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant’s corrective action program database; and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 A.17.2.2.3 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 noted that the applicant 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 further noted that the applicant committed to implement the enhancements to the program no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant’s Reactor Head Closure Stud Bolting program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. In addition, the staff reviewed the exception and enhancements and determined that the AMP, with the exception and the enhancements, is adequate to manage the applicable aging effects. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP consistent with the GALL-SLR Report AMP. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.7 Boric Acid Corrosion

SLRA Section B.2.3.4 describes the existing Boric Acid Corrosion program as consistent, with an enhancement, with GALL-SLR Report AMP XI.M10, “Boric Acid Corrosion.”

Staff Evaluation. During its audit, the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant’s program to the corresponding program elements of GALL-SLR Report AMP XI.M10. For the “scope of program” program element, the staff determined that it needed additional information, which resulted in the issuance of RAI B.2.3.4-1. The staff’s request and the applicant’s response are documented in ADAMS Accession Nos. ML18260A243 and ML18292A642.

In its response, the applicant clarified that the Boric Acid Corrosion program does manage components exposed to air with borated water leakage that are made from copper alloy with greater than 15 percent zinc. Consequently, the applicant modified SLRA Table 3.2-1 (item 3.2-1-008), Table 3.3-1 (item 3.3-1-009), Section A.17.2.2.4, and Section B.2.3.4 to reflect the inclusion of components made from copper alloy with greater than 15 percent zinc. In addition, the applicant modified SLRA Tables 3.2.2-1, 3.3.2-2, 3.3.2-4, and 3.3.2-15 by adding AMR items associated with heat exchanger tubes, heat exchanger shells, nozzles, tubing, and valve bodies made from copper alloy with greater than 15 percent zinc.

The staff finds the applicant’s response acceptable, because the clarification made to the program and the addition of AMR items for managing loss of material in the cited copper alloy components can reasonably ensure that intended functions are maintained through the inspection activities of the Boric Acid Corrosion program during the subsequent period of extended operation.

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

Enhancement. SLRA Section B.2.3.4 includes an enhancement to the “parameters monitored or inspected” program element to include other potential means for identifying borated water leakage. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M10 and finds it acceptable because when it is implemented the program will include additional activities to identify indications of borated water leakage inside containment that may not have been detected during walkdowns.

Based on its audit and its review of the applicant’s response to RAI B.2.3.4-1, the staff finds that program elements 1 through 6, for which the SLRA claims consistency with the GALL-SLR Report, are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M10. The staff also reviewed the enhancement associated with the “parameters monitored or inspected” program element and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.4 summarizes operating experience related to the Boric Acid Corrosion program. The applicant stated that the site-specific operating experience during the first period of extended operation provides objective evidence that the program is effective at identifying, remediating, and managing the associated aging effects. FPL also stated that site-specific operating experience provides objective evidence that activities other than those established specifically to detect borated water leakage through the Boric Acid Corrosion program are also effective at identifying, evaluating, and correcting borated water leaks prior to loss of component intended function.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 A.17.2.2.4, as modified by the RAI response dated October 17, 2018, 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 the applicant committed to continue the existing Boric Acid Corrosion program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff further noted that the applicant committed to implement the enhancement to the program no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's Boric Acid Corrosion program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with AMP XI.M10. The staff reviewed the enhancement and confirmed that its implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components

SLRA Section B.2.3.5 describes the existing Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components program as consistent, with an enhancement, 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, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M11B.

During the audit, and as confirmed by the applicant in ADAMS Accession No. ML18284A335, the staff noted that there are no Class 1 or 2 Inconel piping welds in Turkey Point Units 3 and 4. Based on this, the staff confirmed that the "scope of program" element was appropriately determined.

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

Enhancement 1. SLRA Section B.2.3.5 includes an enhancement to the "detection of aging effects" program element related to a baseline inspection of all susceptible nickel-alloy components and welds in accordance with the guidelines of EPRI MRP-126, "Generic Guidance for Alloy 600 Management." The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M11B and finds it acceptable because when it is implemented it will be consistent with AMP XI.M11B recommendations associated with conducting a baseline inspection of all susceptible nickel-alloy branch line connections and associated welds as identified in Table 4-1 of EPRI MRP-126.

Based on its audit, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M11B. In addition, the staff reviewed the enhancement associated with the "detection of aging effects" program element and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.5 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 program. The applicant stated that it is actively implementing and managing its AMP and keeping up with industry operating events, initiatives, and guidance to improve the effectiveness of aging management. The applicant also stated that the absence of adverse site-specific operating experience is an indication that its AMP has been effective.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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.17.2.2.5 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 program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01.

The staff also noted that the applicant committed to ongoing implementation of the existing Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components program, including implementing the enhancement to the program for managing the effects of aging for applicable components 6 months prior to the subsequent period of extended operation.

Conclusion. On the basis of its audit and its review of the applicant's Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancement and confirmed that its implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Reactor Vessel Internals

SLRA Section B.2.3.7 describes the existing Reactor Vessel Internals (RVI) AMP as consistent, with enhancements, with GALL-SLR Report AMP XI.M16A, "PWR Vessel Internals." SLRA Section B.2.3.7 identifies that the existing RVI AMP implements generic industry guidelines in EPRI MRP Technical Report No. 1022863, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)," dated December 2011 (ADAMS Package Accession No. ML120170453; hereafter referred to in this section as the MRP-227-A report or MRP-227-A).

The SLRA states that the existing RVI AMP is implemented in accordance with industry guidance provided in NEI 03-08, Revision 2, "Guideline for the Management of Materials Issues," dated January 2010 (ADAMS Accession No. ML101050337). SLRA Section B.2.3.7 also states that because the guidelines of MRP-227-A are based on an analysis of the RVI that considers the operating conditions up to a 60-year operating period, these guidelines are supplemented through a gap analysis to identify enhancements to the program that are needed to address an 80-year operating period. This gap analysis is provided in SLRA Appendix C, "MRP-227-A Gap Analysis" (also referred to in this section as the "SLRA gap analysis"). SLRA Section B.2.3.7 further states that this AMP applies the guidance in MRP-227-A, as supplemented by the SLRA gap analysis, for inspecting and evaluating RVI components at Turkey Point. The SLRA states that these inspections provide reasonable assurance that the effects of age-related degradation mechanisms (DMs) will be managed during the subsequent period of extended operation.

The applicant amended SLRA Section B.2.3.7 and SLRA Appendix C by letter dated November 2, 2018 (ADAMS Accession No. ML18311A299).

Summary of the SLRA Appendix C MRP-227-A Gap Analysis

The SLRA gap analysis identifies that it follows the same analytical process that was used to develop the MRP-227-A guidelines for the RVI components, but with changes to time-dependent input parameters to address the 60-to-80 year subsequent period of extended operation. The gap analysis incorporates an analytical process, summarized below, to determine the need for changes to the MRP-227-A guidelines to address the 60-to-80 year subsequent period of extended operation:

- The SLRA gap analysis identifies the Turkey Point-specific RVI components, materials, and environments that are being managed by the RVI AMP. The RVI components list is identified as being consistent with the component listing for Westinghouse-designed plants in MRP-191 and in the FPL response to plant-specific Action Item No. 2 of the NRC safety evaluation (SE) for MRP-227-A. The gap analysis identifies that there have been no modifications to the Turkey Point RVI components or component materials since FPL submitted its existing (40-to-60 year) RVI AMP for the NRC's review and approval in 2012.
- The SLRA gap analysis identifies the screening criteria for the eight material aging DMs. For each DM, screening criteria include screening input parameters for the RVI components, which are compared to the applicable screening thresholds.
- The gap analysis determined that the primary potential for changes to the DM screening compared to that used for developing MRP-227-A are the screening input parameters that change over time, specifically fatigue cumulative usage factor (CUF) and neutron fluence. The gap analysis identifies that the DMs affected by changes to neutron fluence are IASCC, IE, VS, and ISR. The DM affected by changes to CUF is fatigue.
- 80-year neutron fluence inputs used for the DM screening are provided in SLRA Enclosure 5, Attachment 11, MRP 2017-038, "Transmittal of Preliminary Results from MRP-191 Expert Panel Review in Support of Subsequent License Renewal at U.S. PWR Plants," December 15, 2017 (EPRI Proprietary Information). The gap analysis incorporates specific CUF values for Class 1 RVI core support structure components for the subsequent period of extended operation based on the CUF evaluation that was performed for the 2012 EPU.
- The 80-year neutron fluence inputs for all RVI components and the specific EPU CUFs for the Class 1 RVI CSS components are used to determine the need to screen in additional DMs affected by these inputs for the subsequent period of extended operation. The gap analysis lists five components newly screened in for fatigue, five components newly screened in for IASCC, and three components newly screened in for IE.
- The gap analysis performs a reevaluation of MRP's "Failure Modes, Effects, and Criticality Analysis" (FMECA) by considering the potential for an increase in the failure likelihood of the RVI components. The gap analysis states that this FMECA reevaluation used the same FMECA logic as that used to develop MRP-227-A, which is based on a consideration of RVI component failure likelihood and failure consequence. The 60-to-80-year FMECA reevaluation considers the potential for an increase in failure likelihood of the RVI components based on the newly screened in DMs for the subsequent period of extended operation and the increase in the severity of existing 60-year DMs.
- Based on a review of emergent industry operating experience for RVI component degradation, the gap analysis determines which RVI components have an increase in the severity of an existing (60-year) DM sufficient to warrant an increase in failure likelihood.

The gap analysis identifies that the failure consequence rankings for RVI components remain consistent with those used for the 40-to-60-year operating period.

- The 60-to-80-year FMECA reevaluation elevated the FMECA grouping for two RVI components:

  (1) Fuel Alignment Pins - Based on the consideration of emergent industry operating experience with fuel alignment pin surface degradation, the failure likelihood for the Turkey Point Units 3 and 4 fuel alignment pins was elevated from low to high failure likelihood. The FMECA group for these items changed from Group 1, based on low failure likelihood and low safety consequence for 60 years, to Group 2, based on high failure likelihood and low safety consequence for 80 years.

  (2) Upper Support Plate - The 80-year DM screening resulted in this component being newly screened in for fatigue based on the EPU CUF evaluation for this CSS component; this elevates the FMECA group from Group 0 (originally there were no DMs screened in for 60 years) to Group 1 based on low failure likelihood and medium safety consequence for 80 years.

  The 60-to-80-year FMECA group remains unchanged for all other RVI components, considering the emergent industry operating experience for component degradation and the additional DMs that screened in for the subsequent period of extended operation. The gap analysis provides an explanation of the basis for the change or lack of change in the FMECA group for the RVI components with additional DMs that screened in for the subsequent period of extended operation and for RVI components that showed an increase in the severity of an existing DM based on the emergent RVI component degradation operating experience.

- The gap analysis considers the impact of the 60-to-80 FMECA grouping on the severity categorization, engineering evaluation, and the final assignment of the Turkey Point RVI components to one of the four MRP-227-A inspection categories for the subsequent period of extended operation. The four RVI component inspection categories in MRP-227-A are Primary Components, Expansion Components, Existing Programs Components, and No Additional Measures Components. For the components with no change in FMECA group, including the five components newly screened in for fatigue and the five components newly screened in for fluence-related DMs, the severity categorization results for the 60-year period of operation remain unchanged for the 80-year period. Of the two RVI components listed above with elevated FMECA scores for 80 years, only the fuel alignment pins were determined to require a change in the severity categorization from Category A to Category B based on the increase in failure likelihood.

- The gap analysis determined that the industry operating experience with observed surface wear of the fuel alignment pins and the resulting increase in FMECA group and severity rankings is significant enough to elevate the fuel alignment pins from No Additional Measures to Existing Programs Components. Accordingly, the gap analysis identified that visual (VT-3) inspections will be conducted on the fuel alignment pins using the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP as part the Existing Programs Components during the subsequent period of extended operation. The elevation in the inspection category for the fuel alignment pins is included as a specific "enhancement" to the existing RVI AMP.

- Attachment 1 of the gap analysis is a summary table showing the results of the DM screening, FMECA evaluation, severity ranking, and inspection categorization for all RVI components for the 60-to-80-year subsequent period of extended operation. Attachment 2 of the gap analysis provides the inspection categorization for all RVI components for the subsequent period of extended operation. Attachments 3, 4, and 5 of the gap analysis provide updated inspection tables showing new inspection criteria for Existing Programs Components, Primary Components, and Expansion Components, respectively, for the subsequent period of extended operation. Attachment 6 of the gap analysis provides the examination acceptance and expansion criteria for the subsequent period of extended operation.

Based on the above evaluation, the gap analysis identifies that the results of MRP-227-A will be modified by categorizing the fuel alignment pins as Existing Programs Components for the subsequent period of extended operation. The gap analysis concludes that the RVI component categories and inspection criteria provided in the attachments show how MRP-227-A guidelines, as modified by these analysis, are to be applied for the subsequent period of extended operation.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The program description for GALL-SLR Report AMP XI.M16A states that the RVI AMP may be based, in part, on an existing plant program that is consistent with the generic industry guidelines of MRP-227-A, which is implemented in accordance with the staff-endorsed industry guidance provided in NEI 03-08. The staff approved the MRP-227-A inspection and evaluation (I&E) guidelines as the generic basis for aging management of PWR RVI components for initial periods of extended operation associated with the initial license renewal; this corresponds to an operating term of no longer than 60 years. The basis for the staff's approval of the generic MRP-227-A guidelines is documented in its December 16, 2011, SE, which is included with MRP-227-A. The staff approved the existing Turkey Point Units 3 and 4 RVI AMP based on its December 18, 2015, "Staff Assessment" (ADAMS Accession No. ML15336A046), of the RVI AMP submittal to credit implementation of MRP-227-A guidelines for the initial period of extended operation. This AMP submittal included, among other things, plant-specific responses to the eight MRP-227-A action items, which are set forth in the staff's SE for MRP-227-A.

The program description for GALL-SLR Report AMP XI.M16A also states that because the MRP-227-A guidelines are based on an analysis of the RVI components that considers operating conditions up to a 60-year operating period, existing AMP guidelines based on MRP-227-A are supplemented through a "gap analysis" that identifies enhancements to the RVI AMP that are needed to address an 80-year operating period. The GALL-SLR Report AMP uses the term "MRP-227-A (as supplemented)" to describe either MRP-227-A guidelines as supplemented by this SLRA gap analysis, or an acceptable generic methodology such as an approved revision of MRP-227 that considers an operating period of 80 years. Since there is currently no approved version of MRP-227 that considers an 80-year operating period, the staff noted that the applicant's SLRA AMP for the RVI is based on the existing program guidelines in MRP-227-A, as supplemented by the gap analysis provided in SLRA Appendix C.

The staff compared program elements 1 through 6 of the applicant's RVI AMP for implementing MRP-227-A guidelines, as supplemented by the SLRA gap analysis, to the corresponding program elements of GALL-SLR Report AMP XI.M16A. The staff's review of the RVI AMP and gap analysis to verify consistency with elements 1 through 6 of GALL-SLR Report AMP XI.M16A is documented below.

Consistency of the RVI AMP and Gap Analysis with GALL-SLR Report AMP XI.M16A, Elements 1 through 6

The staff verified that the analytical process used in the gap analysis for the 60-to-80 year evaluation of the RVI components is generally consistent with that used to develop the MRP-227-A guidelines for 60-year applications, as documented in EPRI Technical Report No. 1013234, "Materials Reliability Program: Screening, Categorization, and Ranking of Reactor Internals Components for Westinghouse and Combustion Engineering PWR Design (MRP-191)," dated November 2006 (ADAMS Accession No. ML091910130) (the MRP-191 report). The SLRA gap analysis cites an updated version, Revision 1, of the MRP-191 report, dated October 2016 (EPRI Proprietary), as the 60-year basis for the 60-to-80 year analysis of the RVI components. The staff confirmed that the updates in Revision 1 of the MRP-191 report do not affect any of the 60-year generic RVI component analysis for determining the MRP-227-A inspection criteria, as applied to the existing RVI AMP, and they are acceptable as a 60-year basis for performing the 60-to-80 year evaluation of the RVI components.

Compared to the existing RVI AMP for 60 years, the staff identified that there are no changes to the plant-specific RVI component, material, and environment listings for the 60-to-80 year evaluation. The staff noted that the RVI component material and environment listings in the gap analysis are consistent with those listed in SLRA Table 3.1.2-4, "Reactor Vessel Internals – Summary of Aging Management Evaluation" (SLRA AMR items for RVI components).

The staff identified that the RVI component evaluations in the gap analysis are essential for determining the consistency of the SLRA RVI AMP with element 1, "scope of program," of GALL-SLR Report AMP XI.M16A. This program element recommends that the scope of the RVI AMP based on MRP-227-A, as supplemented by the SLRA gap analysis, focuses on identification and justification of the following three items:

(1) RVI components that screen in for additional aging DMs when assessed for the 60-to-80 subsequent period of extended operation

(2) RVI components that previously screened in for certain DMs, and the severity of these 60-year DMs could significantly increase for the 60-to-80 year subsequent period of extended operation

(3) changes to the existing MRP-227-A program characteristics, including but not limited to changes in inspection categories, inspection criteria, or primary-to-expansion component criteria and relationships

Other aspects of GALL-SLR Report AMP XI.M16A elements 1 through 6 that are relevant to RVI component evaluations in the gap analysis, and the resulting changes to MRP-227-A criteria as implemented by the RVI AMP, are summarized below:

- Element 3, "parameters monitored or inspected": The RVI AMP monitors (i.e., inspects) for specific evidence of the aging effects caused by the applicable DMs and implements the parameters monitored or inspected criteria consistent with the applicable inspection tables in Section 4, "Aging Management Requirements," in MRP-227-A, as supplemented by the gap analysis.
- Element 4, "detection of aging effects": The RVI AMP based on MRP-227-A, as supplemented by the gap analysis, provides adequate justification for the inspection criteria (e.g., inspection methods, sample size criteria, and inspection frequency criteria,

etc.) for managing the effects of aging degradation during the subsequent period of extended operation, including any changes to these criteria from their prior assessment in MRP-227-A.

- Element 5, "monitoring and trending": The RVI component re-inspection frequencies are defined in specific tables in Section 4 of MRP-227-A, as supplemented by the gap analysis. Examination and re-examinations that are implemented in accordance with MRP-227-A, as supplemented by the gap analysis, provide for timely detection, reporting, and implementation of corrective actions for the aging effects and DMs managed by the AMP.
- Element 6, "acceptance criteria": AMP examination acceptance and expansion criteria based on the applicable tables in Section 5 of MRP-227-A, as supplemented by the SLRA gap analysis, provide appropriate examination and flaw evaluation acceptance criteria for Primary and Expansion components. For RVI components covered by other existing programs, the acceptance criteria are described within the applicable reference document for the program. As applicable, the RVI AMP establishes acceptance criteria for any physical measurement monitoring methods that are credited for aging management of particular RVI components. The RVI AMP should justify the appropriateness of the acceptance criteria for managing the effects of degradation during the subsequent period of extended operation, including any changes to the acceptance criteria based on the gap analysis.

For Element 2, "preventive actions," the staff's audit confirmed that the applicant's existing RVI AMP is consistent with this program element, but the consistency of the RVI AMP with this program element is not affected by the RVI component evaluations performed in the SLRA gap analysis.

With respect to item (a) of Element 1 of GALL-SLR Report AMP XI.M16A, the staff verified that the gap analysis evaluation of the eight DMs and their screening thresholds for the 60-to-80 year subsequent period of extended operation is consistent with the DM screening methodology in MRP-191. The staff noted that the gap analysis appropriately evaluated the potential for a change to the original MRP-191 screening thresholds for wear and fatigue for bolting and other preloaded items, and thermal embrittlement (TE) for certain CASS materials, by considering the impact of any 60-to-80 change in screening results for ISR and IE on these thresholds.[1] The staff confirmed that the MRP-191 screening thresholds for wear, fatigue, and TE, as applied to the RVI components, are not impacted by the new 80-year screening results because there are no RVI components that become newly screened in for ISR for 80 years, and the three components that newly screen in for IE for 80 years are not CASS materials. The staff verified that the primary potential for a change in DM screening is based upon the two time-dependent screening input parameters for the 60-to-80 year subsequent period of extended operation, specifically neutron fluence and fatigue CUF. The staff's evaluation of these inputs and associated responses to RAIs are discussed below.

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[1] The evaluation of the potential for changes to screening thresholds for wear, fatigue, and IE based on screening results for ISR and IE is discussed in detail in Section C.2.2 of the SLRA gap analysis; however, this issue was determined to have no impact on the screening results for Turkey Point Units 3 and 4 RVI components.

Staff Evaluation of 80-Year RVI Neutron Fluence Inputs into Gap Analysis Degradation Mechanism Screening

To address item (a) of the "scope of program" program element in GALL-SLR Report AMP XI.M16A, the SLRA gap analysis performs the DM screening for IASCC, IE, VS, and ISR using generic 80-year fluence ranges (referred to in the gap analysis as neutron fluence regions) for Westinghouse RVI components provided in EPRI MRP Document MRP 2017-038 (EPRI Proprietary), which was included in the proprietary enclosure to the SLRA. The staff noted that the NRC has not reviewed 80-year neutron fluence ranges for generic use in SLR applications. To support its review of the applicant's use of this fluence data for screening the Turkey Point RVI components, the staff audited Westinghouse Document LTR-REA-17-168, Revision 0, "Comparison of Turkey Point Units 3 and 4 Subsequent License Renewal Reactor Internals Fluence to Representative EPRI MRP-191 3-Loop Plant," dated February 2, 2018 (EPRI Proprietary), including the attachment to this document. LTR-REA-17-168, Revision 0 describes EPRI MRP as "representative reactor internals fluence projections for Westinghouse 3-loop plants."

Based on its review of the 80-year neutron inputs in MRP 2017-038 and its audit of Westinghouse document LTR-REA-17-168, Revision 0, the staff determined that it needed additional information regarding the 80-year neutron fluence methodology, as applied to Turkey Point. Therefore, to determine AMP consistency with item (a) of Element 1 of GALL-SLR Report AMP XI.M16A, the staff requested in RAI B.2.3.7-F that the applicant provide a detailed discussion of the representative reactor internals neutron fluence model used to generate the projections cited in LTR-REA-17-168, Revision 0, and a detailed description of the methods used to obtain the projections. As part of this discussion, the staff requested that the applicant include the following information:

- Confirmation that the fluence analysis methodologies used are consistent with what has been previously reviewed and approved by the NRC.
- A description of how the nodal fluxes in the core are modeled in the representative model.
- A discussion regarding differences between the fluence models used as a basis for the 60- and 80-year fluence projections and the assessments performed to establish fluence region classifications for each RVI component. As part of this discussion, the applicant should address the apparent discrepancies in region classifications as shown in Attachment 1 to SLRA Appendix C (i.e., some components appear to have a lower fluence region classification for the 80-year projection than for the 60-year projection). The applicant should give sufficient information for the staff to understand why the differences would be expected to cause the observed changes in region classifications.

The staff's RAI and the applicant's RAI response regarding the 80-year neutron fluence methodology are documented in ADAMS Accession No. ML19070A113, dated March 6, 2019. The staff's evaluation of the applicant's response to RAI B.2.3.7-F is addressed below.

Two separate fluence evaluations were used to support the discussion in the SLRA and the subsequent RAI response. The first evaluation was performed as part of ongoing EPRI work (i.e., MRP 2017-038) and was performed based on a fluence model for a representative Westinghouse 3-loop plant. This evaluation produced the fluence values used to generate the data used in the 60-to-80 year screening of neutron fluence-dependent DMs in the SLRA gap analysis. The second evaluation was performed based on a Turkey Point specific fluence model. The intent of this evaluation was to provide additional validation of the applicability of the EPRI work to Turkey Point. In the following discussion, for simplicity, the fluence models used to support the two evaluations will be referred to as the “representative model” and the “Turkey Point model,” respectively.

The applicant’s response to RAI B.2.3.7-F established several important facts to support the adequacy of the fluence evaluations.

First, both evaluations were performed using the methodology described in WCAP-14040-A, which has previously been reviewed and approved by the NRC and is consistent with RG 1.190. The prior NRC review and approval, as well as RG 1.190, was concerned mainly with accurately capturing fluence for the RPV. As a result, some of the specific modeling approaches may not be appropriate for accurately capturing fluence for the RVIs. However, the underlying fluence rate synthesis methodology is based on neutron transport theory that would remain valid for the RVIs, as long as the appropriate characteristics important to RVI fluence are captured in the model.

Second, the fluence for RVIs above and below the core is much more sensitive to the neutron flux near the top and bottom of the core than the limiting RPV fluence at the beltline. Consequently, typical RPV fluence models may not be adequate to obtain accurate predictions for RVIs. The applicant stated that the representative model utilized one of two different axial power distributions. One distribution was intended to conservatively maximize the overall fluence, especially near the beltline region or in areas sufficiently distant from the core that the core behaves more like a point source. The second distribution was intended to conservatively maximize the fluence for the areas near the top or bottom of the core, which are much more sensitive to the flux in these regions of the core. The staff reviewed the axial flux modeling approach and determined that the latter distribution can be expected to yield comparable or more conservative results relative to the former distribution. This is partly due to the fact that a flat flux distribution implies a significant increase in power for the lower and top few nodes of the core compared to normal core operations.

Thirdly, the representative model mainly utilized the same modeling approaches as the 60-year RVI fluence projections previously reviewed and approved as part of MRP-227-A, with some differences. The staff requested additional information to better understand how the representative model was updated for the 80-year fluence projections relative to the 60-year fluence projections. The applicant stated that there were three primary changes:

(1) A higher degree of fidelity was incorporated into the model as a result of ongoing industry-wide changes to respond to NRC RIS 2014-11 and to accurately capture fluence for regions that are becoming more important (e.g., RPV nozzles).

(2) The moderator density treatment within the core was updated to utilize different temperatures in the upper and lower halves of the core. That more closely approaches the actual temperature distribution in the core and has the effect of changing the energy spectrum for the flux.

(3) The data visualization tools used to map fluence results to the fluence model regions have improved since the 60-year projections were performed. As a result, the peak fluence values associated with the components on each side of a boundary can be better resolved. This can have a substantial impact for areas where the fluence gradient is extremely high.

The applicant provided some discussion of selected RVI components for which there was a change in classification between the 60- and 80-year fluence projections. The explanations were consistent with the above discussion, especially for the components in which the change in classification was not consistent with the staff's expectations.

Finally, the applicant provided a copy of LTR-REA-17-168, which is a summary report generated by Westinghouse for the applicant, demonstrating applicability of the results from the representative model to Turkey Point. This was done by comparing the representative model to the Turkey Point model, which was used to develop the 80-year projections for the RPV discussed in SLRA Section 4.2.1 and evaluated by the staff in SER Section 4.2.1. In particular, two key areas were compared:

(1) The model geometry was compared for the representative and Turkey Point models. There were multiple differences, but they were all minor and would not be expected to have a significant impact on the fluence predictions calculated for the specific regions discussed in LTR-REA-17-168 (as discussed in the next bullet point).

(2) The fluence predictions from both models were compared for selected locations representative of several RVI components. This comparison covered a sufficient number of data points in different regions of the RPV to provide reasonable assurance that similar results would be observed for all other RVI components. The staff also recognized that the Turkey Point model was not developed specifically for the purpose of predicting fluence for RVIs, so it may lack sufficient resolution to predict fluence for specific components. However, the data points selected were such that a high level of detail would not be expected to affect the results significantly. The results from the comparison show that the representative model would be expected to yield substantially more conservative fluence projections than the Turkey Point model, and that the relative conservatism is generally consistent with the staff's expectations based on the information provided for the representative model (in particular, the modeling of the axial flux).

The staff did not perform a full review of MRP 2017-038 or the representative model; therefore, no findings are being made regarding the adequacy of this model or the applicability of the RVI fluence projections supporting the Turkey Point SLRA to any other plants. However, the information that the applicant provided is sufficient to provide reasonable assurance that the general approach utilized in the representative model is appropriate for generating data relevant to Turkey Point. In addition, the information presented in LTR-REA-17-168 demonstrates that the representative model can be reasonably expected to produce fluence predictions with conservatism (relative to the Turkey Point model) that adequately bounds the uncertainties that the staff considers necessary for fluence evaluations.

As a result of the above discussion, the staff finds that the docketed 80-Year Neutron Fluence Input Table for Westinghouse RVI components, as provided in SLRA Enclosure 5, Attachment 11 (*Westinghouse Proprietary*), is acceptable for use in the gap analysis for 60-to-80 year screening of fluence-dependent aging DMs for the Turkey Point RVI components. As such, the staff further finds that the neutron fluence inputs are adequate to demonstrate that the SLRA AMP based on MRP-227-A guidelines, as supplemented by the SLRA gap analysis, are consistent with item (a) of the "scope of program" program element of GALL-SLR Report AMP XI.M16A—specifically, the scope of the AMP adequately addresses RVI components that screen in for additional fluence-dependent aging DMs when assessed for the subsequent period of extended operation.

Staff Evaluation of RVI CUF Inputs into Gap Analysis Screening for Fatigue

To address item (a) of the "scope of program" program element in GALL-SLR Report AMP XI.M16A, the SLRA gap analysis updates the fatigue screening for the RVI CSS components by incorporating specific CUF values for CSS components that were determined for the 2012 EPU. The staff noted that the applicability of EPU CUFs for the subsequent period of extended operation is determined based on the TLAA evaluation for metal fatigue of Class 1 CSS components in SLRA Section 4.3.1. Two of the Class 1 RVI CSS components, deep beam and lower support plate, which received TLAA evaluation for metal fatigue based on EPU CUF values provided in SLRA Table 4.3-1, are not specifically listed in the gap analysis summary table (Attachment 1 of the gap analysis), or in the SLRA Table 3.1.2-4 AMR results for RVI components. The staff therefore requested in RAI B.2.3.7-1 that the applicant address the apparent inconsistencies and reconcile reported CUF data for these CSS components.

The staff's RAIs and the applicant's RAI responses regarding the CUF inputs to fatigue screening of RVI components for the subsequent period of extended operation are documented in ADAMS Accession No. ML18311A299, dated November 2, 2018. In its response to RAI B.2.3.7-1, the applicant clarified that the deep beam item listed in SLRA Table 4.3-1 is a welded attachment to the upper support plate, which is treated as a single component in the SLRA Table 3.1.2-4 AMR results and in the gap analysis. This is consistent with the component listing that the staff approved based on its 2015 assessment for the existing RVI AMP (ADAMS Accession No. ML15336A046). The applicant clarified that the identifier, "lower support plate," is a generic term for multiple Westinghouse RVI designs of this single component, whereas Turkey Point uses the specific term "lower support forging" to refer to the lower support plate in the SLRA gap analysis and in the Table 3.1.2-4 AMR results. The applicant revised SLRA Table 4.3-1 and the gap analysis summary table to ensure that these CSS component names and their CUF values are consistent throughout the SLRA. The staff found the applicant's RAI response acceptable because the SLRA revisions show that the RVI CSS components and their EPU CUF values, as evaluated in the SLRA Section 4.3.1 TLAA, are consistent with those listed in the gap analysis summary table; and the identification of these components is consistent with RVI AMR results in SLRA Table 3.1.2-4.

The staff noted that most of the RVI components evaluated in the gap analysis did not receive TLAA evaluation for metal fatigue as part of the Class 1 CSS components evaluated in SLRA Section 4.3.1. These components do not show a specific EPU CUF value in the gap analysis summary table. Instead, they are generically screened for fatigue based on a generic determination of whether their CUF meets the established threshold, which is a CUF greater than or equal to 0.1, as per MRP-191. Many of these components were generically screened as not susceptible to fatigue for the 60-year AMP based on MRP-191 because their CUF was generically determined to be less than the CUF threshold of 0.1. The staff noted that these components remain screened out for fatigue for 80-years. Because the gap analysis does not provide updates to the EPU CUF screening results for these non-Class 1 RVI components for the subsequent period of extended operation, the staff requested in RAI B.2.3.7-2 that the applicant address how the MRP-191 generic fatigue screening results for the 60-year AMP were determined to remain valid for 80 years.

In its RAI response, the applicant indicated that based on its TLAA evaluation in SLRA Section 4.3.1, the 80-year fatigue cycles for the RVI components will not exceed the number of design cycles that are assumed for 60 years. The applicant stated that the Turkey Point Fatigue Monitoring AMP is credited with managing fatigue of the Class 1 components to ensure that the number of occurrences and the severity of each design transient remains within the design cycle limits. The applicant noted that the Turkey Point Fatigue Monitoring AMP provides for corrective actions when any applicable transient cycle count comes within 80 percent of the design cycle limits. Based on a comparison of the number of RCS transient cycles that were specified for the original plant design and the projected number of RCS transient cycles for 80-years, the applicant determined that the specific EPU CUF values for the Turkey Point Class 1 RVI components and the MRP-191 generic fatigue screening results for all other RVI components would remain valid for 80 years.

SLRA Tables 4.3-2 and 4.3-3 compare the number of RCS transient cycles for the design, as reported in the UFSAR, with the actual number of cycles accumulated as of 2016 and the projected cycles for 80 years. The staff verified that the projected 80-year transient cycles are less than the original design cycles. SLRA Section 4.3.1 states that the EPU CUF calculations incorporate the plant design cycles, as reported in the UFSAR. On this basis, the staff determined that the 60-year EPU CUF values for the Class 1 RVI components reported in SLRA Table 4.3-1 and in the gap analysis would remain bounding for the subsequent period of extended operation, subject to cycle count management by the Turkey Point Fatigue Monitoring AMP.

The staff also compared the CUF information for the Class 1 RVI components from the SLRA with the information that was reviewed for the EPU amendment that was issued in 2012. As documented in Turkey Point EPU Application Licensing Report No. L-2010-113, dated December 14, 2010 (ADAMS Accession No. ML103560177), fatigue CUF values were calculated for the critical RVI CSS components most affected by the EPU to demonstrate that their structural integrity would not be adversely affected by EPU conditions. As indicated in the SLRA gap analysis, the CUF calculations used bounding transient characteristics for a similar 3-loop plant to demonstrate that ASME Code, Section III, Subsection NG acceptance criteria would be satisfied for EPU conditions. The staff verified that the EPU CUF values listed in this report are consistent with those provided in SLRA Section 4.3.1 for Class 1 RVI components. All RVI CSS component CUF analyses were reviewed and found acceptable by the staff for EPU conditions, as documented in Section 2.2.3 of the staff's SE for EPU Amendments that were issued by letter dated June 15, 2012 (ADAMS Accession No. ML11293A365).

The staff noted that the CLB for Turkey Point does not require specific EPU CUF analyses for the other RVI components that are not evaluated as part of the Class 1 RVI components in SLRA Section 4.3.1. The staff therefore determined that the generic CUF screening of these RVI components for the existing RVI AMP, as per the original design cycle assumptions of MRP-191, remains valid for determining their susceptibility to fatigue for the subsequent period of extended operation because the Fatigue Monitoring AMP is used to ensure that RCS transient cycles during the subsequent period of extended operation are bounded by the original design cycles, or corrective action is taken as needed to update the analysis inputs. The staff found the applicant's response to RAI B.2.3.7-2 acceptable because it provided the basis for determining that the CLB inputs and assumptions for all CUF determinations in the gap analysis, in particular the number of RCS design transient cycles, would remain valid for the subsequent period of extended operation, subject to transient cycle management by the Fatigue Monitoring AMP. With respect to the plant-specific EPU CUF inputs for CSS components, as well as the generic CUF screening for the other RVI components, the staff determined that the AMP is consistent with item (a) of the "scope of program" program element because these CUF inputs provide reasonable assurance that RVI components are adequately screened for fatigue when assessed for the 60-to-80 year operating period.

Evaluation of 60-to-80 Year RVI FMECA Evaluation, Severity Categorization, and MRP-227-A Inspection Categorization

The staff noted that the underlying FMECA methodology, as described in MRP-191, is not affected by the 60-to-80-year subsequent period of extended operation, nor is the evaluation of the safety consequence (conditional damage likelihood, as defined per MRP-191) if the component were to fail. The staff verified that there are no time-dependent assumptions or inputs associated with the FMECA methodology and safety consequence determinations. Therefore, the continued use of existing MRP-191 FMECA logic and safety consequence determinations for the FMECA reevaluation for the Turkey Point RVI components is appropriate for the subsequent period of extended operation. The staff verified that the gap analysis considers the potential need to elevate the FMECA score based on the potential for an increase in the failure likelihood considering the newly screened in DMs for the 60-to-80 year term and the increase in the severity of previously screened-in DMs, as determined based on the evaluation of emergent industry operating experience for RVI component degradation. The staff confirmed that the reevaluation of the MRP-191 severity categorization and the determination of the final MRP-227-A inspection categorization (Primary Components, Expansion Components, Existing Programs Components, or No Additional Measures Components) for the subsequent period of extended operation are based on the changes to the FMECA score.

The staff determined that for the fuel alignment pins, the change from FMECA Group 1 to Group 2 is acceptable, considering the increase in failure likelihood associated with the emergent surface wear operating experience for these pins. For the upper support plate, the staff determined the change from FMECA Group 0 to Group 1 is acceptable based on the fact that just one DM, fatigue, screened in for the subsequent period of extended operation, whereas no DMs were screened in for the upper support plate for 60 years in MRP-191. For the severity and inspection categorizations associated with the FMECA score changes, the staff noted that only the fuel alignment pins are elevated from Severity Category A to Severity Category B, and from the No Additional Measures inspection category to the Existing Programs inspection category, wherein they receive VT-3 examinations using the ASME Section XI ISI AMP, as provided in Attachment 3, “Existing Program Components,” of the SLRA gap analysis. The staff noted that this is a new inspection because fuel alignment pins were not previously identified in the GALL-SLR Report AMR results as receiving aging management using the ASME Section XI ISI AMP. The staff found that these fuel alignment pin inspections would provide adequate aging management for wear based on the reported industry operating experience. An enhancement is implemented in the AMP to incorporate this change. The staff found that the continued assignment of the upper support plate to Severity Category A and the No Additional Measures Category is reasonable given that only one DM (fatigue) screens in for the subsequent period of extended operation, and there is no aging degradation operating experience for this component; however, the general issue of the continued use of the No Additional Measures category for these types of CSS components with newly screened in DMs is explored further in RAI B.2.3.7-6 below.

The staff identified a total of 10 RVI components with newly screened in DMs, plus four RVI components (baffle-former bolting, clevis insert bolting, control rod guide tube (CRGT) guide cards, and fuel alignment pins) that do not have new DMs screen in but have shown significant aging degradation operating experience for existing DMs. Of these 14 components, the staff identified that with the exception of fuel alignment pins and upper support plate, none of them were determined to require an elevated FMECA score, and only fuel alignment pins were determined to require a change to severity and inspection categories.

The staff also noted that the inspection criteria for Existing Programs, Primary, and Expansion Components, provided in inspection tables in Attachments 3, 4, and 5 (respectively) of the gap analysis, incorporate several additional changes (augmentations) to the generic MRP-227-A inspection criteria for components that were not elevated to a higher inspection category. These augmentations include provisions such as more detailed guidance for conducting inspection of certain existing programs components, and for other components, incorporation of new DMs into the aging effects for which the examination is conducted. Although the new subsequent period of extended operation inspection criteria for these several components (other than fuel alignment pins) are not specifically designated as “enhancements” relative to the existing AMP, the staff noted that the gap analysis inspection table for Primary Components includes the provision that implementation of the new 10-year interval inspection criteria are specified to begin with the second 10-year interval from the start of the initial license renewal period (initial period of extended operation); and the new inspection criteria for Existing Programs components are to be implemented on an interval that is in accordance with the referenced existing program document, which includes every 10-year ISI interval for components inspected using the ASME Section XI ISI AMP. The staff’s audit confirmed the SLRA statements regarding the completion of the initial MRP-227-A Primary Component inspections for Turkey Point Units 3 and 4. For re-inspections, the staff found that the gap analysis adequately identifies that the changes to inspection criteria for Primary, Expansion, and Existing Programs Components will be implemented for the remaining term of the initial period of extended operation and the 60-to-80 year subsequent period of extended operation.

The staff reviewed the gap analysis explanation regarding the basis for determination of the same FMECA score, severity category, and inspection category for the applicable RVI components, as well as the changes to inspection criteria implemented in gap analysis Attachments 3, 4, and 5. The staff’s review of these results determined the following:

- For CRGT guide cards, baffle-former bolting, and clevis insert bolting, which have shown active degradation based on industry operating experience, the staff found that continuation of the same FMECA score, severity category, and inspection category for the subsequent period of extended operation is reasonable given that the components already reflect the maximum failure likelihood (i.e., “high”) input into the FMECA logic. However, for these components, the potential need to incorporate a change to gap analysis inspection criteria (e.g., re-inspection frequency, inspection sample size) within that same inspection category (Primary, Expansion, or Existing Programs) to address new NEI 03-08 interim inspection guidance (or other changes based on the degradation operating experience) required additional information, which is addressed in RAIs discussed below.
- For components with newly screened in DMs, the staff determined that if the items show adequate inspection criteria for detection of aging effects associated with newly screened in DMs[2] under the current inspection categories (Primary, Expansion, or Existing Programs), then there is reasonable assurance that the effects of aging on the components’ functionality will be adequately managed for the subsequent period of extended operation. For Expansion components with new DMs, such as the CASS lower support column (LSC) bodies, the staff reviewed the linked Primary components[3] and

[2] For example, if a component is already inspected for cracking due to SCC based on the 60-year analysis, and it newly screens in for fatigue for the subsequent period of extended operation, it will still be inspected for cracking during the subsequent period of extended operation, and the gap analysis inspection table reflects inspection for cracking due to SCC and fatigue

[3] Linked Primary components are those items identified in the existing AMP to be leading indicators of aging affects and DMs for the linked Expansion components, as per MRP-227-A.

Expansion criteria to verify the existing Primary-to-Expansion components relationships would remain acceptable for the subsequent period of extended operation. However, the staff needed additional information to evaluate the lack of a change to any SLRA gap analysis results for No Additional Measures components with newly screened-in DMs, as addressed in RAI B.2.3.7-6 below.

A summary of the staff's findings regarding the 60-to-80 year changes (or lack of change) to the FMECA score, severity categorization, and MRP-227-A inspection categorization for the 10 components with newly screened in DMs and the 4 components with aging degradation operating experience is summarized in the table provided below. This table identifies gap analysis results that prompted RAIs for components with degradation operating experience and the No Additional Measures Components with new DMs. If the gap analysis result did not prompt an RAI, then the staff found the gap analysis result and inspection criteria to be acceptable for the subsequent period of extended operation.

MRP-227-A Gap Analysis Results, Staff Evaluation Table – 60-to-80 Year Changes in **BOLD**

Item	60-Year DMs	60-Year FMECA and Severity Cat.[1]	60-Year Insp. Category[2]	New 80-Year DMs[3]	80-Year FMECA and Sever. Cat.	80-Year Insp. Category	OpE Status[4]	Staff Eval.[5]
Fuel Alignment Pins	IASCC Wear IE VS	**L,L,1-A**	**NAM**	No New DMs	**H,L,2-B**	**Existing Programs**	Yes – Industry OpE	Accept
Baffle-Former Bolting	IASCC Wear Fatigue IE VS ISR	H,M,3-C	Primary	No New DMs	H,M,3-C	Primary	Yes – Industry and Plant OpE	RAI B.2.3.7-4
Clevis Insert Bolting	SCC Wear	H,L,2-B	Existing Programs	No New DMs	H,L,2-B	Existing Programs	Yes – Industry OpE	RAI B.2.3.7-5
CRGT Guide Cards	SCC Wear Fatigue	H,M,3-C	Primary	No New DMs	H,M,3-C	Primary	Yes – Industry and Plant OpE	RAI B.2.3.7-3
CASS Lower Support Columns	**IASCC** **TE** **IE** **VS**	M,L,1-B	Expansion	**IASCC** **TE** **IE** **VS** **Fatigue**	M,L,1-B	Expansion	No	Accept
Radial Keys	**SCC** **Wear**	L,L,1-A	NAM	**SCC** **Wear** **Fatigue**	L,L,1-A	NAM	No	RAI B.2.3.7-6

1 – Consistent with MRP-191 methods, gap analysis FMECA results are shown as Failure Likelihood (Low (L), Medium (M), or High (H)), Failure Consequence (Low (L), Medium (M), or High (H)), FMECA Group (1, 2, or 3); and Severity Category A, B, or C.
2 – MRP-227-A Inspection Categories: Primary, Expansion, Existing Programs, and No Additional Measures (NAM).
3 – New 80-Year DMs are shown along with the existing 60-Year DMs. In all cases, existing 60-Year DMs remain applicable for 80-years.
4 – “OpE Status” refers to the staff’s independent evaluation of reported plant and emergent industry operating experience (OpE) showing active and/or more severe RVI component degradation since the publication of MRP-227-A in December 2011.
5 – “Accept” indicates that the staff accepted the result without the need for an RAI. RAI discussion below includes the SLRA section number with the RAI number. All “NAM” items for RAI B.2.3.7-6 are addressed based on the staff’s bounding evaluation of the response for upper support column bolting, as discussed below.

MRP-227-A Gap Analysis Results, Staff Evaluation Table (Cont.) – 60-to-80 Year Changes in **BOLD**

Item	60-Year DMs	60-Year FMECA And Sever. Cat.[1]	60-Year Insp. Category[2]	New 80-Year DMs[3]	80-Year FMECA and Sever. Cat.	80-Year Insp. Category	OpE Status[4]	Staff Eval.[5]
Clevis Inserts	**Wear**	L,L,1-A	NAM	**Wear Fatigue**	L,L,1-A	NAM	No	RAI B.2.3.7-6
Upper Core Plate Alignment Pins	**SCC Wear**	M,L,1-B	Existing Programs	**SCC Wear Fatigue**	M,L,1-B	Existing Programs	No	Accept
Upper Support Plate	**None**	0-A	NAM	**Fatigue**	L,M,1-A	NAM	No	RAI B.2.3.7-6
Upper Core Plate	**Wear Fatigue IE**	M,M,2-B	Expansion	**Wear Fatigue IE IASCC**	M,M,2-B	Expansion	No	Accept
CASS Upper Support Column Bases	**SCC TE IE**	L,M,1-A	NAM	**SCC TE IE IASCC**	L,M,1-A	NAM	No	RAI B.2.3.7-6
Upper Support Column Bolting	**Wear Fatigue ISR**	L,M,1-A	NAM	**Wear Fatigue ISR IASCC IE**	L,M,1-A	NAM	No	RAI B.2.3.7-6
CRGT Lower Flanges	**SCC Fatigue**	L,M,1-A	Primary	**SCC Fatigue IASCC IE**	L,M,1-A	Primary	No	Accept
CRGT Support Pins	**Wear Fatigue ISR**	L,M,1-A	Existing Programs	**Wear Fatigue ISR IASCC IE**	L,M,1-A	Existing Programs	No, for 316 SS Support Pins[6]	Accept

1 – Consistent with MRP-191 methods, gap analysis FMECA results are shown as Failure Likelihood (Low (L), Medium (M), or High (H)), Failure Consequence (Low (L), Medium (M), or High (H)), FMECA Group (1, 2, or 3); and Severity Category A, B, or C.
2 – MRP-227-A Inspection Categories: Primary, Expansion, Existing Programs, and No Additional Measures (NAM).
3 – New 80-Year DMs are shown along with the existing 60-Year DMs. In all cases, existing 60-Year DMs remain applicable for 80-years.
4 – "OpE Status" refers to the staff's independent evaluation of reported plant and emergent industry operating experience (OpE) showing active and/or more severe RVI component degradation since the publication of MRP-227-A in December 2011.
5 – "Accept" indicates that the staff accepted the result without the need for an RAI. RAI discussion below includes the SLRA section number with the RAI number. All "NAM" items for RAI B.2.3.7-6 are addressed based on the staff's bounding evaluation of the response for upper support column bolting, as discussed below.
6 – As documented in the gap analysis, Section C.2.1, the original nickel alloy Type X-750 CRGT support pins at Turkey Point were replaced with 316 stainless steel support pins, which are more resistant to IASCC. As documented in the 2015 NRC Staff Assessment (ADAMS Accession No. ML15336A046) for the existing 60-year AMP, these pins were replaced in 2007 and 2008.

The staff's review of the gap analysis inspection criteria for RVI components with active degradation issues considering implementation of applicable NEI 03-08 interim inspection guidance determined that the staff needed additional information; these issues are addressed in RAIs B.2.3.7-3, B.2.3.7-4, and B.2.3.7-5. The staff's review of gap analysis results for neutron-absorbing material components with new DMs, and the need for additional information regarding the lack of change to the FMECA and categorization results for these components, is addressed in RAI B.2.3.7-6. The staff's RAIs and the applicant's RAI responses are documented in ADAMS Accession No. ML18311A299, dated November 2, 2018. The staff's evaluation of the RAI responses is provided below.

<u>SLRA Gap Analysis Primary Components Inspection Criteria for CRGT Guide Cards</u>

The Primary Components inspection table in Attachment 4 of the SLRA gap analysis, including note 7, shows that the long-term inspection criteria for CRGT assembly guide cards are the same as the original inspection criteria for guide cards in MRP-227-A. For Unit 4, note 7 of Attachment 4 in the SLRA gap analysis specifies a reduced interval of 8.8 EFPY to the next guide card inspection and an increase in examination coverage to 100 percent of the CRGT assemblies (relative to the 20 percent CRGT sample defined in MRP-227-A). Note 7 and the operating experience discussion in SLRA Section B.2.7 indicate that these changes are based on the 2016 measurements of excessive ligament wear for one of the Unit 4 guide cards and are determined in accordance with WCAP-17451-P, Revision 1, "Reactor Internals Guide Tube Wear – Westinghouse Domestic Fleet Operational Projections," dated October 2013 (Westinghouse Proprietary).

Note 7 of this gap analysis inspection table also states that after the aforementioned accelerated and expanded inspection coverage is complete, the Unit 4 guide card inspection frequency and examination coverage will revert to the original 10-year inspection interval and 20 percent CRGT inspection coverage, consistent with the original MRP-227-A inspection guidelines, barring further corrective actions; and it states that the aforementioned enhanced inspection criteria do not apply to Unit 3. SLRA Section B.2.3.7 documents that the Unit 3 guide card baseline inspections completed in 2015 showed satisfactory results, and the Unit 3 guide cards will continue to be inspected consistent with MRP-227-A.

The staff noted that the original MRP-227-A CRGT guide card inspection criteria have been superseded by interim inspection guidance for guide cards provided under MRP Letter 2014-006 (ADAMS Accession No. ML14274A372) and PWROG submittal letter for WCAP-17451-P, Revision 1 (ADAMS Accession No. ML15041A106), which specify implementation of WCAP-17451-P, Revision 1, in lieu of the inspection criteria for the guide cards in MRP-227-A. These interim inspection guidelines were specified for implementation as "needed" elements under NEI 03-08 in lieu of the original MRP-227-A inspection criteria for guide cards. The staff therefore requested in RAI B.2.3.7-3 that the applicant address how long-term CRGT guide card inspection criteria listed in Attachment 4 of the gap analysis, including note 7, are consistent with the interim inspection guidance for implementation of WCAP-17451-P, Revision 1.

In its RAI response, the applicant stated that the above cited interim inspection guidance for the CRGT guide cards, issued per NEI 03-08, is currently being managed under the existing RVI AMP. The applicant indicated that MRP-227-A represents the 60-year baseline for the existing Turkey Point RVI AMP and the SLRA gap analysis. The applicant emphasized that since the initial guide card inspections for Unit 3 showed satisfactory results, the inspection frequency based on MRP-227-A would remain unchanged. For the Unit 4 guide cards, the applicant indicated that there is not sufficient examination data at this time to define a long-term inspection plan beyond what is already documented in SLRA Section B.2.3.7 (operating experience discussion) and in note 7 of the gap analysis inspection table; and the augmentation of the next Unit 4 guide card inspections per note 7 is consistent with the guidance of WCAP-17451-P, Revision 1. However, the applicant revised note 7 of the primary components inspection table in the SLRA gap analysis to clarify that WCAP-17451-P is applicable to both Units 3 and 4. The applicant indicated that Turkey Point will implement inspection intervals for the CRGT guide cards that are informed by inspection results following completion of the next inspections. The applicant also revised Section C.2.7 (discussion of 80-year inspection categorization) of the SLRA gap analysis to reflect augmentation of the next guide card and baffle-former bolt inspections, consistent with the operating experience discussion in SLRA Section B.2.3.7, and to clarify the long-term inspection plan for the CRGT guide cards and baffle-former bolts. The revisions to Section C.2.7 specifically identify that guide card and baffle-former bolt inspection frequencies are subject to change pending the results of the corrective action program to create future inspection intervals that are informed by plant-specific evaluations.

The staff reviewed the applicant's RAI response and associated SLRA revisions and determined that its ongoing activities for management of CRGT guide card wear, as discussed in the RAI response and SLRA revisions are sufficient for addressing implementation of WCAP-17451-P, Revision 1 guidelines as "needed" elements under NEI 03-08, as set forth in the enclosures to MRP Letter 2014-006. With respect to future guide card inspections, the staff verified that WCAP-17451-P, Revision 1 generally provides that subsequent inspection criteria (or other corrective actions like component replacement) are determined based on the evaluation of inspection results. Although there is no provision in this guidance that specifies future implementation of the original MRP-227-A inspection criteria by default, the staff identified that the "needed" elements of these guidelines do not address long-term inspection criteria beyond the next re-inspection because re-inspection criteria (or other corrective actions) must be established based on evaluation of the inspection results. The staff noted that the evaluation of RVI component inspection results that do not meet applicable acceptance criteria is most appropriately addressed in the site corrective action program, to determine the need for accelerated inspection schedules and/or expanded inspection scope beyond the re-inspection criteria defined in MRP-227-A, or to establish the need for component replacements, as appropriate. Based on these considerations, the staff found the applicant's response to RAI B.2.3.7-3 acceptable because the RAI response and associated SLRA revisions provided the appropriate clarification regarding the implementation of WCAP-17451-P, Revision 1 for the management of CRGT guide card wear in accordance with NEI 03-08.

The staff's RVI AMP audit addressed the Turkey Point corrective action program's implementation of applicable industry guidance documents (in particular, the NEI 03-08 "needed" interim guidance) covering augmented inspections for RVI components, as determined by emergent industry operating experience for RVI component degradation. For the CRGT guide cards, the staff's audit of the site Condition Report in AR No. 02124311 confirmed the SLRA statements regarding the changes to the next Unit 4 guide card inspections identified in note 7. The staff's audit also confirmed the SLRA statements regarding measurements of excessive guide card ligament wear at Unit 4, as addressed in AR No. 02124311, and it verified SLRA and RAI response statements regarding implementation of the WCAP-17451-P, Revision 1 methodology. The staff determined that CRGT guide card wear at Turkey Point Units 3 and 4 is adequately managed by the RVI AMP through implementation of WCAP-17451-P, Revision 1, in accordance with NEI 03-08.

SLRA Gap Analysis Primary Components Inspection Criteria for Baffle-Former Bolts

The Primary Components inspection table in Attachment 4 of the SLRA gap analysis shows that inspection criteria for baffle-former bolts are the same as those in the original MRP-227-A guidelines. Based on these gap analysis inspection criteria, it was not apparent to the staff how the SLRA AMP addresses interim inspection guidance for baffle-former bolts contained in MRP Letter 2017-009 and issued for implementation as "needed" elements under NEI 03-08. The staff therefore requested in RAI B.2.3.7-4 that the applicant address how the baffle-former bolt inspection criteria are consistent with the above-cited interim guidance, and/or revise the discussion of these inspection criteria in the gap analysis to be consistent with this guidance.

In its RAI response, the applicant stated that the interim inspection guidance for the baffle-former bolts contained in MRP Letter 2017-009 and issued under NEI 03-08 is currently being managed under the site corrective action program. The applicant indicated that there is not sufficient inspection data at this time to define a long-term inspection plan for baffle-former bolting that deviates from the existing guidance in MRP-227-A; however, the inspection schedule is augmented by the corrective action program consistent with the operating experience discussion in SLRA Section B.2.3.7. The applicant stated that its corrective action program will implement a long-term inspection interval for the baffle-former bolts that is informed by inspection results following completion of the next augmented inspections. The applicant revised Section C.2.7 of the SLRA gap analysis to reflect augmentation of the next CRGT guide card and baffle-former bolt inspections, consistent with the operating experience discussion in SLRA Section B.2.3.7, and to clarify the long-term inspection plan for the guide cards and baffle-former bolts. The revisions to Section C.2.7 specifically identify that guide card and baffle-former bolt inspection frequencies are subject to change pending the results of the corrective action program to create future inspection intervals that are informed by plant-specific evaluations.

The staff reviewed the applicant's RAI response and associated SLRA revisions and determined that its ongoing activities for management of baffle-former bolting degradation, as discussed in the RAI response and SLRA revisions, are sufficient for addressing implementation of interim inspection guidance for baffle-former bolts in MRP Letter 2017-009 and as "needed" elements under NEI 03-08. With respect to future baffle-former bolt inspections, the staff verified that this MRP interim guidance generally provides that subsequent inspection criteria (and/or other corrective actions like bolt replacements) are determined based on the evaluation of inspection results. Although there is no provision in this guidance that specifies future implementation of the original MRP-227-A inspection criteria by default, the staff identified that these guidelines do not specify long-term inspection criteria other than the performance of subsequent inspections (and/or bolt replacements) based on evaluation of the relevant inspection results in the corrective action program. The staff noted that the evaluation of RVI component inspection results that do not meet applicable acceptance criteria is most appropriately addressed in the site corrective action program to determine the need for accelerated inspection schedules and/or expanded inspection scope beyond the re-inspection criteria defined in MRP-227-A, or to establish the need for component replacements, as appropriate. Based on these considerations, the staff found the applicant's response to RAI B.2.3.7-4 acceptable because the RAI response and associated SLRA revisions provided the appropriate clarification regarding implementation of interim guidance in MRP Letter 2017-009 for management of baffle-former bolting degradation in accordance with NEI 03-08.

The staff's RVI AMP audit addressed the Turkey Point corrective action program's implementation of applicable industry guidance documents (in particular NEI 03-08 as "needed" interim guidance) covering augmented inspections for RVI components, as determined by emergent industry operating experience for RVI component degradation. The staff noted that the RAI response statements are consistent with its audit observations, which identified that interim inspection guidance for the baffle-former bolts contained in MRP Letter 2017-009 is being managed under the site corrective action program. The staff's audit of AR No. 02231145 confirmed the SLRA-reported inspection results for Unit 4 baffle-former bolts. Specifically, out of 1,088 baffle-former bolts, 1,052 had satisfactory results, 20 bolts were suspected to potentially have indications based on interpretation of ultrasonic examination results, and 16 bolts were inaccessible for examination. The staff's audit also confirmed SLRA statements indicating that preliminary review of these results determined that the as found conditions were acceptable for at least one operating cycle, and determination of a longer term re-inspection interval was under evaluation in the corrective action program. The staff noted that the SLRA-reported inspection results are bounded by the industry operating experience for baffle-former bolting degradation. Based on its audit observations and its review of the SLRA and RAI response statements regarding baffle-former bolting inspection results and corrective actions, the staff determined that there is reasonable assurance that the applicant's aging management activities for Turkey Point baffle-former bolting are consistent with the latest NEI 03-08 inspection guidance in MRP Letter 2017-009.

SLRA Gap Analysis Existing Programs Components Inspection Criteria for Clevis Insert Bolts

The Existing Programs Components inspection table in Attachment 3 of the SLRA gap analysis includes augmented inspection criteria (relative to the MRP-227-A guidance) in "note 2" for clevis insert bolts. Note 2 specifies more detailed guidance on implementation of subsequent VT-3 visual examinations to look for specific evidence of wear at clevis insert and radial key interfaces, specific evidence of degraded bolting components (worn or dislocated bolt heads and lock bars), broken tack welds, and dislocated dowel pins. However, SLRA Section B.2.3.7 states that the clevis insert bolts are categorized as a "Primary" component. Given the industry operating experience with clevis insert bolt degradation at other Westinghouse plants, as discussed in SLRA Section B.2.3.7, and the statement in this section that they are "Primary" components, the staff requested in RAI B.2.3.7-5 that the applicant address whether EVT-1 or ultrasonic testing (UT) examinations for this bolting should be included with the Primary Components inspections in Attachment 4 of the gap analysis, or address whether the "note 2" guidance in Attachment 3 is adequate for inspection of these items as Existing Programs Components. The staff also requested that the applicant amend the clevis insert bolting discussion in SLRA Section B.2.3.7 and the SLRA gap analysis inspection tables, as needed, to ensure that the inspection criteria are consistent throughout.

In its RAI response, the applicant indicated that the clevis insert bolts are to remain categorized as "Existing Programs" components in Turkey Point, as provided in Section C.2.7 and Attachment 3 of the SLRA gap analysis. The applicant revised SLRA Section B.2.3.7 to be consistent with Section C.2.7 and Attachment 3 of the gap analysis. The applicant also revised Section C.2.7 to identify that clevis insert bolts will continue to be inspected under the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP, consistent with the Existing Programs identification in Attachment 3. The applicant identified that current inspection criteria in Attachment 3 of the gap analysis are adequate for the clevis insert bolts.

The staff reviewed the applicant's RAI response and associated SLRA revisions and determined that inspection criteria for clevis insert bolts under the Existing Programs components per Attachment 3 of the gap analysis is consistent with the discussion of these components in SLRA Section B.2.3.7, as revised per this response. The staff confirmed the SLRA Section B.2.3.7

statements regarding active degradation of clevis insert bolting at other Westinghouse plants. Based on its review of clevis insert bolting degradation for Donald C. Cook Nuclear Plant (D.C. Cook), Unit 1, as documented in the staff's September 8, 2016 assessment (ADAMS Accession No. ML16063A434) of the D.C. Cook, Units 1 and 2, 60-year AMP submittal to implement MRP-227-A for the initial period of extended operation, the staff determined that this bolting is generally considered to be highly prone to active degradation; thus, it has a high likelihood of component failure. The FMECA score and severity categorization already reflect the high failure likelihood for 60 years, as shown in the gap analysis. As documented in the staff's 60-year AMP assessment for D.C. Cook, it was determined that the VT-3 examination of these components as part of the Existing Program Components under the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP is sufficient, as evidenced by the detection of clevis insert bolting degradation at D.C. Cook and Salem Nuclear Generating Station. For Turkey Point, the staff identified that the gap analysis provides additional guidance (relative to MRP-227-A) for conducting VT-3 examinations of these components per note 2 in Attachment 3. Note 2 specifies how integrated VT-3 examinations of the clevis insert bolts, lock bars, tack welds, and dowel pins are to be performed as part of the ASME Section XI ISI examinations of the Class 1 lower radial support structure (LRSS) components, which include the clevis inserts and radial keys. This augmentation provides additional assurance that these VT-3 examinations provide for adequate detection of aging effects for these components.

Further, the staff noted that the 60-year and 80-year FMECA score for clevis insert bolts generically considers these to be "low safety consequence" components. Consistent with the staff's assessment of this same issue for D.C. Cook, the "low safety consequence" input to the FMECA is well justified because this bolting is not relied on for a core support or core alignment function, as the Class 1 LRSS clevis inserts and radial keys are specifically designed to perform the core support and alignment function without any intact bolts. There has been no active aging degradation detected for LRSS clevis inserts and radial keys, which are "No Additional Measures Components" in the gap analyses for 60 and 80 years – however, as Class 1 CSS components, they are required to be inspected under the ASME Section XI ISI AMP per the SLRA Table 3.1.2-4 AMR results. Based on these considerations, the staff determined that the gap analysis inspection criteria will continue to provide reasonable assurance that the essential core support and alignment function of the LRSS components will be maintained for the subsequent period of extended operation.

The staff found the applicant's RAI B.2.3.7-5 response and associated SLRA revision acceptable because the discrepancies in the SLRA regarding the clevis insert bolt inspection categorization are reconciled; and the staff determined that the augmented inspection criteria for VT-3 examinations of these components provide adequate detection of aging effects for clevis insert bolts and the Class 1 LRSS components.

SLRA Gap Analysis Results for No Additional Measures Components with New DMs

Attachment 1 of the gap analysis provides a summary of the 60-to-80 year DM screening, FMECA scoring, and categorization of the Turkey Point RVI components. Several of the components with new DMs that screen in for 80 years are to remain "No Additional Measures" components for the subsequent period of extended operation. In particular, the staff noted that the upper support column bolting shows new 80-year DMs of IASCC and IE, which is in addition to the 60-year DMs of wear, fatigue, and ISR. Considering the new DMs of IASCC and IE that screen in for 80 years, the staff requested in RAI B.2.3.7-6 that the applicant address why the upper support column bolting shows no change in the FMECA score of "L,M,1" ("Low" Failure Likelihood, "Medium" Failure Consequence, and FMECA Group 1, as per MRP-191) and

Severity Category of “A” for the subsequent period of extended operation, and why no additional action (inspections) is required; or revise the analysis to account for the additional potential for degradation.

In its RAI response, the applicant identified that cracking and loss of material for the upper support column bolting are managed by the ASME Section XI ISI AMP (Subsection IWB) and the Water Chemistry AMP in accordance with Turkey Point SLRA Table 3.1.2-4. The applicant determined that the inspection history of this bolting under ASME Section XI, paired with a lack of any observed degradation in domestic Westinghouse PWRs, is sufficient evidence to maintain a low failure likelihood for this bolting. The applicant stated that a low failure likelihood and medium failure consequence places the upper support column bolting in the “No Additional Measures” inspection category, consistent with the categorization and ranking process established in MRP-191. The applicant indicated that this bolting will continue to be inspected every ISI interval as part of the ASME Section XI ISI AMP. The applicant noted that plant-specific and industry operating experience is tracked and addressed through Turkey Point’s corrective action program; if future operating experience does not support the current low failure likelihood for upper support column bolting, the Turkey Point corrective action program will address the emergent operating experience to ensure that aging management of this bolting is adequate.

The staff reviewed the applicant’s RAI response and verified that the aging effects of cracking and loss of material for the upper support column bolting are managed using the ASME Section XI ISI AMP (Subsection IWB) and the Water Chemistry AMP per the AMR results in Turkey Point SLRA Table 3.1.2-4. These AMR results are consistent with GALL-SLR Report Table IV.B2 AMR items IV.B2.RP-382 (ASME Section XI ISI AMP, Exam Category B-N-3 for RVI CSS components) and IV.B2.RP-24 (Water Chemistry AMP for all RVI components). The GALL-SLR Report AMR item IV.B2.RP-382 specifies the ASME Section XI ISI AMP for detection of cracking and loss of material for those RVI CSS components that are not categorized for inspection as Existing Programs Components using ASME Section XI, Exam Category B-N-3, under MRP-227-A.

Because the GALL-SLR Report AMP recommends that the SLRA AMP and gap analysis address the potential need for changes to existing MRP-227-A inspection criteria to incorporate newly screened in DMs for the subsequent period of extended operation, the staff noted that the lack of observed aging degradation based on industry operating experience alone may not constitute a sufficient basis for an assured determination that the item has a low failure likelihood; the MRP-191 FMECA methodology considers operating experience with component aging degradation in addition to the screened in DMs to determine failure likelihood. However, the upper support column bolting will receive an 80-year lower neutron fluence, and thus is less prone to IASCC and IE than either the baffle-former bolts or the related expansion components, the barrel-former bolts and LSC bolts. Therefore, the staff determined that the 60-to-80 year changes to neutron fluence for upper support column bolting that cause the screening in of IASCC and IE for 80 years are not significant enough to warrant augmented examination in addition to that specified by Section XI for the Turkey Point upper support column bolting. Further, the applicant’s affirmative statement of a lack of observed degradation based on ASME Section XI inspection history for this bolting, and the statement that this bolting will continue to be inspected every ISI interval as part of the ASME Section XI ISI AMP, is reasonable for maintaining the No Additional Measures Categorization for the upper support column bolting. Therefore, considering the ASME Section XI inspections performed for these CSS components, the staff found the applicant’s response to RAI B.2.3.7-6 acceptable because the response provided reasonable justification for the continued use of the No Additional Measures category for the upper support column bolting for the subsequent period of extended operation.

The staff's finding regarding the continued use of the No Additional Measures category for upper support column bolting for the subsequent period of extended operation is also applicable to the other RVI CSS components that have one additional DM screen in for 80 years because these components also receive aging management using the ASME Section XI ISI AMP and the Water Chemistry AMP, per GALL-SLR Report AMR items IV.B2.RP-382 and IV.B2.RP-24. These other No Additional Measures CSS components are clevis inserts, radial keys, upper support plate, and upper support column bases. The staff confirmed that the results of the 60-year and 80-year DM screening and FMECA for these other CSS components are bounded by that for the upper support column bolting and that none of these components have exhibited any aging degradation based on the reported industry operating experience. Therefore, the staff finds that the continued use of the No Additional Measures category for these components is acceptable for the subsequent period of extended operation.

Enhancements to the Reactor Vessel Internals Program

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

Enhancement 1. SLRA Section B.2.3.7 includes an enhancement to the "scope of program" program element to revise program procedures to incorporate the change in inspection category for the fuel alignment pins identified by the gap analysis. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M16A and finds it acceptable because when it is implemented 6 months prior to the subsequent period of extended operation, it will ensure that the program continues to inspect the fuel alignment pins under the "Existing Programs Components" inspection category by performing VT-3 visual examinations as part of the ASME Section XI AMP, per Examination Category B-N-3. The staff also noted that based on its audit of the applicant's AMP basis document and corrective action program documents, and its SLRA Section B.2.3.7 review, the SLRA Appendix C gap analysis, and the UFSAR commitments, there is reasonable assurance that the existing program is implementing these inspections.

Enhancement 2. SLRA Section B.2.3.7 includes an enhancement to the "administrative controls" program element to revise program procedures to include the 45-day period to notify the NRC of any deviation from the I&E methodology of the AMP. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M16A and finds it acceptable because when it is implemented 6 months prior to the subsequent period of extended operation, it will ensure that the program continues to implement this NEI 03-08 requirement. Specifically, for current programs based upon implementation of MRP-227-A, NEI 03-08 implementation requirements specify that plants are to formally notify the NRC of any such deviations with justification for the deviation no later than 45 days after approval by the licensee executive.

Summary of Staff Findings Regarding Consistency of the RVI AMP and Gap Analysis with GALL-SLR Report AMP XI.M16A, Elements 1 through 6

Based on its audit and its review of the RVI AMP and gap analysis, and its review and acceptance of the applicant's responses to RAIs documented above, the staff finds that there is reasonable assurance that the AMP adequately addresses RVI components that screen in for additional DMs when assessed for the 60-to-80 year subsequent period of extended operation, consistent with item (a) of element 1, "scope of program," in GALL-SLR Report AMP XI.M16A. The staff also finds that there is reasonable assurance that the AMP adequately considers the greater severity of RVI component aging effects based upon the emergent industry operating experience for RVI component degradation, in particular industry operating experience that has shown a need to change I&E criteria from their prior assessment in MRP-227-A; these findings ensure that the AMP is consistent with items (b) and (c) of the "scope of program" program element. Based on these findings, the staff also determined that the AMP is consistent with the provisions of Elements 2, 3, 4, 5, and 6 in GALL-SLR Report AMP XI.M16A (as cited above) that address AMP implementation of changes to the MRP-227-A guidelines based on the results of the gap analysis. Therefore, the staff finds that elements 1 through 6 of the SLRA AMP are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M16A. In addition, the staff reviewed the enhancements associated with the "scope of program" and "administrative controls" program elements and finds that, when implemented, they will ensure that the AMP will continue to adequately manage the applicable aging effects and address reporting of AMP deviations to the NRC.

MRP-227-A License Renewal Action Items

The staff's December 2011 SE (ADAMS Accession No. ML11308A770) for MRP-227-A includes eight plant-specific action items covering topics related to the implementation of MRP-227-A that could not be addressed on a generic basis. Many renewed license holders for PWR plants credited their implementation of MRP-227-A guidelines by submitting 60-year RVI AMP documents (also referred to as RVI component "inspection plans") for NRC review and approval in accordance with their initial license renewal commitments for RVI aging management, consistent with earlier revisions of the GALL-SLR Report and staff guidance in RIS 2011-07. For renewed license holders, the action item responses were provided as part of the plant-specific applications to credit implementation of RVI AMPs based on MRP-227-A, as per the criteria Applicant/Licensee Action Item No. 8 (AI-8) of MRP-227-A. The staff reviewed and approved the plant-specific responses to the action items as part of the 60-year RVI AMP submittals.

For Turkey Point, the plant-specific application to credit implementation of MRP-227-A for its 60-year RVI AMP was submitted for NRC review and approval by letter dated December 14, 2012 (ADAMS Accession No. ML12363A103). The applicant's responses to the eight plant-specific action items were provided for staff review and approval as part of this AMP submittal. The staff's evaluation of the 60-year RVI AMP submittal and action item responses are documented in the December 18, 2015, "Staff Assessment" (ADAMS Accession No. ML15336A046) for the Turkey Point RVI AMP.

Because GALL-SLR Report AMP XI.M16A recommends that the SLRA gap analysis identify changes to the program that are needed to address an 80-year operating period, and the action item responses are part of the existing AMP to implement MRP-227-A for 60 years, the action responses are evaluated herein to determine whether they would remain valid for 80 years.

AI-1 – Plant-Specific Applicability Verification of MRP-227-A

This action item states that plants shall demonstrate plant-specific applicability of the RVI component design and plant operating conditions used for the generic DM screening and FMECA for determining the MRP-227-A inspection categories for the RVI components. For Westinghouse and Combustion Engineering plants, the staff determined that acceptable responses to AI-1 for the 60-year AMP submittals are provided by addressing the following criteria:

(1) Regarding RVI component susceptibility to SCC, plants were requested to identify whether there are non-weld or bolting austenitic stainless steel RVI components with 20 percent cold work or greater, and subject to operating stresses greater than 30 ksi, not already evaluated as such in the MRP-191 RVI component evaluations supporting MRP-227-A.

(2) Regarding the 60-year generic neutron fluence ranges, Westinghouse-design RVI, which were used to generically screen the RVI components for fluence-dependent aging mechanisms, plants were requested to address whether the plant has atypical core loading, fuel design, or fuel management that could render the assumptions of MRP-227-A non-representative for that plant.

For the SLRA AMP, the staff determined that SCC screening of non-weld or bolting austenitic stainless steel RVI components is not affected by extension of the licensed operating term from 60 to 80 years because the screening input parameters – percentage of cold work and operating stress – are not time-dependent parameters. Therefore, the applicant's 2015 response to the first criterion of AI-1 remains valid for the subsequent period of extended operation.

For the second criterion, Turkey Point performed a plant-specific 60-year neutron fluence evaluation for EPU conditions, which addressed plant-specific applicability of 60-year generic neutron fluence ranges for Westinghouse RVI components in MRP-191. For the SLRA AMP, the applicant's 60-year RVI fluence evaluation is superseded in its entirety by the generic 80-year fluence ranges for RVI components provided in SLRA, Revision 1, Enclosure 5, Attachment 11 (*Westinghouse proprietary*), which are implemented in the SLRA gap analysis through the 60-to-80 year DM screening and FMECA evaluation described above. Because these generic neutron fluence ranges for Westinghouse RVI components provided in Enclosure 5 have not been generically reviewed and approved for SLR applications, the applicant needed to demonstrate that that they are acceptable for implementation as the basis for screening of additional neutron fluence-dependent DMs for the subsequent period of extended operation, as specified in item (a) of the "scope of program" program element in GALL-SLR Report AMP XI.M16A. This aspect of AI-1 is resolved, based on the staff's review of the applicant's response to RAI B.2.3.7-F for this program element, as discussed above.

AI-2 – Identification of RVI Components Within the Scope of License Renewal

This action item states that applicants and licensees for Westinghouse plants shall review the generic list of RVI components in Table 4-4 of MRP-191 and identify whether this table represents all the RVI components that are within the scope of license renewal for their facilities, in accordance with 10 CFR 54.4. If this generic table does not represent all the RVI components and associated material types that are within the scope of license renewal, the applicant or licensee shall identify the missing components and/or different materials and propose any necessary plant-specific modifications to the generic guidelines in MRP-227-A.

The applicant's response to this item was provided for the 60-year AMP submittal and evaluated per the 2015 staff assessment. All Turkey Point RVI components within the scope of license renewal are represented in Table 4-4, and the few differences in plant-specific RVI component material types compared to Table 4-4 generic materials were determined to be inconsequential to the DM screening and FMECA results for 60 years. For the 80-year period, the AMR results for all Turkey Point RVI components and material types within the scope of 10 CFR 54.4 are addressed in SLRA Table 3.1.2-4. The staff confirmed that the few plant-specific differences in RVI component material type relative to those in Table 4-4 of MRP-191 are adequately incorporated into SLRA Table 3.1.2-4 AMR results and the gap analysis; these differences remain inconsequential to the DM screening and FMECA results for 80 years. The staff's review and acceptance of the SLRA Table 3.1.2-4 AMR results and SLRA gap analysis ensures that this item is satisfied for the subsequent period of extended operation.

AI-3 – Evaluation of Existing Programs

This action item states that applicants and licensees shall provide a description of existing programs that are relied upon to manage aging effects for their RVI components. For Westinghouse plants, the action item response shall include a plant-specific evaluation of aging management activities for the CRGT assembly support pins.

The applicant's response to this item was provided for the 60-year AMP submittal and evaluated per the 2015 staff assessment; the staff had determined that the existing programs that are relied upon to manage aging effects for the RVI components, including CRGT support pins, are acceptable for the 60-year period. Based on its review of the gap analysis results for the 80-year period, the staff determined that the existing programs that are relied on for inspection of Existing Programs Components (as provided in Attachment 3 of the gap analysis, including criteria for CRGT support pins) are acceptable for the subsequent period of extended operation. For clevis insert bolting, the staff found that the applicant's existing program inspection criteria are acceptable based on its review of the applicant's response to RAI B.2.3.7-5, considering the several occurrences of this bolting degradation at other Westinghouse plants. Therefore, the staff finds that this item is satisfied for the subsequent period of extended operation because the existing plant programs and criteria described in the SLRA gap analysis that are relied upon for inspection of the Existing Programs Components will remain adequate to manage the effects of aging for the subsequent period of extended operation.

AI-4 – Babcock & Wilcox Core Support Structure Upper Flange Stress Relief

This action item only pertains to Babcock & Wilcox plants and is not applicable to Turkey Point.

AI-5 – Application of Physical Measurements for RVI Components

This action item states that applicants and licensees for Westinghouse plants shall provide plant-specific acceptance criteria for the MRP-227-A physical measurements for loss of compressibility of Westinghouse hold-down springs (HDS), including an explanation of how the acceptance criteria are used to maintain HDS functionality consistent with the plant's CLB.

The applicant's response to this item was provided for the 60-year AMP submittal and evaluated per the 2015 staff assessment. The applicant derived time-dependent acceptance criteria for measurements of HDS height based on the initial HDS height at plant startup and the required HDS height at the end of the licensed period of extended operation (60 years). The applicant stated that if HDS height measurements are found to be less than the acceptance criteria, the licensee will reevaluate with successive measurements or a replacement HDS will be required.

During its audit of the SLRA AMP, the staff reviewed the applicant's implementation of HDS measurements for the current period of extended operation and verified that the AMP is adequately managing HDS functionality. For the 80-year period, the SLRA gap analysis "Primary Components" inspection table includes the MRP-227-A requirement to perform direct measurement of HDS height within three cycles of the beginning of the subsequent period of extended operation to determine HDS functionality. SLRA Section B.2.3.7 identifies that the acceptance criterion for physical measurements of HDS height is a time-dependent parameter. The SLRA also states that HDS height at plant start-up and the required HDS height at the end of the subsequent period of extended operation (80 years) is interpolated linearly to determine the required minimum acceptance threshold for HDS height measurements. The staff reviewed this information and finds that this item is satisfied for the subsequent period of extended operation because the HDS acceptance criteria and performance of HDS measurements will continue to ensure that the effect of aging, specifically the loss of spring hold-down force, is adequately managed for the subsequent period of extended operation.

AI-6 – Evaluation of Inaccessible Babcock & Wilcox RVI Components

This action item only pertains to Babcock & Wilcox plants and is not applicable to Turkey Point.

AI-7 – Evaluation of Cast Austenitic Stainless Steel Components

This action item states that applicants and licensees for Westinghouse plants shall provide plant-specific analyses to demonstrate that CASS LSC bodies and additional RVI components that may be fabricated from CASS, martensitic, or precipitation hardened stainless steel will maintain their functionality during the period of extended operation. These analyses should consider the possible loss of fracture toughness caused by TE and IE. The plant-specific analysis shall be consistent with the plant's licensing basis and the need to maintain component functionality under all licensing basis conditions of operation.

The applicant's response to this item was provided for the 60-year AMP submittal and evaluated per the 2015 staff assessment. There are four RVI components that are fabricated from CASS: LSC bodies, upper support column bases, bottom-mounted instrumentation (BMI) column bases/cruciforms, and Unit 4 upper instrumentation columns and supports. All four components were generically evaluated as CASS for 60-year DM screening and FMECA in MRP-191. Upper support column bases, BMI column bases/cruciforms, and Unit 4 upper instrumentation columns and supports are categorized "No Additional Measures" components for the 60-year AMP per MRP-227-A and required no further evaluation to resolve AI-7. These three CASS components are to remain in the "No Additional Measures" inspection category for the subsequent period of extended operation based on the results of the gap analysis. Based on its review of the DM screening and FMECA results for 80 years, the staff confirmed that the No Additional Measures categorization for upper support column bases, BMI column bases/cruciforms, and Unit 4 upper instrumentation columns and supports remains acceptable for 80-years.

Based on their core support function, the CASS LSC bodies were originally identified as needing a plant-specific structural integrity evaluation to resolve AI-7, considering their projected reduction in fracture toughness due to the combined effects of TE and IE. In order to address this item for the 60-year AMP submittal, the applicant performed a review of the original fabrication records and determined that the ferrite content of the CASS LSC bodies was sufficiently low that they could be screened out for TE on a plant-specific basis. Further, since the CASS LSC bodies are categorized as MRP-227-A "Expansion" components, the staff had determined that a structural integrity evaluation based on the reduction in fracture toughness due to IE alone was not needed if an additional MRP-227-A "Primary" component (i.e., a "linked Primary" component) was added as a leading indicator of IE. For this purpose, the applicant had selected the lower core barrel (LCB) cylinder girth welds as a second "linked Primary" component in addition to the generic linked Primary component per MRP-227-A, the CRGT lower flange welds. The staff had determined that this addition demonstrated that the effects of aging would be adequately managed so that the intended function of the CASS LSC bodies would be maintained for the 60-year licensed operating period.

For the 60-to-80 year subsequent period of extended operation, the staff reviewed the 60-year technical basis for the CASS LSC bodies in concert with the results of the SLRA gap analysis. The staff verified that the neutron fluence-dependent DMs of IASCC and IE will continue to be adequately managed for the subsequent period of extended operation based on the linked Primary components, LCB cylinder girth welds and CRGT lower flange welds, because these components would continue to adequately function as leading indicators of IASCC and IE during the subsequent period of extended operation. The staff noted that the SLRA gap analysis determined that there is one new DM for CASS LSC bodies that screens in for the 60-to-80 year term, which is fatigue. Because CASS LSC bodies would receive enhanced visual (EVT-1) examinations (if expansion is required) to detect cracking due to IASCC and fatigue, and the linked Primary components, LCB cylinder girth welds and CRGT lower flange welds, receive EVT-1 examinations to detect cracking due to SCC, IASCC, and fatigue, the staff identified that the CASS LSC bodies will continue to be adequately managed for cracking as an expansion component, considering their potential susceptibility to IASCC and fatigue for the subsequent period of extended operation. Therefore, the staff determined that this action item is satisfied for the subsequent period of extended operation because the RVI AMP will continue to ensure that the effects of aging on CASS LSC bodies are adequately managed for the subsequent period of extended operation.

AI-8 – Submittal of Plant-Specific Information for NRC Review and Approval

This action item states that applicants and licensees seeking to credit implementation of MRP-227-A for 60-year license terms shall submit for NRC review and approval an RVI AMP that addresses the criteria of Section 3.5.1 of the staff's SE for MRP-227-A. Section 3.5.1 of the SE provides five criteria (also referred to as "information items") for the content of RVI AMP submittals. The first information item addresses submittal of RVI AMP information that addressed consistency with the 10 elements defined in Revision 2 of GALL-SLR Report AMP XI.M16 for initial periods of extended operation, corresponding to 60-year terms. The second item specifies submittal of an inspection plan for implementation of MRP-227-A, which addresses the eight plant-specific action items for staff review and approval, as well as the identification and justification of any deviations from the MRP-227-A guidelines. Per the guidance of Section 3.5.1 of the MRP-227-A SE, the applicant's 60-year RVI AMP submittal only needed to address the first two information items because the initial license renewal for Turkey Point was approved in 2002, about 9 years before the issuance of the staff's SE for MRP-227-A. However, since the Turkey Point SLRA was submitted for NRC review after the issuance of the SE for MRP-227-A, the staff reviewed the SLRA AMP and gap analysis to verify that all five criteria are resolved for the subsequent period of extended operation.

The staff determined that the first two information items addressed in the 60-year AMP submittal are resolved for 80 years because the staff's review of the SLRA AMP and gap analysis, as documented herein, ensures that these items are updated as needed for the subsequent period of extended operation. The staff's review of the SLRA AMP and gap analysis to verify the resolution of the remaining three information items under AI-8 is addressed below.

AI-8, Information Items 3 and 4

Information item 3 states that license renewal applicants shall ensure that the programs and activities for managing the effects of aging on RVI components are summarily described in the UFSAR supplement, as required by 10 CFR 54.21(d). This same requirement applies to both initial and subsequent license renewals. The Turkey Point SLRA includes in its UFSAR supplement a summary description of programs and activities for managing the effects of aging on RVI components for the subsequent period of extended operation. SLRA Section A.17.2.2.7 provides the UFSAR supplement for the RVI AMP. The staff's review of the UFSAR supplement is documented below.

Information item 4 states that if plants have mandated requirements for inspection or analysis of RVI components in the facility operating license or in the Technical Specifications (TS), the applicant shall compare its licensed requirements with the recommendations of MRP-227-A. If the licensed requirements differ from (i.e., are more comprehensive than) the MRP-227-A recommendations, applicants shall ensure that their implementation of MRP-227-A does not affect compliance with mandated licensed requirements for inspection or analysis of RVI components. The staff determined that this item is not applicable to Turkey Point because there are no mandated requirements for inspection or analysis of RVI components in the plant TS or elsewhere in the facility operating license.

AI-8, Information Item 5

This information item specifies that applicants are to identify RVI component analyses in the CLB that conform to the definition of a TLAA in 10 CFR 54.3 and shall evaluate the TLAAs, in accordance with 10 CFR 54.21(c)(1). Since MRP-227-A does not address the resolution of TLAAs for RVI components, this item states that RVI component TLAAs shall be submitted for NRC review and approval in the license renewal application, as per the requirements of 10 CFR 54.21(c)(1). For RVI CUF analyses that are TLAAs, this item states that the applicant may use the RVI AMP as the basis for accepting CUF analyses, in accordance with 10 CFR 54.21(c)(1)(iii), only if the RVI components are periodically inspected for fatigue-induced cracking during the period of extended operation. Otherwise, acceptance of CUF TLAAs shall be in accordance with either 10 CFR 54.21(c)(1)(i) or (ii), or in accordance with 10 CFR 54.21(c)(1)(iii) using the applicant's Fatigue Monitoring AMP. This item also states that to satisfy the evaluation requirements of the ASME Code, Section III, Subsection NG, NG-2160 and NG-3121, the fatigue CUF analyses shall include the effects of the RCS water environment.

For Turkey Point, the CUF analyses for Class 1 RVI components, evaluated in SLRA Section 4.3.1, are the only RVI component analyses in the CLB that conform to the definition of a TLAA. As addressed above for the evaluation of the applicant's responses to RAIs B.2.3.7-1 and B.2.3.7-2, the Turkey Point Fatigue Monitoring AMP is used to manage fatigue of the Class 1 components (including RVI CSS components) to ensure that the number of occurrences and the severity of each design transient remains within the CLB design cycle limits, as provided in the UFSAR. Based on a comparison of the RCS design transient cycles with the projected number of transient cycles for 80 years, the applicant determined that the specific EPU CUF values for the Turkey Point Class 1 RVI components reported in SLRA Section 4.3.1 and in the gap analysis are expected to remain valid for 80 years. The Turkey Point Fatigue Monitoring AMP provides for corrective actions when any applicable transient cycle count comes within 80 percent of the design cycle limits. The RVI AMP is not used as a basis for accepting any CUF analysis documented in SLRA Section 4.3.1, pursuant to 10 CFR 54.21(c)(1)(iii), because not all Class 1 CSS components are to be directly inspected for fatigue cracking based on the FMECA methodology of MRP-191, even if they do screen in for the fatigue DM for the subsequent period of extended operation. The staff's independent review of the applicant's use of the Fatigue Monitoring AMP for managing fatigue of Class 1 components provides reasonable assurance that the EPU CUF analyses for CSS components are acceptable for the subsequent period of extended operation.

With respect to the final provision of information item 5 of AI-8 regarding the consideration of environmental effects of the RCS water environment for CUF analyses, the staff identified that neither the CLB for Turkey Point nor the SRP-SLR Report specify that the effects of the RCS water environment on the EPU CUF analyses for the RVI CSS components need to be considered because RVI components are not reactor coolant pressure boundary components. Nevertheless, the MRP recognized the potential for the effects of the RCS water environment on RVI component fatigue behavior to be an issue and incorporates an environmental fatigue multiplier of 10 into the screening threshold, resulting in the use of a CUF threshold of 0.1 (as opposed to the design CUF threshold of 1.0) to screen all RVI components to determine potential susceptibility to fatigue. While the 0.1 CUF threshold may not completely bound the effects of the environmental fatigue multipliers (F_{en}) that are evaluated in SLRA Section 4.3.3, the staff determined that the effect of the largest of these multipliers shown in SLRA Table 4.3.3-2 is not significant enough to cause any Turkey Point Class 1 CSS component to become screened in for fatigue if the component did not screen in for fatigue based on having an EPU CUF value less than the MRP-191 threshold of 0.1. Therefore, based on the CUF threshold of 0.1, the staff determined that the SLRA AMP and gap analysis adequately incorporates the potential environmental effects of the RCS water environment for the fatigue screening. On this basis, the staff finds that the issue described in Information item 5 of AI-8 is resolved for Turkey Point Units 3 and 4.

Based on its evaluation documented above, the staff finds that all eight plant-specific action items in the staff's SE for MRP-227-A are resolved for the subsequent period of extended operation.

Operating Experience. SLRA Section B.2.3.7 summarizes operating experience related to the Reactor Vessel Internals program. The applicant stated that its plant-specific operating experience provides objective evidence that the Reactor Vessel Internals program is effective in ensuring that the Turkey Point RVI components remain in an adequate condition to support their intended function. The applicant also stated that for instances where RVI components inspection results were not satisfactory, the plant-specific operating experience provides evidence that the site corrective action program is effective in addressing RVI component degradation through augmented subsequent inspections and analyses.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed

AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying its proposed program beyond that incorporated during the staff's SLRA review.

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 Vessel Internals program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.7 provides the UFSAR supplement for the Reactor Vessel Internals program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to continue implementing the Reactor Vessel Internals program for managing the effects of aging on the RVI components, including the enhancements to the program described 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. On the basis of its audit and its review of the applicant's Reactor Vessel Internals program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report AMP XI.M16A are consistent. Also, the staff reviewed the program enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended 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).

3.0.3.2.10 Flow-Accelerated Corrosion

SLRA Section B.2.3.8 describes the existing Flow-Accelerated Corrosion program as consistent, with enhancements, with GALL-SLR Report AMP XI.M17, "Flow-Accelerated Corrosion."

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M17. For the "scope of program," "detection of aging effects," and "acceptance criteria" program elements, the staff determined that it needed additional information, which resulted in the issuance of RAIs B.2.3.8-1, B.2.3.8-2, and B.2.3.8-3. The staff's requests and the applicant's responses are documented in ADAMS Accession Nos. ML18260A243 and ML18292A642.

In its response to RAI B.2.3.8-1, as supplemented in its response dated November 15, 2018 (ADMAS Accession No. ML18352A885), the applicant clarified that software used in the AMP (FAC Manager Web Edition and CHECWORKS) are classified through the Software Quality Assurance program as Level C, "Business Critical," because they perform evaluations and develop scopes for the AMP. The staff noted that the new classification determinations completed on September 27, 2018, resolve the disparity identified by the staff, and therefore finds the applicant's response acceptable.

In its response to RAI B.2.3.8-2, the applicant stated that the most recent system susceptibility evaluation was documented in August 2017. The staff noted that the applicant had performed the susceptibility evaluation as part of the low pressure turbine replacement activities. During its research for this RAI, the applicant identified discrepancies for the reference to NSAC-202L and corrected this by making changes to SLRA Section A.17.2.2.8, and the corresponding references in SLRA Section A.17.5 and Appendix B. The staff finds the applicant's response and the noted changes to the SLRA acceptable because they clarify the bases of the program enhancement for reassessing components that had previously been excluded from the program based on low usage.

In its response to RAI B.2.3.8-3, the applicant stated that the evaluations using the "10% Rule" are based on the increase in allowable stress or stress intensity for primary-membrane stresses and, for the Flow-Accelerated Corrosion program, are only used to support continued plant operation until such time that repairs can be implemented. The staff finds the applicant's response acceptable because the evaluation of a localized condition is only used to determine operability until repairs can be made.

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

Enhancement 1. SLRA Section B.2.3.8 contains an enhancement to the "scope of program" program element to include erosion mechanisms, where applicable, for components that contain treated water or steam. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M17 and finds it acceptable because when it is implemented the program will also manage erosion mechanisms in applicable components consistent with the corresponding guidance.

Enhancement 2. SLRA Section B.2.3.8 includes an enhancement to the "parameters monitored or inspected" and "monitoring and trending" program elements to address erosion as an aging mechanism by trending wall thickness, evaluating the validity of previous extent-of-condition reviews, and confirming the effectiveness of corrective actions for replacement components. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M17 and finds it acceptable because when it is implemented the program will also manage erosion mechanisms consistent with the corresponding guidance.

Enhancement 3. SLRA Section B.2.3.8 includes an enhancement to the "detection of aging effects" program element to use extent-of-condition reviews for identifying locations susceptible to erosion and to reassess piping systems that were previously excluded from the program using the 2 percent operating time exclusion. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M17 and finds it acceptable because when it is implemented the program will use operating experience to identify locations susceptible to erosion and will ensure that the basis remains valid for previously excluding systems from the program consistent with the corresponding guidance.

Enhancement 4. SLRA Section B.2.3.8 contains an enhancement to the "corrective actions" program element to verify that the use of any alternate material, to address erosion mechanisms, is effective. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M17 and finds it acceptable because when it is implemented the program will verify the effectiveness of corrective actions associated with the use of alternate materials for erosion issues consistent with the corresponding guidance.

Based on its audit and its review of FPL's responses to RAIs B.2.3.8-1, B.2.3.8-2, and B.2.3.8-3, the staff finds that program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report XI.M17. The staff also reviewed the enhancements associated with the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.8 summarizes operating experience related to the Flow-Accelerated Corrosion program. The applicant provided examples to demonstrate that the program remains effective in ensuring that component intended functions are maintained consistent with the CLB.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 Flow-Accelerated Corrosion program was evaluated.

UFSAR Supplement. SLRA Appendix A Section A.17.2.2.8, as modified by letter dated October 17, 2018, 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 the applicant committed to continue the existing Turkey Point Flow-Accelerated Corrosion program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff further noted that the applicant committed to implement the enhancements to the program no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's Flow-Accelerated Corrosion program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with AMP XI.M17. The staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Bolting Integrity

SLRA Section B.2.3.9 describes the existing Bolting Integrity program as consistent, with enhancements, with GALL-SLR Report AMP XI.M18, “Bolting Integrity.” The applicant amended this SLRA section by letters dated October 4, 2018, and February 13, 2019.

Staff Evaluation. During its audit, the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant’s program to the corresponding program elements of GALL-SLR Report AMP XI.M18.

For the “parameters monitored or inspected” and “detection of aging effects” program elements, the staff determined that it needed additional information, which resulted in the issuance of RAIs. RAI B.2.3.9-1 and followup RAI B.2.3.9-1a and the applicant’s responses are documented in ADAMS Accession Nos. ML18311A299 and ML19050A401.

During its evaluation of the applicant’s response to RAI B.2.3.9-1 and followup RAI B.2.3.9-1a, the staff noted that the applicant performed a review of its site maintenance specifications for bolting, piping, and tubing. The staff noted that after review of these specifications, the applicant concluded that with the exception of the reactor vessel head closure studs, high strength (i.e., actual yield strength greater than or equal to 150 ksi (1,034 MPa)) closure bolting greater than 2 inches in diameter is not allowed for use as initial or replacement closure bolting in pressure-retaining components at Turkey Point. The staff noted that the reactor vessel closure studs are not within the scope of the applicant’s Bolting Integrity program but are within the scope of the applicant’s Reactor Head Closure Stud Bolting program (SLRA Section B.2.3.3), which is the AMP recommended by the GALL-SLR Report to manage the aging effects of these components. The staff’s review of the applicant’s Reactor Head Closure Stud Bolting program is documented in SER Section 3.0.3.2.6. The staff noted that the applicant also revised SLRA Sections B.2.3.9 and A.17.2.2.9 (UFSAR supplement), as well as SLRA Tables 3.2-1, 3.3-1, 3.4-1, and 17-3 (item No. 13) to: (1) state that there is no high-strength bolting within the scope of this program, and (2) remove its previously proposed enhancement requiring volumetric inspections in accordance with ASME Section XI to detect cracking due to SCC on high strength closure bolts. The staff reviewed the UFSAR and did not find instances where high strength closure bolting greater than 2 inches in diameter is used in SSCs within the scope of the applicant’s Bolting Integrity program. In addition, the staff noted that the Bolting Integrity program is enhanced (Enhancement 2) to ensure that any replacement or newly installed closure bolting will have an actual yield strength that is less than 150 ksi. The staff finds the applicant response and corresponding changes to the SLRA AMP, UFSAR supplement, and SLRA tables acceptable because based on its review of the SLRA, UFSAR, and the applicant’s response: (1) there are no high strength closure bolts greater than 2 inches in diameter within the scope of the Bolting Integrity program; (2) the AMP is enhanced to preclude the use of high strength closure bolting; and (3) absent closure bolting with high strength material, the aging effect of cracking due to SCC is not applicable and there is no need to perform volumetric inspections to detect such aging effects.

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

Enhancement 1. SLRA Section B.2.3.9 includes an enhancement to the “scope of program” and “detection of aging effects” program elements that relates to the updating of existing procedures and the creation of new procedures to include inspection of submerged pressure-retaining bolting and closure bolting that contain air or gas which makes leakage detection difficult. 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 the Bolting Integrity program will incorporate the inspection of closure bolting that is located in submerged environments and closure bolting in systems that contain air or gas, and this is consistent with the recommendations in GALL-SLR Report AMP XI.M18.

Enhancement 2. SLRA Section B.2.3.9 includes an enhancement to the “preventive actions” program element that relates to the updating of existing procedures and the creation of new procedures to ensure that any replaced or new closure bolting has an actual yield strength less than 150 ksi, and that lubricants with molybdenum disulfide or containing sulfur are not used in closure bolts. 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 update or create site procedures to prevent the use of bolting material with a yield strength equal or greater than 150 ksi and molybdenum disulfide lubricants on closure bolting, which is consistent with the recommendations in GALL-SLR Report AMP XI.M18.

Enhancement 3. SLRA Section B.2.3.9 includes an enhancement to the “acceptance criteria” program element that relates to the incorporation of acceptance criteria for closure bolting, which is submerged pressure-retaining bolting and closure bolting in piping systems that contain gas or air for which leakage is difficult to detect. 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 the applicant will include acceptance criteria on its Bolting Integrity program for submerged closure bolting and closure bolting in systems that contain air or gas; this is consistent with the recommendation in GALL-SLR Report AMP XI.M18.

The staff conducted an audit to verify the applicant’s claim of consistency with the GALL-SLR Report. Based on its review of the SLRA, amendments, and responses to RAIs B.2.3.9-1 and B.2.3.9-1a, the staff finds that the “parameters monitored or inspected” and “monitoring and trending” program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M18. In addition, the staff reviewed the enhancements associated with the “scope of program,” “preventive actions,” “detection of aging effects,” and “acceptance criteria” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.9 summarizes operating experience related to the Bolting Integrity program. The applicant stated that its operating experience provides reasonable assurance that the Bolting Integrity program will identify and resolve the issues before system function is adversely impacted.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant’s corrective action program database; and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 A.17.2.2.9 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 the applicant committed to ongoing implementation of the existing Bolting Integrity program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implement the enhancements to the program no later than 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 13, 2019, is an adequate summary description of the program.

Conclusion. On the basis of its review of the applicant's Bolting Integrity program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Steam Generators

SLRA Section B.2.3.10 describes the existing Steam Generators program as consistent, with enhancements, with GALL-SLR Report AMP XI.M19, "Steam Generators," with one exception. The applicant amended this SLRA section by letter dated November 2, 2018.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M19.

For the "parameters monitored or inspected" program elements, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.10-1 and the applicant's response is documented in ADAMS Accession Nos. ML18269A228 and ML18311A299. The staff's evaluation of the applicant's response to RAI B.2.3.10-1 is documented in SER Section 3.1.2.2.11.

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

Exception 1. SLRA Section B.2.3.10 includes an exception to the "scope of program" program element to exclude the tube-to-tubesheet (T/TS) welds from inspection and monitoring. The T/TS joint consists of the tube, which is hydraulically expanded against the bore of the tubesheet, the T/TS weld located at the tube end, and the tubesheet. The licensee's approved

H* alternate repair criteria (ADAMS Accession No. ML12292A342) relies on the ability of the hydraulically expanded portion of the tube from the top of the tubesheet to 18.11 inches below the top of the tubesheet to resist tube end cap pressure loads. The alternate repair criteria takes no credit for the portion of the tube more than 18.11 inches below the top of the tubesheet or the T/TS weld to maintain structural and leakage integrity, which removes the T/TS weld from a pressure boundary function. The staff reviewed the exception against the corresponding program element in GALL-SLR Report AMP XI.M19 and finds it acceptable because the T/TS weld is no longer part of the reactor coolant pressure boundary consistent with SRP-SLR Section 3.1.2.2.11 Part (2).

Enhancement 1. SLRA Section B.2.3.10, as amended in the response to RAI B.2.3.10-1, includes an enhancement to the "parameters monitored or inspected" program element to update AMP procedures to include adding reference lists, which include EPRI documents, and to include additional means for monitoring loose parts. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M19 and finds it acceptable because when it is implemented it will incorporate industry guidance to bring the program into alignment with effective industry practices.

Based on its audit, the staff finds that program elements 1 through 7 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M19. The staff also reviewed the exception associated with the "scope of program" program element, and its justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancement associated with the "parameters monitored or inspected" program element and finds that, when implemented, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.10 summarizes operating experience related to the Steam Generators program. The applicant stated that the overall effectiveness of the Steam Generators program is supported by the plant-specific steam generator operating experience and inspection results.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 A.17.2.2.10 provides the UFSAR supplement for the Steam Generators 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 the applicant committed to ongoing implementation of the existing Steam Generators program in Commitment No. 14, as amended in its response to RAI B.2.3.10-1, with enhancements, to incorporate the latest EPRI steam generator guidelines per NEI 97-06 and to perform a one-time inspection of the divider plate assembly as part of the One-Time Inspection program 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. On the basis of its audit and its review of the applicant's Steam Generators program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. In addition, the staff reviewed the exception and its justification and determined that the AMP, with the exception, is adequate to manage the applicable aging effects. Also, the staff reviewed the enhancement and confirmed that its implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Open-Cycle Cooling Water System

SLRA Section B.2.3.11 describes the existing Open-Cycle Cooling Water (OCCW) System program as consistent, with enhancements, with GALL-SLR Report AMP XI.M20, "Open-Cycle Cooling Water System." The applicant amended this SLRA section by letters dated January 31, 2019, and April 10, 2019.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M20.

For the "detection of aging effects" program element, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.11-1 and the applicant's response are documented in a letter dated January 31, 2019 (ADAMS Accession No. ML19035A195), which supersedes the applicant's response in the letter dated October 16, 2018 (ADAMS Accession No. ML18296A024).

During its evaluation of the response to RAI B.2.3.11-1, the staff noted that the applicant revised the program description in SLRA Section B.2.3.11 by clarifying the scope of the OCCW System program. The applicant stated that the program includes the portions of the intake cooling water (ICW) pump casings exposed to raw water and the piping from the ICW pump discharge flanges to the inlet flanges of the component cooling water heat exchangers and the turbine plant cooling water basket strainers. The expanded scope now includes ICW piping with diameters less than 24 inches. The staff finds the applicant's response acceptable because it ensures that the applicable aging effects will be managed by the OCCW System program for all ICW piping within the scope of GL 89-13, "Service Water System Problems Affecting Safety-Related Equipment."

By letter dated April 10, 2019 (ADAMS Accession No. ML19102A065), the applicant provided a supplemental response for the OCCW System AMP by modifying the enhancements to the OCCW System AMP to make the portion of this program used to manage loss of coating integrity consistent with the recommendations in GALL-SLR Report AMP XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks.” The staff notes that, as provided in the GALL-SLR Report, if the OCCW System AMP manages loss of coating integrity, the program includes the guidance of GALL-SLR Report AMP XI.M42. The staff reviewed the portions of the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and tending,” “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 enhancements follows.

Enhancement 1. SLRA Section B.2.3.11 includes an enhancement to the “parameters monitored or inspected” program element to specify the aging mechanism associated with coatings/linings in test procedures. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M42 and finds it acceptable because when it is implemented it will clearly define the aging mechanisms to be managed for coatings/linings used in OCCW system piping.

Enhancement 2. SLRA Section B.2.3.11, as amended by letter dated April 10, 2019, includes enhancements to the “detection of aging effects” program element to incorporate the corresponding program element recommendations from GALL-SLR Report AMP XI.M42. The staff reviewed these enhancements against the corresponding program element in GALL-SLR Report AMP XI.M42 and finds them acceptable because when they are implemented the determination of the inspection intervals and representative sample sizes, the inspections of coatings between interlocking surfaces, and the qualifications of individuals performing inspections of cementitious ICW piping coatings will be consistent with the recommendations in GALL-SLR Report AMP XI.M42, which will adequately manage degradation of coatings used in OCCW system piping.

Enhancement 3. SLRA Section B.2.3.11, as amended by letter dated April 10, 2019, includes an enhancement to the “monitoring and trending” program element to conduct pre-inspection reviews and to prepare a post-inspection report. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M42 and finds it acceptable because when it is implemented, it will require a review of the two previous ICW piping inspection results and the preparation of a post-inspection report consistent with the recommendations of GALL-SLR Report AMP XI.M42.

Enhancement 4. SLRA Section B.2.3.11 includes enhancements to the “acceptance criteria” program element to implement acceptance criteria of GALL-SLR Report AMP XI.M42. The staff reviewed these enhancements and finds them acceptable because degradation of coatings/linings in OCCW System piping will be addressed before it leads to a loss of component intended function and the program includes the guidance given in GALL-SLR Report AMP XI.M42, which will adequately manage degradation of coatings used in OCCW system piping.

Enhancement 5. SLRA Section B.2.3.11, as amended by letter dated April 10, 2019, includes enhancements to the “corrective actions” program element to address coatings/linings that do not meet acceptance criteria of GALL-SLR Report AMP XI.M42. The staff reviewed these enhancements and finds them acceptable because inspection results that do not meet the acceptance criteria are addressed and the program includes the guidance given in GALL-SLR Report AMP XI.M42, which will adequately manage degradation of coatings used in OCCW system piping.

Based on its audit and its review of the applicant's responses to RAI B.2.3.11-1, the staff finds that program elements 1 through 7 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M20 and AMP XI.M42. In addition, the staff reviewed the enhancements associated with the "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.11 summarizes operating experience related to the OCCW System AMP. The applicant stated that the site-specific operating experience prior to and during the initial period of extended operation provides objective evidence that the OCCW System AMP effectively manages aging effects so that the intended functions of structures and components within the scope of the OCCW System AMP will be maintained during the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 OCCW System AMP was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.11, as modified by letter dated January 31, 2019, provides the UFSAR supplement for the OCCW System AMP. The staff reviewed this UFSAR supplement description of the program and noted that: (a) it is consistent with the recommended description in GALL-SLR Report Table XI-01, and (b) it states that the program also manages loss of coating integrity for internal coatings of piping within the scope of the program and that the OCCW System AMP includes the guidance provided in the Turkey Point Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP to manage loss of coating integrity.

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

Conclusion. On the basis of its audit and review of the applicant's Open-Cycle Cooling Water System AMP, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Closed Treated Water Systems

SLRA Section B.2.3.12 describes the existing Closed Treated Water Systems program as consistent, with enhancements, with GALL-SLR Report AMP XI.M21A, “Closed Treated Water Systems,” with one exception.

Staff Evaluation. During its audit, the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant’s program to the corresponding program elements of GALL-SLR Report AMP XI.M21A.

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 exception and enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of the exception and enhancements follows.

Exception. SLRA Section B.2.3.12 includes an exception to the “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements. The staff notes that the exception is based on the applicant’s use of the latest guidance in EPRI 3002000590, Revision 2, “Closed Cooling Water Chemistry Guideline.”. The industry operating experience discussion in the SLRA states that the applicant updates the governing Turkey Point chemistry procedure when the EPRI water chemistry guidelines are updated. The staff reviewed this latest guidance and agrees that it provides the technical basis for a reasonable but conservative set of chemical treatment and monitoring programs at Turkey Point. The staff reviewed this exception and finds it acceptable because the updated EPRI guideline represents the latest industry consensus guidance based on reviews of data for closed cooling water system corrosion, including recent industry operating experience.

Enhancement 1. SLRA Section B.2.3.12 includes an enhancement to the “scope of program” program element. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M21A and finds it acceptable because when it is implemented the scope of the program will include any closed cooling water system components that were identified in the subsequent license renewal AMR reports, which are not currently included in the program’s associated implementing procedures.

Enhancement 2. SLRA Section B.2.3.12 includes an enhancement to the “parameters monitored or inspected” program element. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M21A and finds it acceptable because when it is implemented the heat transfer capability for all in-scope heat exchangers will be verified either by visually inspecting the heat transfer surfaces for cleanliness or by performing functional testing.

Enhancement 3. SLRA Section B.2.3.12 includes an enhancement to the “detection of aging effects,” “monitoring and trending,” and “acceptance criteria” program elements. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M21A and finds it acceptable because when it is implemented the program will be aligned with the latest guidance in EPRI 3002000590, Revision 2, as discussed in the exception above.

Enhancement 4. SLRA Section B.2.3.12 includes an enhancement to the "detection of aging effects" program element. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M21A and finds it acceptable because when it is implemented the program will be updated to include new guidance delineated in GALL-SLR Report AMP XI.M21A, regarding the visual inspection of components' internal surfaces whenever system boundaries are opened and inspections of a representative sample of components for loss of material, cracking, and fouling.

Enhancement 5. SLRA Section B.2.3.12 includes an enhancement to the "monitoring and trending" program element. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M21A and finds it acceptable because when it is implemented, the program will be updated to include new guidance delineated in GALL-SLR Report AMP XI.M21A, regarding the confirmation of the sampling bases to ensure the projected rate and extent of degradation will not affect components' intended functions.

Enhancement 6. SLRA Section B.2.3.12 includes an enhancement to the "acceptance criteria" program element. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M21A and finds it acceptable because when it is implemented the program's water treatment procedures will be aligned with the latest guidance in EPRI 3002000590, Revision 2, as discussed in the exception above.

Enhancement 7. SLRA Section B.2.3.12 includes an enhancement to the "corrective actions" program element. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M21A and finds it acceptable because when it is implemented the program will be aligned with the latest guidance in GALL-SLR Report AMP XI.M21A, regarding additional inspections for any inspection that does not meet acceptance criteria.

Based on its audit, the staff finds that program elements 1 through 7, for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M21A. The staff also reviewed the exception associated with the "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements and its justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.12 summarizes operating experience related to the Closed Treated Water Systems program. The applicant stated that the operating experience examples in the SLRA illustrate that the Closed Treated Water Systems program will be effective in ensuring that intended functions are maintained consistent with the CLB during the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 Closed Treated Water Systems program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.12 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 also noted that the applicant committed to ongoing implementation of the existing Closed Treated Water Systems program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff further noted that the applicant committed to enhance the program no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's Closed Treated Water Systems program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. In addition, the staff reviewed the exception and its justification and determined that the AMP, with the exception, is adequate to manage the applicable aging effects. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

SLRA Section B.2.3.13 describes the existing Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program as consistent, with enhancements, with GALL-SLR Report AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems." The applicant amended this SLRA section by letter dated November 2, 2018.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M23.

For the "scope of program" program element, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.13-1 and the applicant's response is documented in ADAMS Accession No. ML18311A299.

During its evaluation of the applicant's response to RAI B.2.3.13-1, the staff noted that the applicant stated that structural components of trolleys and rigging are within the scope of AMP B.2.3.13 and are included as AMRs in the SLRA. The staff noted that SLRA Tables 3.5.2-11, 3.5.2-14, and 3.5.2-17 include AMRs for trolley structures of the turbine gantry crane and polar crane and ICW valve pit rigging beam that will be age managed under AMP B.2.3.13. The staff also noted that the applicant revised AMP B.2.3.13 to remove the statement that identified trolleys and rigging as components not within the scope of license renewal. The staff finds the applicant's response acceptable because structural components of trolleys and rigging will be managed under AMP B.2.3.13, consistent with the "scope of the program" recommendations in GALL-SLR Report AMP XI.M23.

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

Enhancement 1. SLRA Section B.2.3.13 includes an enhancement to the "parameters monitored or inspected" and "detection of aging effects" program elements that relates to updating governing AMP procedures for visual inspections of bolted connections. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M23 and finds it acceptable because when it is implemented it will be consistent with GALL-SLR Report AMP XI.M23 recommendations for visual inspections of cranes components and bolted connections for loss of material, cracking, loss of preload, and loose or missing bolts or nuts.

Enhancement 2. SLRA Section B.2.3.13 includes an enhancement to the "detection of aging effects," "acceptance criteria," and "corrective actions" program elements that relates to updating governing AMP procedures for performance of inspections for signs of deformed, cracked, corroded members; for loose or missing fasteners; and at intervals as described in the 2005 version of ASME B30.2, "Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)." The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M23 and finds it acceptable because when it is implemented it will be consistent with GALL-SLR Report recommendations associated with implementation of ASME B30.2 for: (1) performance of inspections for aging effects such as deformation, cracking, loss of material of crane members, and for loose or missing bolts; (2) performance of periodic inspections (once per year) for "normal service" cranes and; (3) performance of inspections for infrequent service cranes before these are placed in service.

Enhancement 3. SLRA Section B.2.3.13 includes an enhancement to the "detection of aging effects" program element that relates to updating governing AMP procedures for periodic inspections of cranes that are infrequently in service (e.g., polar cranes). The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M23 and finds it acceptable because when it is implemented it will be consistent with GALL-SLR Report recommendations to perform inspections of load handling systems that are infrequently in service, at a frequency of once every RFO just prior to use.

Enhancement 4. SLRA Section B.2.3.13 includes an enhancement to the "acceptance criteria" and "corrective actions" program elements that relates to updating governing AMP procedures for the guidance for evaluation and repair of crane components with visual indications for loss of material, deformation, cracking, and loss of preload in accordance with B30.2 or other ASME B30 Series standards. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M23 and finds it acceptable because when it is implemented it will be consistent with GALL-SLR Report recommendations that any visual indication of loss of material, deformation, or cracking; and any visual sign of loss of bolting preload is evaluated in accordance with ASME B30.2 or other applicable industry standard in the ASME B30 series.

Enhancement 5. SLRA Section B.2.3.13 includes an enhancement to the "parameters monitored or inspected," "detection of aging effects," "acceptance criteria," and "corrective actions" program elements that relates to creating a new inspection procedure. The new inspection procedure will address aging management of structural members and components of fuel transfer machines for visual inspections, inspections frequency, and evaluation/correction of deformations, cracking, loss of material, and loss of preload aging effects, in accordance with the respective ASME B30 standard. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M23 and finds it acceptable because when it is implemented it will be consistent with GALL-SLR Report recommendations to: (1) perform visual inspections at a frequency that is in accordance with the appropriate standard in the ASME B30 series; (2) perform visual inspections of structural components for loss of material, deformation, cracking, and wear; (3) perform visual inspections of bolted connections for loss of material, cracking, loose or missing nuts, and other conditions indicative of loss of preload; and (4) evaluate and repair any visual indication of these aging effects in accordance with the applicable ASME B30 standard.

Enhancement 6. SLRA Section B.2.3.13 includes an enhancement to the "parameters monitored or inspected," "detection of aging effects," "acceptance criteria," and "corrective actions" program elements that relates to creating a new inspection procedure. The new inspection procedure will address spent fuel bridge cranes visual inspections, inspections frequency, evaluation of aging effects (e.g., deformation, cracking, loss of material, loss of preload), and corrective actions needed for bridges, structural members, and structural components, in accordance with ASME B30.2. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M23 and finds it acceptable because when it is implemented it will be consistent with GALL-SLR Report recommendations to: (1) perform visual inspections at a frequency that is in accordance with the ASME B30.2 standard; (2) perform visual inspections of structural components for loss of material, deformation, cracking, and wear; (3) perform visual inspections of bolted connections for loss of material, cracking, loose or missing nuts, and other conditions indicative of loss of preload; and (4) evaluate any visual indication of these aging effects in accordance with the ASME B30.2 standard.

Enhancement 7. SLRA Section B.2.3.13 includes an enhancement to the "parameters monitored or inspected," "detection of aging effects," "acceptance criteria," and "corrective actions" program elements that relates to creating a new inspection procedure. The new inspection procedure will address aging management of structural members and components of monorails and rigging beams. For these components, the procedure will specify visual inspections; inspections frequency; and evaluation and resolution of aging effects such as deformation, cracking, loss of material, and loss of preload; in accordance with the ASME B30.11 standard. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M23 and finds it acceptable because when it is implemented it will be consistent with GALL-SLR Report recommendations to: (1) perform visual inspections at a frequency that is in accordance with the appropriate standard in the ASME B30 series; (2) perform visual inspections of structural members and components for loss of material, deformation, cracking, and wear; (3) perform visual inspections of bolted connections for loss of material, cracking, loose or missing nuts, and other conditions indicative of loss of preload; and (4) evaluate and repair these aging effects in accordance with the applicable ASME B30 standard.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on its review of the SLRA, amendments, and response to RAI B.2.3.13-1, the staff finds that program elements 1 through 7 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M23. In addition, the staff reviewed the enhancements associated with the "parameters monitored or inspected," "detection of aging effects," "acceptance criteria," and "corrective actions" program elements and finds that when implemented they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.13 summarizes operating experience related to the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program. The applicant stated that a review of recent industry operating experience and NRC generic communications with respect to crane aging management indicated that there was no requirement for Turkey Point to provide a response. The applicant also stated that site-specific operating experience provides objective evidence that the enhanced Turkey Point Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program, as part of the Turkey Point Systems and Structures Monitoring program, will remain effective in ensuring that the intended functions of crane and crane components within the scope of this AMP are maintained during the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.13 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 it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implement the enhancements to the program no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its review of the applicant's Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Compressed Air Monitoring

SLRA Section B.2.3.14 describes the existing Compressed Air Monitoring program as consistent, with enhancements, with GALL-SLR Report AMP XI.M24, “Compressed Air Monitoring.”

Staff Evaluation. During its audit, the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant’s program to the corresponding program elements of GALL-SLR Report AMP XI.M24. The staff also reviewed the portions of the “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements associated with the enhancements to determine whether the program will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of these enhancements follows.

Enhancement 1. SLRA Section B.2.3.14 includes an enhancement to the “preventive actions” program element. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M24 and finds it acceptable because when it is implemented it will be consistent with AMP XI.M24 recommendations associated with maintaining moisture and other corrosive contaminants in the system’s air below specified limits. These limits are prepared with considerations from manufacturer’s recommendations for individual components and guidelines based on ASME OM-2012, “Performance Testing of Instrument Air Systems Information Notice Light-Water Reactor Power Plants,” Division 2, Part 28; ANSI/ISA-7.0.01-1996, “Quality Standard for Instrument Air”; and EPRI TR–108147, “Compressor and Instrument Air System Maintenance Guide: Revision to NP-7079.”

Enhancement 2. SLRA Section B.2.3.14 includes an enhancement to the “parameters monitored or inspected” and “detection of aging effects” program elements. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M24 and finds it acceptable because when it is implemented it will be consistent with AMP XI.M24 recommendations associated with opportunistic visual inspections of accessible internal surfaces for evidence of corrosion and abnormal corrosion products.

Enhancement 3. SLRA Section B.2.3.14 includes an enhancement to the “detection of aging effects” program element. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M24 and finds it acceptable because when it is implemented it will be consistent with AMP XI.M24 recommendations associated with inspections and tests being performed by personnel qualified in accordance with site procedures and programs to perform the specified task.

Enhancement 4. SLRA Section B.2.3.14 includes an enhancement to the “monitoring and trending” program element. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M24 and finds it acceptable because when it is implemented it will be consistent with AMP XI.M24 recommendations associated with monitoring and trending of dew point readings.

Enhancement 5. SLRA Section B.2.3.14 includes an enhancement to the "acceptance criteria" program element. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M24 and finds it acceptable because when it is implemented it will be consistent with AMP XI.M24 recommendations associated with air quality moisture limits that are established based on accepted industry standards.

Enhancement 6. SLRA Section B.2.3.14 includes an enhancement to the "acceptance criteria" program element. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M24 and finds it acceptable because when it is implemented it will be consistent with AMP XI.M24 recommendations associated with bottled gases meeting quality standards.

Enhancement 7. SLRA Section B.2.3.14 includes an enhancement to the "detection of aging" program element. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M24 and finds it acceptable because when it is implemented it will be consistent with AMP XI.M24 recommendations associated with periodically sampling and testing the air in the compressed system in accordance with industry standards (i.e., ANSI/ISA-7.0.01-1996).

Enhancement 8. SLRA Section B.2.3.14 includes an enhancement to the "corrective actions" program element. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M24 and finds it acceptable because when it is implemented it will be consistent with AMP XI.M24 recommendations associated with corrective actions being taken if any parameters, such as moisture content in the system air, are out of acceptable ranges, or if corrosion is identified on internal surfaces.

Based on its audit, the staff finds that program elements 1 through 7 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M24. In addition, the staff reviewed the enhancements associated with the "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.14 summarizes operating experience related to the Compressed Air Monitoring program. The applicant stated that the review of site-specific operating experience during the first period of extended operation, including past corrective actions, provides reasonable assurance that the Compressed Air Monitoring program effectively manages aging effects so that the intended functions of SSCs within the scope of the Compressed Air Monitoring program will be maintained during the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 A.17.2.2.14 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 the applicant committed to ongoing implementation of the existing Compressed Air Monitoring program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implement the enhancements to the program no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's Compressed Air Monitoring program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Fire Protection

SLRA Section B.2.3.15 describes the existing Fire Protection program as consistent, with enhancements, with GALL-SLR Report AMP XI.M26, "Fire Protection."

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M26.

For the "detection of aging effects" program element, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI 3.5.2.10-1 and the applicant's response are documented in ADAMS Accession No. ML18260A243 and ML18292A642.

During its evaluation of the applicant's response to RAI 3.5.2.10-1, the staff noted that the applicant removed the subject drip shields from the scope of the SLRA. The staff finds the applicant's response and changes to Table 3.5.2-10 acceptable because: (a) the thermo-lag barriers are not credited for separation in the outdoor fire zones as part of the risk-informed, performance-based Fire Protection program that went into effect in May 2015, (b) the wrap beneath the turbine/generator bearings is abandoned in place and not required to demonstrate compliance, and (c) the subject drip shields are therefore no longer required to perform a function within the scope of subsequent license renewal.

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 enhancements follows.

Enhancement 1. As amended (ADAMS Accession No. ML19035A195), SLRA Section B.2.3.15 includes an enhancement to the "parameters monitored or inspected" and "acceptance criteria" program elements. The applicant revised this enhancement to state that any visual indications of cracking or corrosion on a fire damper assembly will be documented and evaluated for repair or replacement. 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 specify inspections to manage corrosion and cracking on all in-scope fire damper assemblies and any visual indications of cracks or corrosion will be documented and evaluated for repair or replacement, which is consistent with GALL-SLR Report AMP XI.M26.

Enhancement 2. As amended (ADAMS Accession No. ML19035A195), SLRA Section B.2.3.15 includes an enhancement to the "detection of aging effects" program element. The applicant revised this enhancement to specify that procedures will be updated to state that inspectors and evaluators are qualified per the NRC-approved fire protection program to perform such inspections and determine appropriate corrective actions, respectively. 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 update procedures to state that inspections are performed by personnel qualified in accordance with the fire protection program, which is consistent with GALL-SLR Report AMP XI.M26.

Enhancement 3. SLRA Section B.2.3.15 includes an enhancement to the "monitoring and trending" program element. This enhancement will provide updates to procedures regarding documentation, trending, projection, and evaluation of degradation. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M26 and finds it acceptable because when it is implemented it will: (a) specify trending of degradation in halon fire suppression system tests; (b) specify that, when practical, degradation is to be projected until the next scheduled inspection; and (c) specify that results are evaluated against acceptance criteria to confirm sampling bases and frequency of inspections are adequate during the subsequent period of extended operation, which is consistent with GALL-SLR Report AMP XI.M26.

Enhancement 4. SLRA Section B.2.3.15 includes an enhancement to the "corrective actions" program element. This enhancement will update the fire barrier penetration seal inspection procedure to specify actions to be taken in the event that projected inspections results will not meet acceptance criteria prior to the next scheduled inspection. 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 procedures will require inspection frequencies to be adjusted in accordance with the corrective action program if any projected inspection results do not meet the acceptance criteria, which is consistent with GALL-SLR Report AMP XI.M26.

Based on its audit and its review of the applicant's response to RAI 3.5.2.10-1, the staff finds that program elements 1 through 7 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M26. In addition, the staff reviewed the enhancements associated with the "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that when implemented they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.15 summarizes operating experience related to the Fire Protection program. The applicant stated that the Fire Protection program, with enhancements, will provide reasonable assurance that the effects of aging will be adequately managed so that the intended function(s) of components within the scope of the program will be maintained consistent with the CLB during the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 Fire Protection AMP was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.15 provides the UFSAR supplement for the Fire Protection program.

The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to ongoing implementation of the existing Fire Protection program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implement the enhancements to the program no later than 6 months prior to the subsequent period of extended operation.

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

Conclusion. On the basis of its audit and its review of the applicant's Fire Protection AMP, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Fire Water System

SLRA Section B.2.3.16 describes the existing Fire Water System program as consistent, with enhancements, with GALL-SLR Report AMP XI.M27, "Fire Water System." The applicant amended this SLRA section by letters dated August 31, 2018, and November 28, 2018.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M27.

For the "detection of aging effects," "acceptance criteria," "and corrective actions" program elements, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.16-1 and the applicant's response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257.

RAI B.2.3.16-1 Request No. 1. In its response, the applicant provided Table RAI B.2.3.16-1.a, "Existing Procedures," and Table RAI B.2.3.16-1.b, "New Procedures," which list each existing plant-specific procedure and the new requirements to be incorporated into the procedures and, for new procedures, the referenced GALL-SLR Report AMP XI.M27, Table XI.M27-1, "Fire Water System Inspection and Testing Recommendations," or program element recommendations to be incorporated. In addition, the applicant revised Enhancement No. 4 to delete the term "visual" as a modifier to the type of inspection procedures that would be revised.

RAI B.2.3.16-1 Request No. 2. In its response, the applicant stated that it will revise its plant-specific procedure to verify full drainage of hydrant barrels within 60 minutes. This change is listed in the new Table RAI B.2.3.16-1.a.

RAI B.2.3.16-1 Request No. 3. In its response, the applicant stated that it will revise its plant-specific procedure to "include a requirement to ensure that fire water systems are normally maintained at required operating pressure and monitored in such a way that loss of system pressure is immediately detected and corrected when acceptance criteria are exceeded." This change is listed in the new Table RAI B.2.3.16-1.a.

RAI B.2.3.16-1 Request No. 4. In its response, the applicant listed the specific sprinkler systems that use open head spray nozzles, which are allowed to be cleaned. The applicant also listed the specific sprinkler system that use closed head sprinklers. The procedures for inspecting the closed head sprinklers will be revised to require replacement of these sprinklers rather than removal and cleaning.

RAI B.2.3.16-1 Request No. 5. In its response, the applicant stated that the existing plant-specific procedure states the following acceptance criterion for visual inspections: "[i]f signs of age related degradation loss of material are evident, it shall be documented in a Condition Report. Engineering shall determine if corrective measures are required." The applicant also stated that the procedure will be revised to state that the acceptance criterion for volumetric wall thickness inspections is that minimum design wall thickness will be met. This change is listed in the new Table RAI B.2.3.16-1.a.

RAI B.2.3.16-1 Request No. 6. In its response, the applicant stated that conducting deposit removal evaluations is addressed in the response to RAI B.2.3.16-2 (below) and conducting flushes in accordance with NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," Annex D.5, "Flushing Procedures," is addressed in plant-specific procedure changes in the new Table RAI B.2.3.16-1.a, and Table RAI B.2.3.16-1.b.

The staff finds the applicant's response to all six requests and changes to SLRA Section B.2.3.16 acceptable because the changes described in the two new tables and in the applicant's responses are consistent with the recommendations in GALL-SLR Report

AMP XI.M27. Furthermore, removal of the term “visual” clarifies that other types of inspection procedures (e.g., wall thickness) are within the scope of the enhancement.

During its evaluation of the applicant’s response to RAI B.2.3.16-1, Request No. 6, the staff noted that the applicant’s proposed revision to plant-specific procedures would appear to allow an evaluation to determine whether to remove loose deposits. The procedures will be revised to state, “[i]f loose deposits are identified in the piping, and the evaluation determines that the deposits must be removed, then the piping is required to be flushed repeatedly, in accordance with NFPA 25 Annex D.5, until it is determined that either no deposits are left or that the remaining deposits pose no blockage threat.” The recommendation in GALL-SLR Report AMP XI.M27 is that a flush is conducted when loose fouling products that could cause flow blockage in the sprinklers is detected, regardless of an evaluation. Based on the statement, “the remaining deposits pose no blockage threat,” the staff finds that there is reasonable assurance that the procedures can provide sufficient guidance with regard to conducting flushes for loose deposits given the stated criterion for completion of flush activities.

For the “monitoring and trending” program element, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.16-2 and the applicant’s response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257.

In its response, the applicant stated that the spray and sprinkler inspection and test procedures will be revised to document and trend deposits including both scale and foreign material. The applicant provided examples of methods and parameters for trending such as: (a) photographs of deposits; (b) weight of the deposits; and (c) elapsed time to complete a flush. The applicant also stated that the procedures will also be revised to include steps to compare the amount of deposits to previous inspection results. Negative trends or inspection results that would indicate a challenge to the system intended function prior to the next inspection will be entered into the corrective action program. The applicant further stated that deposits will be evaluated for potential impacts on downstream components.

The staff finds the applicant’s response and future changes to the spray and sprinkler inspection and test procedures acceptable because consistent with GALL-SLR Report AMP XI.M27, deposits will be documented, trended, and evaluated to determine potential impacts on the intended function of the spray and sprinkler systems.

For the “detection of aging effects” program element, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.16-3 and the applicant’s response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257.

In its response, the applicant stated that it will use the low-frequency electromagnetic testing (LFET) method to conduct raw water tank bottom thickness measurements consistent with GALL-SLR Report AMP XI.M29, Table XI.M29-1, “Tank Inspection Recommendations.” A new plant-procedure will be developed.

During its evaluation of the applicant’s response to RAI B.2.3.16-3, the staff noted that the LFET method of conducting tank bottom thickness measurements is an acceptable method cited in footnote 3 of Table XI.M29-1. The staff finds the applicant’s response and new procedure to conduct raw water tank bottom thickness measurements acceptable because the test methods and periodicity will be consistent with GALL-SLR Report AMP XI.M29.

For the “detection of aging effects” and “monitoring and trending” program element, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.16-4 and the applicant’s response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257.

In its response, the applicant stated that the data collection guidelines of its plant-specific procedure for extending fire protection surveillance frequencies follow the guidance of EPRI Report 1006756, “Fire Protection Equipment Surveillance Optimization and Maintenance Guide,” in regard to the number of years prior to the subsequent period of extended operation from which data would be collected and the minimum sample size to modify test and inspection frequencies. The applicant also stated that the procedure would be revised to not allow performance data to modify surveillance intervals for: (a) raw water tank volumetric and internal tests and inspections; (b) underground flow tests; and (c) inspections of normally dry but periodically wetted piping that will not drain due to its configuration.

During its evaluation of the applicant’s response to RAI B.2.3.16-4, the staff noted that examples provided by the applicant for data collection requirements are consistent with EPRI Report 1006756 Section 11.2.1.1, “How Much Data?” The staff finds the applicant’s response and future changes to the plant-specific procedure as described above acceptable because it is consistent with the current staff position documented in NUREG-2172, “Safety Evaluation Report Related to the License Renewal of Callaway Plant, Unit 1,” Section 3.0.3.2.7, “Fire Water System,” dated March 2015 (ADAMS Accession No. ML15068A342).

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

Enhancement 1. SLRA Section B.2.3.16 includes an enhancement to the “scope of program” program element related to replacement or testing of sprinklers prior to reaching 50 years of service. 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 AMP XI.M27 recommendations associated with sprinkler replacement or testing.

Enhancement 2. SLRA Section B.2.3.16 includes an enhancement to the “parameters monitored or inspected” program element related to volumetric wall thickness measurements of periodically wetted normally dry sprinkler piping. 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 AMP XI.M27 recommendations associated with conducting periodic volumetric wall thickness measurements for water-based piping that is normally dry but periodically subject to flow.

Enhancement 3. SLRA Section B.2.3.16 includes an enhancement to the “parameters monitored or inspected” program element related to additional volumetric wall thickness measurements when surface irregularities are detected. 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 AMP XI.M27 recommendations associated with conducting followup wall thickness measurements when surface irregularities indicate unexpected levels of degradation due to corrosion and corrosion product deposition.

Enhancement 4. SLRA Section B.2.3.16 includes an enhancement to the "detection of aging effects" program element related to procedure changes consistent with GALL-SLR Report AMP XI.M27 Table XI.M27-1, "Fire Water System Inspection and Testing Recommendations." The applicant modified this enhancement in response to RAI b.2.3.16-1 (see the staff's evaluation of the applicant's response to RAI B.2.3.16-1 above). 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 fire water system testing and inspection procedures will be consistent with GALL-SLR Report AMP XI.M27.

Enhancement 5. SLRA Section B.2.3.16 includes an enhancement to the "detection of aging effects" program element related to tests and inspections of periodically wetted normally dry sprinkler piping. 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 AMP XI.M27 recommendations associated with tests and inspections for water-based piping that is normally dry but periodically subject to flow that cannot be drained or allow water to collect.

Enhancement 6. SLRA Section B.2.3.16 includes an enhancement to the "detection of aging effects" program element related to underground internal piping inspections. 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 AMP XI.M27 recommendations associated with using internal inspections of aboveground piping to extrapolate the internal condition of buried and underground piping.

Enhancement 7. SLRA Section B.2.3.16 includes an enhancement to the "detection of aging effects" program element related to qualification requirements for individuals conducting tests and inspections of fire water system components. 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 AMP XI.M27 recommendations associated with qualifications for staff performing tasks associated with managing aging effects for fire water system piping and applicable inspection parameters.

Enhancement 8. As amended by letter dated November 28, 2018, SLRA Section B.2.3.16 includes an enhancement to the "detection of aging effects" program element related to bottom surface inspections of fire water storage tanks. The staff noted that the applicant revised this enhancement and Commitment No. 20 to state that a new procedure to perform tank bottom thickness inspections using the LFET technique and, as necessary, followup ultrasonic examinations will be developed. 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 AMP XI.M27 recommendations associated with bottom thickness measurements for the raw water tanks.

Enhancement 9. SLRA Section B.2.3.16 includes an enhancement to the "monitoring and trending" program element specific requirements for trending tests, flushes, and inspections. 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 AMP XI.M27 recommendations associated with: (a) projecting degradation;

(b) timing of future inspections based on inspection results; (c) and confirmation of the adequacy of sampling-based inspections.

Enhancement 10. SLRA Section B.2.3.16 includes an enhancement to the “monitoring and trending” program element related to continuous monitoring of the fire water system pressure. 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 AMP XI.M27 recommendations associated with continuously monitoring system discharge pressure or using equivalent methods (e.g., jockey pump starts or run time).

Enhancement 11. SLRA Section B.2.3.16 includes an enhancement to the “monitoring and trending” program element related to updating trending procedures. 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 AMP XI.M27 recommendations associated with monitoring key parameters obtained during flow tests, flushes, and wall thickness measurements.

Enhancement 12. SLRA Section B.2.3.16 includes an enhancement to the “acceptance criteria” program element related to minimum component wall thickness acceptance criteria. 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 AMP XI.M27 recommendations associated with maintaining required minimum wall thickness in fire water system components.

Enhancement 13. SLRA Section B.2.3.16 includes an enhancement to the “acceptance criteria” program element related to cross referencing wall thickness acceptance criteria procedures. 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 AMP XI.M27 recommendations associated with maintaining required minimum wall thickness in fire water system components.

Enhancement 14. SLRA Section B.2.3.16 includes an enhancement to the “corrective actions” program element related to conducting additional tests when acceptance criteria are not met. 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 AMP XI.M27 recommendations associated with expanding the scope of testing when inspection results do not meet acceptance criteria.

The staff conducted an audit to verify the applicant’s claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, amendments, and the responses to RAI B.2.3.16-1, B.2.3.16-2, B.2.3.16-3, and B.2.3.16-4, the staff finds that program elements 1 through 7 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M27. The staff reviewed the enhancements associated with the “scope of program,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.16 summarizes operating experience related to the Fire Water System program. The applicant stated that it is actively implementing and managing its AMP overall and seeking to identify areas that will improve the effectiveness of aging management.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 Fie Water System program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.16 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 the applicant committed to ongoing implementation of the existing Fire Water System program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implement the enhancements to the program no later than 6 months prior to the subsequent period of extended operation.

Conclusion. On the basis of its review of the applicant's Fire Water System program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Outdoor and Large Atmospheric Metallic Storage Tanks

SLRA Section B.2.3.17 describes the existing Outdoor and Large Atmospheric Metallic Storage Tanks program as consistent, with enhancements, with GALL-SLR Report AMP XI.M29, "Outdoor and Large Atmospheric Metallic Storage Tanks." The staff identified one exception, described below. The applicant amended this SLRA section by letters dated October 16, 2018, and November 28, 2018.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M29.

For the "scope of program" program element, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.17-1 and the applicant's response are documented in ADAMS Accession Nos. ML18243A006 and ML18296A024.

During its evaluation of the applicant's response to RAI B.2.3.17-1, the staff noted that the applicant added the primary water storage tanks (PWSTs) to the scope of the program in order to provide a makeup flowpath of water to the component cooling water surge tanks (CCWST) that meets the scoping criterion of 10 CFR 54.4(a)(2). The staff noted that the PWST material, environment, and aging effects are the same as for other tanks originally included within the scope of the program. The staff finds the applicant's response and changes to the Outdoor and Large Atmospheric Metallic Storage Tanks program acceptable because the scope of the program was revised to reflect inclusion of the PWSTs and the inspections conducted as described by the program can be capable of detecting loss of material for these tanks.

Exception 1. During its review of SLRA Section B.2.3.17, the staff identified a difference in the "preventive actions" program element. In this difference, the staff noted that sealant or caulking is not used at the tank-to-concrete interface. In regard to this exception, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.17-3 and the applicant's response are documented in ADAMS Accession Nos. ML18260A241 and ML18292A642.

During the onsite audit, the staff noted that: (a) several of the tanks could potentially be exposed to water at the tank to concrete interface; and (b) caulking or sealant was installed at the tank to concrete interface joint; however, in the applicant's response to this RAI, it stated that the caulking would not be credited as a preventive action for the tanks. In its response, the applicant stated that it will use the LFET method to conduct bottom thickness measurements for the condensate storage tanks, refueling water storage tanks, Unit 3 emergency DOST, demineralized water storage tanks, and PWSTs consistent with GALL-SLR Report AMP XI.M29, Table XI.M29-1, "Tank Inspection Recommendations." A new plant-procedure will be developed.

During its evaluation of the applicant's response to RAI B.2.3.16-3, the staff noted that the LFET method of conducting tank bottom thickness measurements is an acceptable method cited in footnote 3 of GALL-SLR Report Table XI.M29-1. The staff finds the applicant's response, with this exception, and the new procedure to conduct tank bottom thickness measurements acceptable because the test methods and periodicity will be consistent with GALL-SLR Report AMP XI.M29 and the test can be capable of detecting localized loss of material at the tank to concrete foundation interface.

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

Enhancement 1. As amended by letter dated October 16, 2018, SLRA Section B.2.3.17 includes an enhancement to the "scope of program" and "acceptance criteria" program elements related to including the Turkey Point Unit 3 emergency diesel fuel oil storage tank and the PWSTs in the scope of the program. 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 plant-specific procedures will appropriately identify the Unit 3 emergency diesel fuel oil storage tank and PWSTs as being in the scope of the program and the acceptance criteria for loss of material, which is consistent with AMP XI.M29.

Enhancement 2. As amended by letter dated November 28, 2018, SLRA Section B.2.3.17 includes an enhancement to the "parameters monitored or inspected," "detection of aging effects," and "monitoring and trending" program elements related to converting one-time inspections to the inspection frequency recommended in GALL-SLR Report AMP XI.M27. The staff noted that the applicant revised this enhancement and Commitment No. 21 to state that a new procedure to perform tank bottom thickness inspections using the LFET technique and, as necessary, followup ultrasonic examinations will be developed. 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, plant-specific procedures will require periodic inspections instead of one-time inspections of the internal tanks surfaces and tank bottom thickness measurements, which is consistent with AMP XI.M29.

Enhancement 3. SLRA Section B.2.3.17 includes an enhancement to the "corrective actions" program element related to increasing the extent of inspections when inspection acceptance criteria are not met. 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 the extent of additional inspections when acceptance criteria are not met will be consistent with AMP XI.M29.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, amendments, and the applicant's responses to RAI B.2.3.17-1 and RAI B.2.3.17-2, the staff finds that program elements 1 through 7 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M29, with the exception of the staff-identified difference between the applicant's program and GALL-SLR Report AMP XI.M29. The staff also reviewed the staff-identified difference between the applicant's program and GALL-SLR Report AMP XI.M29 associated with the "preventive actions" program element, and its justification, and finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.17 summarizes operating experience related to the Outdoor and Large Atmospheric Metallic Storage Tanks program. The applicant stated that the Outdoor and Large Atmospheric Metallic Storage Tanks program, with enhancements, will provide reasonable assurance that the effects of aging will be managed so that the intended function(s) of components within the scope of the program will be maintained consistent with the CLB during the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 Outdoor and Large Atmospheric Metallic Storage Tanks program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.17, as amended by letter dated October 16, 2016, provides the UFSAR supplement for the Outdoor and Large Atmospheric Metallic Storage 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.

The staff also noted that the applicant committed to ongoing implementation of the existing Outdoor and Large Atmospheric Metallic Storage Tanks program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implement the enhancements to the program no later than 6 months prior to the subsequent period of extended operation.

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

Conclusion. On the basis of its review of the applicant's Outdoor and Large Atmospheric Metallic Storage Tanks program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent, with the exception of the staff-identified difference between the applicant's program and GALL-SLR Report AMP XI.M29. In addition, the staff reviewed the staff-identified difference between the applicant's program and GALL-SLR Report XI.M29 and determined that the AMP, with the exception, is adequate to manage the applicable aging effects. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Fuel Oil Chemistry

SLRA Section B.2.3.18 describes the existing Fuel Oil Chemistry program as consistent, with enhancements, with GALL-SLR Report AMP XI.M30, "Fuel Oil Chemistry," with one exception.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M30.

The staff also reviewed the portions of the "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "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 exceptions and enhancements follows.

Exception 1. SLRA Section B.2.3.18 includes an exception to the “detection of aging effects” program element related to cleaning and inspecting the internal surfaces of fuel oil tanks. The staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP XI.M30 and finds it acceptable because the staff understands that the location and geometry of the skid tanks does not allow for complete draining, cleaning, 100 percent internal visual inspection, or volumetric inspection of the bottom of the skid tanks. However, the applicant will drain and clean the skid tanks to the extent practical. In addition, visual inspections will be performed at accessible locations of the skid tank, and volumetric inspections of accessible portions of the skid tank as close to the bottom of the skid tanks as possible will be performed. The staff also notes that when contaminants such as water and microbiological organisms accumulate at the bottom of the tank, loss of material due to general, pitting, and crevice corrosion can occur. The applicant will address accumulated water in the skid tanks by periodically draining accumulated water and will maintain fuel oil quality by testing and analyzing stored fuel oil.

Enhancement 1. SLRA Section B.2.3.18 includes an enhancement to the “preventive actions” program element related to periodic cleaning and draining of water accumulated at the bottom of diesel fuel tanks, and visual inspection of the internal surfaces of diesel fuel 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 AMP XI.M30.

Enhancement 2. SLRA Section B.2.3.18 includes an enhancement to the “parameters monitored or inspected” program element related to monitoring fuel oil quality and inspections of tank internal surfaces. 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 AMP XI.M30.

Enhancement 3. SLRA Section B.2.3.18 includes an enhancement to the “detection of aging effects” program element related to periodic multilevel sampling, periodic draining and cleaning, and inspection of the bottom of diesel fuel 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 AMP XI.M30.

Enhancement 4. SLRA Section B.2.3.18 includes an enhancement to the “monitoring and trending” program element related to monitoring and trending of water, biological activity, and particulate contamination. 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 AMP XI.M30.

Enhancement 5. SLRA Section B.2.3.18 includes an enhancement to the “acceptance criteria” program element related to providing acceptance criteria, consistent with industry standards. 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 “acceptance criteria” program element of the GALL-SLR Report AMP XI.M30.

Enhancement 6. SLRA Section B.2.3.18 includes an enhancement to the “corrective actions” program element related to actions taken to prevent recurrence when the specified limits for fuel oil standards are exceeded or when water is drained during periodic surveillance, or if there is evidence of microbiologically-influenced corrosion, a biocide is added to fuel oil. 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 AMP XI.M30.

Based on its audit, the staff finds that program elements 1 through 7 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M30. The staff also reviewed the exception associated with the "detection of aging effects" program element and its justification. The staff finds that the AMP, with the exception, is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.18 summarizes operating experience related to the Fuel Oil Chemistry program. The applicant stated that the plant-specific operating experience provides objective evidence that the Fuel Oil Chemistry program sampling, inspection, and cleaning activities are effective in identifying fuel oil contamination and that the corrective action program is effectively used to take corrective actions prior to loss of material and fouling in components exposed to a diesel fuel oil environment.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 Fuel Oil Chemistry program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.18 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 the applicant committed to ongoing implementation of the existing Fuel Oil Chemistry program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implement the enhancements to the program no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's Fuel Oil Chemistry program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. In addition, the staff reviewed the exception and its justification and determined that the AMP, with the exception, is adequate to manage the applicable aging effects. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 ASME Code Class 1 Small-Bore Piping

SLRA Section B.2.3.22 describes the existing condition monitoring ASME Code Class 1 Small-Bore Piping program as consistent, with an enhancement, with GALL-SLR Report AMP XI.M35, "ASME Code Class 1 Small-Bore Piping."

Staff Evaluation. During its audit, the staff reviewed the applicant's AMP for consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M35.

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

Enhancement. SLRA Section B.2.3.22 includes an enhancement to the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements to create a new procedure to: (1) perform the one-time inspection as specified in the GALL-SLR Report program; (2) based on the inspection results, evaluate and determine if additional or periodic examinations are required; and (3) perform the additional examinations if required. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M35 and finds it acceptable because when it is implemented the program will be consistent with the GALL-SLR program.

Based on its audit, the staff finds that program elements 1 through 7 are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M35. The staff also reviewed the enhancement 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, it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.22 summarizes operating experience related to the ASME Code Class 1 Small-Bore Piping program. The applicant stated that the ASME Code Class 1 Small-Bore Piping program will be effective in ensuring that the intended functions of the ASME Code Class 1 small-bore piping are maintained consistent with the CLB during the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database;

and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 A.17.2.2.22 provides the UFSAR supplement for the 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 that the applicant committed to ongoing implementation of the existing condition monitoring ASME Code Class 1 Small-Bore Piping program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implementing the enhancement to the program no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's ASME Code Class 1 Small-Bore Piping program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff reviewed the enhancement and confirmed that the implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 External Surfaces Monitoring of Mechanical Components

SLRA Section B.2.3.23 describes the existing External Surfaces Monitoring of Mechanical Components program as consistent, with enhancements, with GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components." The applicant amended this SLRA section by letter dated October 17, 2018.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M36. For the "scope of program" and "detection of aging effects" program elements, the staff determined that it needed additional information, which resulted in the issuance of RAIs B.2.3.23-1 and B.2.3.23-2. The staff's requests and the applicant's responses are documented in ADAMS Accession Nos. ML18260A243 and ML18292A642.

In its response to RAI B.2.3.23-1, the applicant stated that, although the systems crediting the External Surfaces Monitoring of Mechanical Components program in the SLRA are not in the current corresponding implementing procedures of the System and Structures Monitoring program, the transition from the current program to the subsequent period of extended operation program will include both the enhancements identified in the SLRA and other administrative clarifications through revisions to existing procedures or the development of new procedures. The applicant revised Commitment No. 27 in SLRA Table 17-3 to state that it would transition and continue the existing External Surfaces Monitoring of Mechanical Components program with various enhancements. The staff finds the applicant's response and the changes to SLRA Table 17-3 acceptable because the additional systems crediting the External Surfaces Monitoring of Mechanical Components program will be incorporated into the implementing procedures through administrative clarifications or the development of new procedures.

In its response to RAI B.2.3.23-2, the applicant stated that as part of the revisions to the current implementing procedures, the portions that refer to external surfaces monitoring walkdowns being performed under a different AMP will be removed or clarified to clearly indicate that the requirements of both AMPs are met. The staff finds the applicant's response acceptable because the enhancements to the implementing procedures will ensure that where different AMPs credit external surface monitoring, the walkdown requirements of each AMP will be met.

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

Enhancement 1. SLRA Section B.2.3.23 contains an enhancement to the "parameters monitored or inspected" program element to look for aging effects in elastomers and flexible polymeric components based on various parameters, to monitor debris accumulation on in-scope components, and to inspect seals, insulation jacketing, and air-side heat exchanger surfaces. 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 the inspections performed through the program will look for appropriate indications of aging in polymeric materials, seals, insulation jacketing, and air-side heat exchangers, which is consistent with the GALL-SLR Report.

Enhancement 2. SLRA Section B.2.3.23 contains an enhancement to the "detection of aging effects" program element to include qualification requirements for inspection personnel, a minimum sample size of at least 10 percent of the surface area for polymeric materials, a sample size of either 20 percent or 25 components for surface or visual inspections, and alternative methods for detecting moisture inside piping insulation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because when it is implemented the program will include inspection techniques, personnel qualification, and samples sizes that are consistent with the GALL-SLR Report.

Enhancement 3. SLRA Section B.2.3.23, as modified by letter dated October 17, 2018, contains an enhancement to the "monitoring and trending" program element to include spreadsheets for tracking deficiencies to monitor, trend, and resolve issues identified by the program. In addition, the program owner will interface with the recently developed fleet corrosion monitoring action program to identify problem areas and to track deficiency resolutions. The staff reviewed this enhancement as part of its evaluation of the response to RAI B.2.3.23-3 that is discussed in the Operating Experience section below. The staff finds this enhancement acceptable because it represents a portion of the corrective actions taken in response to recent NRC inspection reports documenting the failure to identify and correct external corrosion on certain piping and the failure to inspect other piping in accordance with prior license renewal commitments.

Enhancement 4. SLRA Section B.2.3.23 contains an enhancement to the "acceptance criteria" program element to add the guidance from EPRI aging assessment and identification documents to program procedures for visual/tactile inspections. The staff reviewed this enhancement against the corresponding element in GALL-SLR Report AMP XI.M36 and finds it acceptable because the guidance in the cited EPRI reports are the basis for the acceptance criteria used to develop the GALL-SLR Report program.

Enhancement 5. SLRA Section B.2.3.23 contains an enhancement to the "corrective actions" program element for conducting additional inspections if acceptance criteria are not met and for inspecting additional samples for any recurring degradation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M36 and finds it acceptable because the additional inspections and sampling are consistent with the GALL-SLR Report program.

Based on its audit and its review of the applicant's responses to RAIs B.2.3.23-1, B.2.3.23-2, and B.2.3.23-3, the staff finds that program elements 1 through 7, for which the applicant claimed consistency with the GALL-SLR Report, are consistent with the corresponding program elements of GALL-SLR Report AMP XI.36. The staff reviewed the enhancements associated with the "parameters monitored or inspected," "detection of aging effects," "acceptance criteria," and "corrective actions" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.23 summarizes operating experience related to the External Surfaces Monitoring of Mechanical Components program. The applicant stated that the examples provided in the SLRA provide objective evidence that the program will be effective in ensuring that intended functions are maintained consistent with the CLB.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff identified operating experience for which it determined that it needed additional information, which resulted in the issuance of RAI B.2.3.23-3. The staff's request and the applicant's response are documented in ADAMS Accession Nos. ML18260A243 and ML18292A642.

In its response to RAI B.2.3.23-3, FPL stated that: (1) the fleet system program health reporting procedure was revised to clarify guidance for review by the plant health committee for unacceptable conditions requiring near term or immediate actions to achieve improvement; (2) a fleet corrosion monitoring action program procedure was developed to clarify the requirements and strategies to monitor and control externally initiated corrosion; (3) two spreadsheets were created for Turkey Point that include structures and coatings as part of the "Top Material Condition and Nuclear Coatings Issues," which list critical issues requiring extensive repairs that are reviewed by the plant health committee and include all referenced tracking information; and (4) all site engineers were trained to a newly developed information sharing document that identifies all site and fleet procedures associated with structures, corrosion, and coatings monitoring programs, to re-emphasize the engineer's responsibilities for identifying and notifying program managers of issues in the plant. FPL also revised SLRA Section B.2.3.23 by: (1) adding an enhancement to the "monitoring and trending" program element to include maintaining a spreadsheet of all known deficiencies associated with the program and interfacing with the fleet corrosion monitoring action program; and (2) clarifying that corrective actions to resolve issues regarding the identified ineffectiveness of the program have been initiated but have not been completed. The staff finds FPL's response acceptable because the applicant has taken corrective actions to address the ineffective portions of the existing program.

Based on its audit, review of the application, and review of the applicant's response to RAI B.2.3.23-3, 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 A.17.2.2.23 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. The staff also noted that FPL committed to continue the existing Turkey Point External Surfaces Monitoring of Mechanical Components program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that, as modified by letter dated October 17, 2018, the applicant committed to implement the enhancements to the program no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's External Surfaces Monitoring of Mechanical Components program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report AMP XI.M36 are consistent. The staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Flux Thimble Tube Inspection

SLRA Section B.2.3.24 describes the existing Flux Thimble Tube Inspection program as consistent, with enhancements, with GALL-SLR Report AMP XI.M37, "Flux Thimble Tube Inspection." The applicant amended this SLRA section by letter dated October 17, 2018.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M37.

For the "monitoring and trending" program element, the staff determined that it needed additional information as it relates to the two methodologies (i.e., WCAP-12866 and Turkey Point letter JPNS-Turkey Point-91-5374) used to trend flux thimble tube wall thickness measurements and calculate wear rates, which resulted in the issuance of an RAI. RAI B.2.3.24-1 and the applicant's response are documented in ADAMS Accession No. ML18292A642.

During its evaluation of the applicant's response to RAI B.2.3.24-1, the staff noted that the licensee confirmed that the calculational methodology for wear rate projections in JPNS-Turkey Point-91-5374 is the same as WCAP-12866. Further, the licensee explained that there are calculational methodologies for wear rate projections in these documents; one methodology is provided for cases with sufficient existing data for tube wall thickness (at least two prior inspections), and one for cases without sufficient existing data (i.e., replacement of a tube, or changes to flow rates). The licensee explained that when sufficient data exist, the extent of wall loss is based on an exponentially decreasing curve with a tube-specific exponent value calculated using two tube-specific inspection results. For additional conservatism, the applicant stated that it will enhance its program to ensure that the two most limiting data points are used when calculating a tube-specific exponent value. The staff's evaluation of this enhancement is documented in Enhancement 3.

The staff finds the applicant's response acceptable because the applicant's program incorporates wear projections for situations when past inspection results are and are not available, and bases its examination frequency on actual tube-specific wear data, which is consistent with the recommendations in GALL-SLR Report.

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

Enhancement 1. SLRA Section B.2.3.24 includes an enhancement to the "detection of aging effects" program element. In this enhancement, the applicant stated that it will revise the governing AMP procedure to specify that the interval between inspections will be established such that no flux thimble tube is predicted to incur wear that exceeds the established acceptance criteria before the next inspection.

For this enhancement to the "detection of aging effects" program element, the staff determined that it needed additional information as it relates to periodic inspections to confirm that the site-specific wear predictions are accurate or conservative during the subsequent period of extended operation, which resulted in the issuance of an RAI. RAI B.2.3.24-2 and the applicant's response is documented in ADAMS Accession No. ML18292A642.

During its evaluation of the applicant's response to RAI B.2.3.24-2, the staff noted that the applicant confirmed that the basic examination interval of the AMP is for inspections to be performed every two or three outages and that intervals may deviate from this recommendation provided the new schedule is established through an engineering disposition of the most recent examination results and considers industry initiatives regarding inspection frequency. The staff finds the applicant's response acceptable because the applicant confirmed that its program includes a basic examination interval, and that deviations are made to this interval based on disposition of the most recent examination results such that no flux thimble tube is predicted to incur wear that exceeds the established acceptance criteria before the next inspection.

The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M37 and finds it acceptable because when it is implemented the applicant's program will be consistent with the recommendations in the GALL-SLR Report, such that the timing of future inspections are based on site-specific wear data and projections that ensure that the flux thimble tubes maintain their intended function until the next scheduled inspection.

Enhancement 2. SLRA Section B.2.3.24 includes an enhancement to the “corrective actions” program element. In this enhancement, the applicant stated that it will revise the governing AMP procedure to state that flux thimble tubes that cannot be inspected over the tube length, that are subject to wear due to restriction or other defects, and that cannot be shown by analysis to be satisfactory for continued service are removed from service to ensure the integrity of the RCS pressure boundary.

The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M37 and finds it acceptable because when it is implemented the applicant’s program will be consistent with the recommendations in GALL-SLR, such that necessary and appropriate corrective actions associated with the flux thimble tubes will be taken to ensure that the integrity of the RCS pressure boundary is maintained.

Enhancement 3. SLRA Section B.2.3.24, as amended by letter dated October 17, 2018, includes an enhancement to the “monitoring and trending” program element. In this enhancement, the applicant stated that it will revise the governing AMP procedure to state that the calculational methodology will use the default exponent value methodology from WCAP-12866 to calculate the wear rate. When three or greater data points exist, a calculated exponent value from the two most limiting data points may be used in accordance with the WCAP-12866 methodology.

The staff noted that WCAP-12866 incorporates detailed test data and evaluations and plant-specific wear rate data from Westinghouse-designed thimble tubes. Furthermore, the staff noted that Westinghouse used this compilation of thimble tube wear data to derive a generic and conservative wear rate equation for Westinghouse-designed thimble tubes.

The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.M37, and finds it acceptable because when it is implemented the applicant’s program will be consistent with the recommendations in the GALL-SLR Report, such that flux thimble tube wall thickness measurements are trended and wear rates are calculated based on plant-specific data. In addition, the applicant’s use of the two most limiting plant-specific data points is conservative to ensure that wall thickness acceptance criteria continue to be met during plant operation between scheduled inspections.

Based on its audit and its review of the applicant’s responses to RAI B.2.3.24-1 and RAI B.2.3.24-2, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M37. 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.

<u>Operating Experience</u>. SLRA Section B.2.3.24 summarizes operating experience related to the Flux Thimble Tube Inspection program. The applicant provided a summary of industry and site-specific operating experience for its program. The applicant stated that the plant-specific operating experience provides objective evidence that the Flux Thimble Tube Inspection program is a mature and established program and its effectiveness has been demonstrated.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

The staff noted that the applicant evaluated applicable industry and plant-specific operating experience to determine the effectiveness of its Flux Thimble Tube Inspection program. The applicant also provided examples of plant-specific operating experience that demonstrated its program is capable of (1) identifying wall thinning and replacing flux thimble tubes prior to through-wall wear and (2) implementing program changes based on inspection results. The staff did not identify any operating experience that would indicate that the applicant should consider modifying its proposed program beyond that 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 Flux Thimble Tube Inspection program was evaluated.

<u>UFSAR Supplement</u>. SLRA Section A.17.2.2.24 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 the applicant committed 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 also noted that the applicant committed to implement the enhancements to the program no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

<u>Conclusion</u>. On the basis of its audit and its review of the applicant's Flux Thimble Tube Inspection program, as amended by letter dated October 17, 2018, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancements, as amended by letter dated October 17, 2018, and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Lubricating Oil Analysis

SLRA Section B.2.3.26 describes the existing Lubricating Oil Analysis program as consistent, with enhancements, with GALL-SLR Report AMP XI.M39, "Lubricating Oil Analysis."

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M39.

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 enhancements follows.

Enhancement 1. SLRA Section B.2.3.26 includes an enhancement to the "scope of program" program element related to components exposed to an environment of lubricating oil. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M39 and finds it acceptable because when it is implemented it will be consistent with AMP XI.M39.

Enhancement 2. SLRA Section B.2.3.26 includes an enhancement to the "preventive actions," "parameters monitored or inspected," "detection of aging effects," and "monitoring and trending" program elements related to testing of lubricating oil for moisture and corrosion particles in accordance with industry standards. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M39 and finds it acceptable because when it is implemented it will be consistent with AMP XI.M39.

Enhancement 3. SLRA Section B.2.3.26 includes an enhancement to the "detection of aging effects" program element related to periodic sampling of lubricating oil. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M39 and finds it acceptable because when it is implemented it will be consistent with AMP XI.M39.

Enhancement 4. SLRA Section B.2.3.26 includes an enhancement to the "acceptance criteria" and "corrective actions" program elements related to basing sampling results on equipment manufacturer's recommendations or industry standards, and taking corrective actions when acceptance criteria are reached or exceeded. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M39 and finds it acceptable because when it is implemented it will be consistent with AMP XI.M39.

Based on its audit, the staff finds that program elements 1 through 7 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M39. In addition, the staff reviewed the enhancements associated with the "scope of program," "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 B.2.3.26 summarizes operating experience related to the Lubricating Oil Analysis program. The applicant stated that the plant-specific operating experience provides objective evidence that the Lubricating Oil Analysis program will be capable of maintaining the oil environment in the mechanical systems to the quality required to prevent or mitigate age-related degradation of components within the scope of this AMP. The corrective action program is used to take effective corrective actions prior to loss of component intended function.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 A.17.2.2.26 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-01. The staff also noted that the applicant committed to ongoing implementation of the existing Lubricating Oil Analysis program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implement the enhancements to the program no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's Lubricating Oil Analysis program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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 Monitoring of Neutron-Absorbing Materials other than Boraflex

SLRA Section B 2.3.27 describes the existing Monitoring of Neutron-Absorbing Materials other than Boraflex program as consistent, with enhancements, with GALL-SLR Report AMP XI.M40, "Monitoring of Neutron-Absorbing Materials other than Boraflex." The applicant amended this SLRA section by letter dated October 16, 2018.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.M40.

For the "detection of aging effects" program element, the staff determined that it needed additional information, which resulted in the issuance of RAIs. RAIs B.2.3.27-1 and B.2.3.27-2, and the applicant's responses are documented in ADAMS Accession Nos. ML18243A006, ML18296A024, ML18352A885, and ML19035A195.

During its evaluation of the applicant's response to RAI B.2.3.27-1, the staff noted that the applicant plans to conduct testing, and to monitor the neutron-absorbing materials past the 30 years originally described in the site procedures and through the subsequent period of extended operation. The staff finds the applicant's response, and changes to SLRA Appendix A, Table 17-3, Commitment No. 31 and Section B.2.3.27 acceptable because the condition of the neutron-absorbing materials will continue to be monitored throughout the subsequent period of extended operation. Therefore, the applicant's program will be consistent with the GALL-SLR Report.

During its evaluation of the applicant's response to RAI B.2.3.27-2, the staff noted that the applicant proposed to submit a license amendment request to revise TS surveillance requirement (SR) 4.9.14.2 at least 18 months prior to entering the subsequent period of extended operation. The SR will be revised to reference UFSAR Section A.17.2.2.27. The staff finds the applicant's response, and changes to SLRA Appendix A, Table 17-3, Commitment No. 31, acceptable because these provide reasonable assurance that the SR will reference the appropriate Neutron-Absorbing Materials other than Boraflex program in the UFSAR.

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

Enhancement 1. SLRA Section B.2.3.27 includes an enhancement to the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective action" program elements, which would create a new surveillance procedure to manage aging effects of the Boral neutron-absorbing material in the spent fuel pool. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M40 and finds it acceptable because when it is implemented it will create a new surveillance program to manage aging effects associated with the Boral neutron-absorbing material in the spent fuel pool that is consistent with GALL-SLR Report.

Enhancement 2. SLRA Section B.2.3.27 includes an enhancement to the "detection of aging effects" program element that would modify the frequency of the Metamic inspection and testing to ensure that test intervals do not exceed 10 years. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M40 and finds it acceptable because when it is implemented it will ensure that the maximum interval between each Metamic inspection and coupon test doesn't exceed 10 years, which is consistent with the GALL-SLR Report.

Enhancement 3. SLRA Section B.2.3.27 includes an enhancement to the "monitoring and trending" program element that would provide for comparison of periodic test data to baseline data and prior measurements in order to trend and project future degradation of the neutron-absorbing material. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M40 and finds it acceptable because when it is implemented it will provide for trending of inspection and coupon measurements to baseline data, as well as for projecting future degradation, which is consistent with the GALL-SLR Report.

Enhancement 4. SLRA Section B.2.3.27 includes an enhancement to the “corrective actions” program element that would require corrective actions if measurement results and analyses indicate that the 5 percent subcriticality margin cannot be maintained because of current or projected degradation of the neutron-absorbing material. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.M40 and finds it acceptable because when it is implemented it will ensure that the applicant takes corrective actions to install an alternate neutron-absorbing material, or to take other actions, if the Metamic neutron-absorbing material degrades in order to maintain the 5 percent subcriticality margin, consistent with the GALL-SLR Report.

Based on its audit and its review of the applicant’s responses to RAIs B.2.3.27-1 and B.2.3.27-2, the staff finds that program elements 1 through 7 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.M40. In addition, the staff reviewed the enhancements associated with the “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “corrective actions,” program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.27 summarizes operating experience related to the Monitoring of Neutron-Absorbing Materials other than Boraflex program. The applicant stated that the operating experience provides evidence that the Monitoring of Neutron-Absorbing Materials other than Boraflex AMP will be effective in ensuring the intended functions are maintained consistent with the CLB for the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant’s corrective action program database; and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 Monitoring of Neutron-Absorbing Materials other than Boraflex program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.27 provides the UFSAR supplement for the Monitoring of Neutron-Absorbing Materials other than Boraflex program.

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

The staff also noted that the applicant committed to ongoing implementation of the existing Monitoring of Neutron-Absorbing Materials other than Boraflex program for managing the effects of aging for applicable components during the subsequent period of extended operation.

Additionally, the staff noted that the applicant committed to continue the existing neutron-absorbing material monitoring program for Metamic, and to implement the enhancements to the “detection of aging effects,” “monitoring and trending,” and “corrective actions” program elements for the Metamic monitoring program. The applicant also committed to implement enhancements to manage aging effects of the Boral neutron-absorbing material, and, in response to RAI B.2.3.27-2, to submit a license amendment request to revise SR 4.9.14.2 to reference UFSAR Section A.17.2.2.27. The commitments to implement enhancements to the Metamic and Boral monitoring programs will be implemented no later than 6 months prior to the subsequent period of extended operation. The commitment to submit a license amendment request will be implemented no later than 18 months prior to the subsequent period of extended operation.

The staff finds that the information in the UFSAR supplement, as amended by letter dated October 16, 2018, is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's Monitoring of Neutron-Absorbing Materials other than Boraflex program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with AMP XI.M40. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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).

3.0.3.2.26 ASME Section XI, Subsection IWE

SLRA Section B.2.3.30 describes the existing ASME Section XI, Subsection IWE program as consistent, with enhancements, with GALL-SLR Report AMP XI.S1, "ASME Section XI, Subsection IWE." The applicant amended this SLRA section by letters dated October 17, 2018, November 2, 2018, December 14, 2018, and February 13, 2019.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.S1.

For the "detection of aging effects" program element, the staff determined that it needed additional information, which resulted in the issuance of RAIs. RAIs B.2.3.30-1 and B.2.3.30-1a and the applicant's responses are documented in ADAMS Accession Nos. ML18292A642, ML18352A885, and ML19050A420.

During its evaluation of the applicant's response to RAIs B.2.3.30-1 and B.2.3.30-1a, the staff noted that: (1) the amended enhancement specifies one-time volumetric examination in both units by sampling random and focused areas of the containment liner, if triggered by plant-specific operating experience of liner corrosion initiated on the inaccessible (concrete) side in either unit; (2) the amended enhancement specifies that sampling conducted for this one-time examination will statistically demonstrate, with 95 percent confidence, that 95 percent of the accessible portion of the liner is not experiencing degradation of greater than 10 percent loss of wall thickness; (3) the response clarified that the 2006 operating experience of the small hole found in the Unit 4 reactor cavity sump liner plate was determined to have originated on the accessible side (and not the inaccessible side) of the liner and attributed to boric acid and galvanic corrosion, thus there has been no operating experience at Turkey Point of containment liner corrosion initiating on the inaccessible side since the June 6, 2002, issuance of the Turkey Point renewed licenses, and the operating experience triggering the one-time volumetric examination has not occurred to date. The staff finds the applicant's response and changes to the SLRA AMP and UFSAR supplement acceptable because: (1) the revised enhancement includes the operating experience trigger, sampling specifications, and acceptance criteria for the one-time supplemental volumetric examination of the containment liner consistent with that recommended in the GALL-SLR Report AMP; (2) the proposed implementation schedule of conducting the one-time examination in both units within two RFOs of identifying the triggering operating experience in either unit is reasonable; and (3) it clarified that the triggering operating experience has not occurred at Turkey Point to date.

The staff notes that SLRA Section B.2.3.30 was also amended as a result of RAIs 3.5.9-1, 3.5.9-2, 3.5.2.1.2-1 and 3.5.2.1.2-1a. The staff evaluation of the applicant's response to these RAIs is documented in SER Sections 3.5.2.2.1.5 and 3.5.2.2.1.6.

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

Enhancement 1. SLRA Section B.2.3.30 includes an enhancement (which corresponds to Commitment No. 34(a) in SLRA Table 17-3) to the "preventive actions" program element that relates to maintaining bolting integrity. 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 it will provide guidance for "preventive actions" for proper selection and storage of bolting and coating material and lubricants, and appropriate installation torque consistent with industry standards to provide reasonable assurance that bolting integrity is maintained, which is consistent with the recommendations of GALL-SLR Report AMP XI.S1.

Enhancement 2. SLRA Section B.2.3.30, as amended by letters dated December 14, 2018, and February 13, 2019, includes an enhancement (which corresponds to Commitment No. 34(b) in SLRA Table 17-3) to the "detection of aging effects" program element that relates to conducting a one-time volumetric examination of the containment liner if triggered by plant-specific operating experience of corrosion initiated on the inaccessible side. 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 it will include actions, sampling criteria (random and focused areas), and statistical-based acceptance criteria consistent with GALL-SLR Report AMP XI.S1 recommendations to conduct a one-time supplemental volumetric examination (on both units) of the containment liner surfaces inaccessible from one side, if triggered by plant-specific operating experience of corrosion (in either unit) initiated on the inaccessible side since the issuance of the first renewed license through the end of the subsequent period of extended operation. Based on the information provided in responses to RAIs B.2.3.30-1 and B.2.3.30-1a, the staff notes that the triggering operating experience has not occurred to date at Turkey Point. The proposed schedule for conducting the examination in both units, if the triggering operating experience occurs in either unit, within two RFOs of the operating experience identification is reasonable considering that the one-time supplemental examination is intended to confirm the effectiveness of the AMP for managing potential liner corrosion degradation from the inaccessible side.

Enhancement 3. SLRA Section B.2.3.30, as amended by letters dated December 14, 2018, and February 13, 2019, includes an enhancement (which corresponds to Commitment No. 34(c) in

SLRA Table 17-3) to the "detection of aging effects" and "corrective action" program elements that relates to conducting a one-time inspection to confirm the absence of SCC in potentially susceptible containment penetration components. 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 it will require a one-time supplemental examination, prior to the subsequent period of extended operation, of the stainless steel fuel transfer tube and a representative sample of dissimilar metal welds of susceptible containment penetrations in each unit. This one-time examination will confirm the presence or absence of SCC aging effect or mechanism. If absence of the aging effect cannot be confirmed, periodic supplemental examination will be added to the program at an interval consistent with other IWE examinations. The examination method that will be used (surface or enhanced visual) is consistent with that recommended in the GALL-SLR Report for detecting cracking due to SCC.

Enhancement 4. SLRA Section B.2.3.30, as amended by letters dated December 14, 2018, and February 13, 2019, includes an enhancement (which corresponds to Commitment No. 34(d) in SLRA Table 17-3) to the "operating experience" program element that relates to addressing NRC Information Notice (IN) 2014-07, "Degradation of Leak-Chase Channel Systems for Floor Welds of Metal Containment Shell and Concrete Containment Metallic Liner," dated May 5, 2014, with regard to the examination of accessible air chase (leak-chase) test connections at the containment floor interface. The staff notes that the response to RAI B.2.3.30-2a, dated February 13, 2019, indicates that the applicant updated (since the December 14, 2018, letter) the IWE inspection procedure/plan to include examination of accessible air chase system test connections in each unit, in accordance with Table IWE-2500-1, Examination Category E-A, item E.1.30 of Subsection IWE of ASME Section XI, for future IWE inspections. The applicant further amended the enhancement to indicate only the acceptance criteria and potential corrective action for this examination. The staff reviewed the enhancement against the corresponding program element in GALL-SLR Report AMP XI.S1 and finds it acceptable because when it is implemented it will result in periodic general visual examination of accessible containment floor air chase system test connections against acceptance criteria specified in the enhancement (which is no evidence of loose or degraded air chase test connections). If a loose or degraded test connection is found, prior to repair, it will be opened and the air chase channel inspected internally to confirm no water intrusion to the liner. These actions are consistent with the recommendations in IN 2014-07.

Enhancement 5. SLRA Section B.2.3.30, as amended by letter dated December 14, 2018, includes an enhancement (which corresponds to Commitment No. 34(e) in SLRA Table 17-3) to the "detection of aging effects" program element that relates to performing periodic surface examinations at a frequency consistent with Subsection IWE to detect cracking due to cyclic loading. The enhancement applies to non-piping containment penetrations (e.g., hatches, electrical penetrations, etc.), dissimilar metal welds, and fuel transfer tube expansion joints. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S1 and finds it acceptable because when it is implemented it will require periodic supplemental surface examinations to detect cracking due to cyclic loading for containment pressure-retaining components subject to cyclic loading but that have no CLB fatigue analyses, which is consistent with recommendations in the GALL-SLR Report AMP.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on its review of the SLRA, amendments, and responses to RAIs B.2.3.30-1, B.2.3.30-1a, 3.5.9-1, 3.5.9-2, 3.5.2.1.2-1, and 3.5.2.1.2-1a, the staff finds that "scope of program," "parameters monitored or inspected," "monitoring and trending," and "acceptance criteria" program elements for which the applicant claimed consistency with the GALL-SLR

Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.S1. In addition, the staff reviewed the enhancements associated with the "preventive actions," "detection of aging effects," "corrective actions," and "operating experience" program elements and finds that, when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.30, as amended by letters dated December 14, 2018, and February 13, 2019, summarizes operating experience related to the ASME Section XI, Subsection IWE AMP. The applicant stated that the AMP will continue to be effective as it is informed and enhanced by industry operating experience, and that the plant-specific operating experience provides objective evidence that the ASME Section XI, Subsection IWE AMP will be effective in ensuring that component intended functions are maintained consistent with the CLB through the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

The staff identified an industry operating experience issue for which it determined that it needed additional information, which resulted in the issuance of RAIs. RAIs B.2.3.30-2 and B.2.3.30-2a, and the applicant's responses are documented in ADAMS Accession Nos. ML18352A885 and ML19050A420.

During its evaluation of the applicant's responses to RAI B.2.3.30-2 and B.2.3.30-2a, the staff noted that: (1) consistent with the recommendations in IN 2014-07, the IWE inspection procedure/plan was updated since the December 14, 2018, letter to include periodic general visual examination of 100 percent of the accessible air chase test connections at the containment floor-level interfaces in each unit; (2) this examination will be performed in accordance with Table IWE-2500-1, Examination Category E-A, item E1.30, "Moisture Barriers" of ASME Section XI, Subsection IWE, at a frequency specified by the code for that item; (3) an amended program enhancement (Enhancement 4, evaluated above) will revise the IWE procedure/plan to specify the acceptance criteria and related action(s) for the examination, which are (a) no evidence of loose or degraded air chase test connections; and (b) if a loose or degraded test connection is identified, it will be opened prior to repair and the test connection and air chase channel inspected internally to confirm no water intrusion that could cause degradation of the liner; (4) there is no past operating experience at Turkey Point Units 3 and 4 of moisture intrusion into inaccessible containment liner areas through the air chase system interfaces that could cause degradation of the inaccessible liner areas; and (5) it clarified that the air chase test connections are included in Table 3.5.2-1 under the component description "Liner plate, anchors and attachments…." The staff finds the applicant's response and changes to the AMP, UFSAR supplement, and Table 17-3 acceptable because (a) the actions proposed for periodic examination of accessible air chase system test connections at containment floor interfaces of each unit are consistent with the recommendations in IN 2014-07 and (b) there has been no past operating experience of containment liner degradation in inaccessible areas due to moisture intrusion through the air chase system.

Based on its audit and its review of the application and the applicant's responses to RAIs B.2.3.30-2 and B.2.3.30-2a, 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 A.17.2.2.30, as amended by letters dated December 14, 2018, and February 13, 2019, 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 the applicant committed to ongoing implementation of the existing ASME Section XI, Subsection IWE AMP for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implement the enhancements to the program and pre-subsequent period of extended operation one-time inspections no later than 6 months or the last RFO prior to the subsequent period of extended operation. The staff further noted that the applicant committed to complete the one-time volumetric examination of containment liner in both units, if degradation from the inaccessible (concrete) side is identified in either unit, within two outages of such identification prior to or during the subsequent period of extended operation.

The staff finds that the information in the UFSAR supplement, as amended by letters dated December 14, 2018, and February 13, 2019, is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's ASME Section XI, Subsection IWE program, as amended, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended 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).

3.0.3.2.27 ASME Section XI, Subsection IWL

SLRA Section B.2.3.31 describes the existing ASME Section XI, Subsection IWL program as consistent, with enhancements, with GALL-SLR Report AMP XI.S2, "ASME Section XI, Subsection IWL," with an exception. The applicant amended this SLRA section by letters dated October 17, 2018, November 28, 2018, December 14, 2018, and May 6, 2019.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements to the corresponding program elements of GALL-SLR Report AMP XI.S2. Subsequent to the audit, the applicant submitted a letter dated October 17, 2018, which added clarifications to SLRA Section B.2.3.31. Additionally, the applicant submitted a letter dated December 14, 2018, that supplemented the

October 17, 2018, response with additional clarifications discussed during the November 15, 2018 NRC public meeting with the applicant (ADAMS Accession No. ML18315A004).

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

Exception. SLRA Section B.2.3.31, as amended by letter dated May 6, 2019 (in response to RAI B.2.2.3-1a (follow-up)), includes an exception to the “monitoring and trending” program element. The staff’s review of this exception is documented in Section 3.0.3.2.3, Exception 3.

Enhancement 1. SLRA Section B.2.3.31 includes an enhancement to the “acceptance criteria” program element. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S2 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations for calculating the predicted tendon forces using the methodology in RG 1.35.1.

Enhancement 2. SLRA Section B.2.3.31, as amended by letter dated November 28, 2018, in response to operating experience RAI B.2.3.31-1 discussed below, includes an enhancement to the “preventive actions” program element. The enhancement relates to the implementation of appropriate inspection intervals and the continuation of existing periodic inspections and water removal for the tendon pits (buttress pits) and tendon galleries. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S2 and finds it acceptable because when it is implemented it will ensure tendon pits and galleries are inspected and water removed, which will serve to prevent water intrusion into the tendon systems that could cause corrosion.

Enhancement 3. SLRA Section B.2.3.31, as amended by letter dated November 28, 2018, in response to operating experience RAI B.2.3.31-1 discussed below, includes an enhancement to the “parameters monitored or inspected” program element. The enhancement relates to supplemental visual inspections of a wire selected from a random vertical, dome, and horizontal tendon of each unit at locations most susceptible to grease leakage, water in-leakage, and water intrusion. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S2 and finds it acceptable because when it is implemented it will adequately address plant-specific operating experience (consistent with the recommendations of the GALL-SLR Report AMP “operating experience” program element) by performing additional inspections such that age-related degradation can be identified prior to a loss of intended function.

Enhancement 4. SLRA Section B.2.3.31, as amended by letter dated November 28, 2018, in response to operating experience RAI B.2.3.31-1 discussed below, includes an enhancement to the “detection of aging effects” program element. The enhancement relates to the completion and acceptability of conditions found during supplemental inspections to be performed for grease leakage and water intrusion indications in random tendons. By letter dated May 6, 2019, as part of its response to RAI B.2.2.3-1a on issues related to the Concrete Containment Unbonded Tendon Prestress program, the applicant amended this enhancement and respective Commitment No. 35 to clarify that this enhancement will be implemented no later than during the 50th (i.e., 2022 for Unit 3) and 55th (i.e., 2027 for Unit 4) year surveillances. The staff’s evaluation of the applicant's response to RAI B.2.2.3-1a is documented in SER Section 3.0.3.2.3. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S2 and finds it acceptable because when it is implemented the supplemental inspections will provide for timely identification of age-related degradation, and this will be done prior to the subsequent period of extended operation such that corrective actions can be taken as necessary to ensure that the program will adequately manage age-related degradation of tendons from the start of the subsequent period of extended operation.

Enhancement 5. SLRA Section B.2.3.31, as amended by letter dated November 28, 2018, in response to operating experience RAI B.2.3.31-1 discussed below, includes an enhancement to the "monitoring and trending" program element. By letter dated May 6, 2019, as part of its response to RAI B.2.2.3-1a on issues related to the Concrete Containment Unbonded Tendon Prestress program the applicant added a new activity (b) under this enhancement. The enhancement relates to the selection of a common dome tendon for inspection. The staff's evaluation of the applicant's response to RAI B.2.2.3-1a and of this enhancement is documented in SER Section 3.0.3.2.3 Enhancement 2.

Enhancement 6. SLRA Section B.2.3.31, as amended by letter dated November 28, 2018, in response to operating experience RAI B.2.3.31-1 discussed below, includes an enhancement to the "acceptance criteria" program element, which relates to acceptance criteria for supplemental inspections of tendons. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S2 and finds it acceptable because when it is implemented it will provide requirements for supplemental inspections which are adequate to address plant-specific operating experience (consistent with the recommendations of GALL-SLR Report AMP "operating experience" program element), which warrants additional inspections such that age-related degradation can be identified prior to a loss of intended function.

Enhancement 7. SLRA Section B.2.3.31, as amended by letter dated November 28, 2018, in response to operating experience RAI B.2.3.31-1 discussed below, includes an enhancement to the "corrective actions" program element, which relates to corrective actions associated with supplemental inspections. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S2 and finds it acceptable because when it is implemented, it will add corrective actions specific to the performance of supplemental inspections for tendon degradation, which ensures that quality assurance of the corrective action program is applied to the additional inspections in the enhanced ASME Section XI, Subsection IWL program.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, amendments, and responses to RAIs B.2.3.31 1 and B.2.2.3-1a, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.S2. The staff also reviewed the exception associated with the "monitoring and trending" program element and its 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 "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and “corrective actions” program elements and finds that when implemented, they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.31 summarizes operating experience related to the ASME Section XI, Subsection IWL program. The staff evaluated operating experience information by reviewing the SLRA and conducting audits (ADAMS Accession Nos. ML18183A445 and ML18341A024 for the operating experience audit report and the onsite audit report, respectively).

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant’s corrective action program database; and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

The staff identified operating experience for which it determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.31-1 and the applicant’s response is documented in ADAMS Accession No. ML18334A182. The staff also notes that by letter dated May 6, 2019, the applicant revised the timeline for implementation of the commitments (Commitment No. 35) associated with the response to RAI B.2.3.31-1.

In its response to the staff’s concerns regarding grease leakage and water drainage at tendon assemblies, the applicant stated that, considering their operating experience relative to grease leakage or water drainage out of prestressing tendons and the non-functional containment cathodic protection system, supplemental inspection is warranted. The supplemental inspections will consist of, first, a baseline visual inspection to be performed in accordance with existing tendon inspection procedures of a wire from a representative vertical and dome or other tendon from each unit, selected based on the most significant operating experience. The baseline supplemental inspection will be added to the 50th year interval, which is approximately 10 years prior to the subsequent period of extended operation. Second, a followup baseline supplemental inspection of the same two tendons will be conducted under the 55th year interval, which is approximately 5 years prior to the subsequent period of extended operation. The purpose of the second baseline supplemental inspection will be to confirm that there has been no unacceptable grease leakage or water intrusion based on the results of the previous inspection. This will provide direct evidence that tendon degradation is detected in a timely manner using the current IWL inspection frequency or will identify the need to establish more frequent inspections.

For horizontal tendons in the below-grade tendon inspection pits and tendon galleries, the supplemental inspection will include a wire from a lower hoop tendon for each unit as a leading indicator for potential degradation or tendon surface corrosion. The applicant stated that the program will also be enhanced to ensure that periodic inspections and water removal for the tendon inspection pits and tendon galleries are performed and will be credited as preventive actions. The applicant updated the SLRA accordingly. The applicant added enhancements to the program to capture these supplemental activities.

The staff finds the applicant’s response to RAI B.2.3.31-1 acceptable because:

(1) The scope of the supplemental inspections is based on the areas that have experienced the most degradation and visual inspections are adequate to detect corrosion of the tendon wires.

(2) A baseline for the condition of the inspected wires for vertical and dome tendons in each unit will be established prior to the subsequent period of extended operation to confirm that corrosion is not occurring and then a followup inspection at the start of the subsequent period of extended operation will identify if there is grease leakage or water intrusion that could lead to corrosion and determine whether the IWL-driven inspection frequency is sufficient to detect degradation prior to a loss of intended function.

(3) Supplemental inspections of lower hoop tendon wire for each unit will be conducted to provide leading indications for exposure of the tendon to moisture that could lead to tendon corrosion.

(4) The program is revised to ensure that the existing periodic inspections and water removal for tendon pits and galleries continue to be performed through the subsequent period of extended operation.

Subsequent to the audit, in a letter dated October 17, 2018, the applicant added information pertaining to the reactor vessel closure head (RVCH) replacement, discussing the removal, replacement, and retensioning of tendons to support the plant modification. In addition, the October 17, 2018, letter added supplemental information regarding the operating experience listed in SLRA Section B.2.3.31. By letter dated May 6, 2019, the applicant again revised the SLRA to include operating experience related to Unit 3 current common dome tendon 3D08 which, during the Unit 3 20th year surveillance in 1992, was de-tensioned for wire removal and therefore does not meet the ASME Code, Section XI, Subsection IWL criteria for a common tendon. The staff's review of this operating experience and its concerns with current common dome tendon 3D08, for which the staff issued RAI B.2.2.3 1a, are discussed in SER Section 3.0.3.2.3.

Based on its audit and its review of the application and the applicant's responses to RAI B.2.3.31-1 and RAI B.2.2.3 1a, 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 A.17.2.2.31 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 the applicant 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 also noted that the applicant committed to enhance the program to calculate predicted tendon forces in accordance with RG 1.35.1. In addition, the applicant updated the SLRA by letters dated November 28, 2018, and May 6, 2019 (ADAMS Accession Nos. ML18334A182 and ML19128A149, respectively), to include commitments to:

(1) Include a supplemental visual inspection in the 50th year interval for one unit and the 55th year interval for the other unit for:

- a wire of a representative (random) vertical tendon for each unit at location of greatest and/or frequent grease leakage

- a wire of a representative (random) dome or other tendon for each unit at location of greatest and/or frequent water inleakage
- a wire of a (random) lower horizontal tendon for each unit at location of highest susceptibility to water intrusion in tendon inspection pits.

(2) Include a confirmation in the 50th year interval for one unit and 55th year interval for the other unit that there has been no unacceptable grease leakage or water intrusion from the previously inspected (random) tendons.

(3) Ensure that existing periodic inspections and water removal for the tendon inspection pits (buttress pits) and tendon galleries continue at appropriate intervals through the subsequent period of extended operation.

(4) Review the AMP governing procedure, or develop a new implementing procedure, to direct the trending and evaluation of related operating experience and documentation of same.

(5) Select a new common tendon for Unit 3 during the 50th year surveillance

The staff finds that the information in the UFSAR supplement, as amended by letters dated November 28, 2018, and May 6, 2019, is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's ASME Section XI, Subsection IWL program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. In addition, the staff reviewed the exception and justification and determined 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.28 ASME Section XI, Subsection IWF

SLRA Section B.2.3.32 describes the existing ASME Section XI, Subsection IWF program as consistent, with enhancements, with GALL-SLR Report AMP XI.S3, "ASME Section XI, Subsection IWF," with exceptions. The applicant amended this SLRA section by letters dated February 13, 2019, March 15, 2019, and May 6, 2019.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.S3.

For the "preventive actions," "detection of aging effects," and "monitoring and trending" program elements, the staff determined that it needed additional information, which resulted in the issuance of RAIs. RAIs B.2.3.32-1 and B.2.3.32-2 and the applicant's responses are documented in ADAMS Accession Nos. ML18341A003 and ML19050A420.

During its evaluation of the applicant's response to RAIs B.2.3.32-1 and B.2.3.32-2, the staff noted that volumetric inspections will begin during the inspection interval prior to the start of the subsequent period of extended operation. The staff also noted that for each inspection, the sample of high-strength bolting to be inspected will consist of 20 percent of high-strength bolting up to a maximum of 25 bolts per unit. Additionally, the staff noted that the use of sulfur-containing lubricants will be prohibited at Turkey Point prior to the start of the subsequent period of extended operation. The staff finds the applicant's response and changes to the AMP and UFSAR supplement acceptable because (1) by performing volumetric examinations prior to the start of the subsequent period of extended operation, the program will identify cracking due to SCC and will allow for corrective actions to occur to prevent brittle failure prior to the first inspection interval of the subsequent period of extended operation; (2) the program is using a sample size that is consistent with other sampling programs and is sufficient to detect aging; and (3) sulfur-containing lubricants such as molybdenum disulfide will not be used, which lowers the likelihood of contaminants causing cracking due to SCC. In addition, the applicant clarified that the program is enhanced to modify the sample population of component supports when a support in the sample is repaired to as-new condition, which provides assurance that aging effects detected by the sample being inspected is representative of the remaining population of supports/components.

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 "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. In addition, the response to RAI 3.5.2.2.2.6-9 (ADAMS Accession No. ML19128A149), which is reviewed and evaluated in SER Section 3.5.2.2.2.6, added enhancements to the "scope of program," "detection of aging effects," "monitoring and trending" and "corrective actions" program elements. The staff's evaluation of the exceptions and enhancements follows.

Exception 1. SLRA Section B.2.3.32 includes an exception to the "preventive actions" program element. The staff reviewed this exception against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because the program includes volumetric examinations of a representative sample of bolting which will detect cracking due to SCC prior to a loss of intended function, consistent with recommendations in GALL-SLR Section XI.S3.

Exception 2. During its review of revised SLRA Section B.2.3.32, the staff identified a difference in the "parameters monitored or inspected" program element. Specifically, the staff noted that the applicant did not address loss of fracture toughness (as indicated by cracking) as a parameter to be monitored for the ASME Class 1 reactor pressure vessel (RPV) supports and structural bolting used in ASME Class 1 RPV supports as noted in AMR items included in the revised SLRA, dated May 6, 2019. The applicant addressed loss of fracture toughness (cracking) in the "detection of aging effects" and "scope of program" program elements as monitoring "applicable aging effects," which in this case includes cracking as discussed in SER Section 3.5.2.2.2.6.

The staff reviewed this difference against the corresponding program elements in GALL-SLR Report AMP XI.S3 and SRP-SLR Section A.1, "Aging Management Review—Generic (Branch Technical Position RLSB-1)," and finds it acceptable because the applicant plans to monitor the performance of the RPV supports by "detecting the presence and extent of aging effects" that include loss of fracture toughness/cracking through "inspections for cracking that could potentially impact the[ir] intended function." This is consistent with the guidance in GALL-SLR Report AMP XI.S3 and SRP-SLR Section A.1.2.3.3, which recommends the establishment of a link between the degradation of the particular structure or component-intended function(s) and the parameter(s) being monitored.

Enhancement 1. SLRA Section B.2.3.32, as revised by letter dated May 6, 2019, includes an enhancement to the "scope of program" program element which relates to visual inspections of accessible portions of all six RPV supports. Components to be inspected include accessible portions of the beams, bolting, rollers, and brackets. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and SRP-SLR Section A.1 and finds it acceptable because it incorporates the accessible portions of specific components to be inspected consistent with the guidance provided in GALL-SLR Report AMP XI.S3 and the review and acceptance procedures of SRP-SLR Section A.1.2.3.1.

Enhancement 2. SLRA Section B.2.3.32 includes an enhancement to the "preventive actions" program element which relates to storage of high-strength bolting materials. 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 be consistent with GALL-SLR Report recommendations to store high-strength bolts in accordance with Section 2 of the Research Council on Structural Connections' "Specification for Structural Joints Using High Strength Bolts."

Enhancement 3. SLRA Section B.2.3.32 includes an enhancement to the "preventive actions" program element which relates to the disuse of molybdenum disulfide and other lubricants containing sulfur. The applicant added this enhancement in response to RAI B.2.3.32-2. 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 be consistent with GALL-SLR Report recommendations to prohibit the use of molybdenum disulfide and other lubricants containing sulfur as a preventive measure to manage cracking due to SCC.

Enhancement 4. The revised SLRA Section B.2.3.32 includes an enhancement to the "parameters monitored or inspected" program element which relates to the identification of high-strength bolts 1-inch or greater in size and the subsequent sampling for volumetric examinations to detect cracking due to SCC. The applicant revised the enhancement in its response to RAI B.2.3.32-1. 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 identify the sample for performing volumetric examinations, or will inspect removed high-strength bolting using a method capable of detecting cracking to ensure that the program will detect cracking due to SCC.

Enhancement 5. SLRA Section B.2.3.32 includes an enhancement to the "detection of aging effects" program element which relates to a one-time inspection of an additional 5 percent of the sample size specified in Table IWF-2500-1. 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 inspections of component supports not previously inspected by the program to ensure that the routinely inspected sample is representative of the aging of the remaining population of supports, consistent with recommendations in GALL-SLR Report AMP XI.S3.

Enhancement 6. SLRA Section B.2.3.32 includes an enhancement to the "detection of aging effects" program element which relates to managing aging of elastomeric vibration isolation elements. 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 use tactile inspection methods capable of detecting hardening to indicate loss of vibration isolation function, consistent with recommendations in GALL-SLR Report AMP XI.S3.

Enhancement 7. SLRA Section B.2.3.32 includes an enhancement to the "detection of aging effects" program element which relates to the use of volumetric examinations to detect cracking due to SCC. In response to RAI B.2.3.32-1, the applicant stated that it will begin volumetric inspections during the inspection interval prior to the start of the subsequent period of extended operation. As an alternative to volumetric examinations, bolting may be removed and inspected using a technique capable of detecting cracking. The applicant also stated that the sample of volumetric examinations will consist of 20 percent of high-strength bolting within the boundaries of IWF-1300, up to a maximum of 25 bolts per unit. The applicant also stated that even if additional high-strength bolting is installed, this sample will represent the most susceptible locations since molybdenum disulfide and other sulfur-containing lubricants will be prohibited for use at Turkey Point. 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 ensure that a representative sample of high-strength bolting is volumetrically examined or alternatively removed and inspected for cracking due to SCC. The volumetric examinations are consistent with recommendations in GALL-SLR AMP XI.S3. Removal and inspection using techniques capable of detecting cracking is an adequate alternative to volumetric examinations, as it is acceptable to manage cracking due to SCC.

Enhancement 8. SLRA Section B.2.3.32, as revised by letter dated May 6, 2019, includes an enhancement to the "detection of aging effects" program element to perform an initial baseline visual inspection, "enhanced to the extent possible" for "applicable aging effects," for all RPV supports as part of the ASME Section XI, Subsection IWF AMP. Visual inspections will be performed prior the subsequent period of extended operation and thereafter (during the subsequent period of extended operation) on a frequency not to exceed 5 years. Inspections are to include detection of cracking in the location/configuration of all the RPV supports for evidence of deformation, movement, wear, gouging, or corrosion in accessible areas (i.e., the primary shield wall (PSW) liner plate near the supports and the relative position of the primary loop piping in the penetrations through the PSW) that could potentially impact the intended function of the RPV supports. Observed anomalies will be evaluated under the corrective action program.

The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and to SRP-SLR Section A.1 and finds it acceptable because the effects of aging of the accessible portions of all six RPV support components in each unit will be managed through visual inspections on an increased frequency relative to that required by ASME Code Section XI, Subsection IWF; and because it identifies and justifies the method, location, and frequency of implementation of performance monitoring activities for continuous RPV support structure availability to perform their intended function(s) as designed, consistent with the guidance of SRP-SLR Section A.1.2.3.4.

Enhancement 9. SLRA Section B.2.3.32, as revised by letter dated February 13, 2019, includes an enhancement to the "monitoring and trending" program element which relates to increasing or modifying the inservice inspection sample of Class 1, 2, 3 and MC piping components and their associated supports, when a component within the inspection sample is repaired to as-new condition. In its response to RAI B.2.3.32-2, the applicant clarified that this was an enhancement to the program. 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 ensure the program inspects a sample that is representative of the aging effects of the remaining population of supports, consistent with recommendations in GALL-SLR Report AMP XI.S3.

Enhancement 10. SLRA Section B.2.3.32, as revised by letter dated May 6, 2019, includes an enhancement to the "monitoring and trending" program element which relates to monitoring and trending of anomalies (e.g., loss of material, cracking, deformation) at the RPV supports to identify and evaluate changes compared to the original baseline inspections. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S3 and finds it acceptable because its implementation would ensure that identified anomalies due to the aforementioned aging effects are evaluated prior to loss of intended function.

Enhancement 11. SLRA Section B.2.3.32, as revised by letter dated May 6, 2019, includes an enhancement to the "corrective actions" program element which relates to corrective actions to be taken for structural significance of cracks, deformations, or other anomalies associated with the RPV supports that could impact their ability to perform their intended function. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S3 and finds it acceptable because in accordance with the requirements of ASME Code Section XI, Subsection IWF, its implementation addresses unacceptable conditions evaluated or tested before returning to service.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL SLR Report. Based on a review of the SLRA, amendments, and responses to RAIs B.2.3.32-1 and B.2.3.32-2, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria" and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.S3, with the exception of staff-identified differences between the applicant's program and GALL-SLR Report AMP XI.S3. The staff also reviewed the exceptions and staff-identified differences between the applicant's program and GALL-SLR Report AMP XI.S3 associated with the "preventive actions" and "parameters monitored or inspected" program elements, and their justifications, and finds that the AMP with the exceptions is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "corrective actions" program elements and finds that when implemented they will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.32 summarizes operating experience related to the ASME Section XI, Subsection IWF program. The applicant stated that plant-specific operating experience provides evidence that the ASME Section XI, Subsection IWF program inspection activities are effective in identifying susceptible locations and that the corrective actions program is effectively used to take corrective actions prior to loss of component intended function, which demonstrates that the ASME Section XI, Subsection IWF AMP remains effective.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying its proposed program.

Based on its audit and its review of the application, and the applicant's responses to RAIs B.2.3.32-1 and B.2.3.32-2, the staff finds that the conditions and operating experience at the plant are bounded by those for which the ASME Section XI, Subsection IWF was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.32, as revised by letters dated February 13, 2019, March 15, 2019, and May 6, 2019, provides the UFSAR supplement for the ASME Section XI, Subsection IWF program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01.

The staff also noted that the applicant committed (Commitment No. 36) to ongoing implementation of the existing ASME Section XI, Subsection IWF program, including its revised enhancements, by letters dated February 13, 2019, March 15, 2019, and May 6, 2019, for managing the effects of aging for applicable components during the subsequent period of extended operation. The applicant committed to implement enhancements to the program no later than 6 months prior to entering the subsequent period of extended operation, or the last refueling outage prior to the subsequent period of extended operation.

Conclusion. On the basis of its audit and its review of the applicant's ASME Section XI, Subsection IWF program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report AMP XI.S3 are consistent, with the exception of applicant and staff-identified differences between the applicant's program and GALL-SLR Report AMP XI.S3. In addition, the staff reviewed the exceptions and justifications, and the staff-identified difference between the applicant's program and GALL-SLR Report AMP XI.S3, and determined that the AMP with the exceptions is adequate to manage the applicable aging effects. The staff also reviewed the enhancements and confirmed that their implementation prior to the period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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).

3.0.3.2.29 10 CFR Part 50, Appendix J

SLRA Section B.2.3.33 describes the existing 10 CFR Part 50, Appendix J program as consistent, with an enhancement, with GALL-SLR Report AMP XI.S4, "10 CFR Part 50, Appendix J," with one exception (difference).

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.S4.

The staff also reviewed the portions of the "scope of program" and "corrective actions" program elements associated with an enhancement and an exception (difference), respectively, 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 (difference) and enhancement follows.

Exception (Difference) 1. During its review of SLRA Section B.2.3.33, the staff identified a difference in the SLRA "corrective actions" program element. In this difference, noted by the staff in the In-Office Audit Report (ADAMS Accession No. ML18230B482), contrary to the SLRA statement that Turkey Point implementing documents for 10 CFR Part 50, Appendix J include the NEI 94-01, Revision 2-A, Turkey Point actually uses provisions of NEI 94-01, Revision 0. The staff reviewed this difference against the corresponding program element in GALL-SLR Report AMP XI.S4 and finds it acceptable because Section 6.8.4.h of Turkey Point's Technical Specifications (TS) require the use of NEI 94-01, Revision 0 as one of the implementing documents for 10 CFR Part 50, Appendix J regulatory requirements, and because the corrective actions taken by Turkey Point in accordance with the guidance of NEI 94-01, Revision 0 are consistent with those of NEI 94-01, Revision 2-A.

Enhancement 1. SLRA Section B.2.3.33 includes an enhancement to the "scope of program" program element. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S4 and determined that it needed additional information, which resulted in the issuance of RAI B.2.3.33-1. The applicant's response, dated November 28, 2018, to RAI B.2.3.33-1 is documented in ADAMS Accession No. ML18334A182.

During its evaluation of the applicant's response to RAI B.2.3.33-1 regarding the containment system components excluded from 10 CFR Part 50 Appendix J local leakage rate testing (LLRTs), the staff noted that Turkey Point proposes to meet the regulatory requirement of 10 CFR 54.21(a)(3) to maintain the integrity of the containment against leakage and manage the effects of aging on essential and non-essential containment barrier components (i.e., water and steam lines/valves, penetrations) through various SLRA AMPs. Following the review of UFSAR Section 6.6.2, the staff verified that Turkey Point's itemized systems (i.e., residual heat removal, component cooling water, chemical and volume control, safety injection, steam generator wet layup, main steam, feedwater, auxiliary feedwater, and secondary sampling), containment structure, and spent fuel storage and handling systems have components that are excluded from LLRTs.

Turkey Point's proposed AMPs to manage the effects of aging for the excluded components are discussed in SLRA Sections B.2.2.1 (Fatigue Monitoring), B.2.3.2 (Water Chemistry), B.2.3.4 (Boric Acid Corrosion), B.2.3.8 (Flow-Accelerated Corrosion), B.2.3.12 (Closed Treated Water Systems), B.2.3.20 (One-Time Inspection), B.2.3.23 (External Surfaces Monitoring), B.2.3.25 (Internal Surfaces in Miscellaneous Piping and Ducting Components), B.2.3.26 (Lubricating Oil Analysis), B.2.3.30 (ASME Section XI, Subsection IWE), and portions of B.2.3.33 (the visual inspection aspects of the 10 CFR Part 50, Appendix J) and accordingly credited in SLRA AMR Tables 3.2.2-4, 3.2.2-5, 3.3.2-2, 3.3.2-4, 3.3.2-7, 3.4.2-1, 3.4.2-2, 3.4.2-3, 3.5.2-1, and 3.5.2-15 of associated systems, as supplemented by the applicant's letter dated November 2, 2018 (ADAMS Accession No. ML18311A299).

The staff finds that there is a reasonable assurance that Turkey Point credited AMPs will maintain the leak-tightness function of the containment pressure boundary retaining components excluded from LLRTs in accordance with 10 CFR 54.21(a)(3) through the subsequent period of extended operation, because:

- SLRA AMP B.2.2.1 (Fatigue Monitoring) continuously monitors the number of occurrences and severity of design transients to ensure that relevant components remain within the limits of their fatigue analyses, thus ensuring that the potential for cracking and loss of their intended function is minimized.
- SLRA AMP B.2.3.2 (Water Chemistry) periodically monitors treated water to prevent/mitigate loss of material or cracking of relevant components exposed to the

reactor water system chemistry through sampling and testing performed in accordance with industry standard EPRI PWR water chemistry guidelines and based on plant operating conditions. The SLRA AMP B.2.3.20 (One-Time Inspection) monitors this AMP to ensure that its satisfactory performance minimizes the listed aging effects.

- SLRA AMP B.2.3.4 (Boric Acid Corrosion) monitors the effects of aging of relevant components exposed to boric acid water leaks for loss of material and mechanical closure integrity due to aggressive chemical attack with inspections, surveillances, evaluations, and corrective actions. Leakages that could trigger these aging effects are also monitored through additional methods, such as RCS water inventory balancing performed at every shift in accordance with Turkey Point TS.
- SLRA AMP B.2.3.8 (Flow-Accelerated Corrosion) monitors the condition and mitigates flow-accelerated corrosion of relevant components based on industry guidelines and industry operating experience. For affected components, the AMP includes analysis, baseline inspections, determinations, evaluations, corrective actions, and followup inspections.
- SLRA AMP B.2.3.12 (Closed Treated Water Systems) prevents/mitigates underlying mechanism(s)/chemical species in treated water that could cause aging effects in relevant components, such as loss of material due to corrosion and cracking due to SCC. Aging effects are controlled through periodic sampling of treated water for microbiological and species testing, the use of corrosion inhibitors to modify the chemical composition of the water to mitigate corrosion and periodic inspections of varying frequency to determine the presence or extent of any degradation. SLRA AMP B.2.3.20 (One-Time Inspection) monitors this AMP to ensure that its satisfactory performance minimizes the listed aging effects.
- SLRA AMP B.2.3.20 (One-Time Inspection) supports other SLRA AMPs such as B.2.3.2, B.2.3.12, and B.2.3.26 by additional one-time inspections to verify their effectiveness in controlling aging effects for loss of material, cracking, and loss of heat transfer due to fouling.
- SLRA AMP B.2.3.26 (Lubricating Oil Analysis) mitigates age-related degradation of relevant components for loss of material due to corrosion and loss of heat transfer due to fouling in components exposed to lubricating oil through sampling, testing, and analysis of lubricating oil for detrimental contaminants so that the required fluid quality is maintained. SLRA AMP B.2.3.20 (One-Time Inspection) monitors this AMP to ensure that its satisfactory performance minimizes the listed aging effects.
- SLRA AMP B.2.3.30 (ASME Section XI, Subsection IWE) and portions of SLRA AMP B.2.3.33 (the visual inspection aspects of the 10 CFR Part 50, Appendix J AMP) monitor the condition and effects of aging on liner pressure-retaining components (barriers) relevant to the structural integrity and leak tightness through the required ASME Section XI, Subsection IWE visual surface and volumetric examinations, surveillances, and through 10 CFR Part 50, Appendix J's required periodic visual examinations.
- SLRA AMP B.2.3.23 (External Surfaces Monitoring of Mechanical Components) monitors the condition of components for loss of material and cracking by performing inspections of visually accessible surfaces of relevant components per ASME Section XI requirements, when applicable, in locations normally accessible only during RFOs (e.g., high dose areas). If surfaces are not readily visible during plant operations or RFOs, they are inspected when available and at such intervals to ensure that the components' intended functions are maintained.

- SLRA AMP B.2.3.25 (Internal Surfaces in Miscellaneous Piping and Ducting Components) monitors the condition of relevant components for loss of material and cracking during internal inspections of relevant components, periodic system and component surveillances, or during the performance of maintenance activities when the surfaces are made accessible for visual inspection. Maintenance activities by rule (10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants") require condition monitoring and preventive maintenance to accessible components at least every refueling cycle and not to exceed a period of 24 months. At a minimum, in each 10-year period of the subsequent period of extended operation, inspections focus on representative samples with an emphasis on bounding components most susceptible to aging because of time in service and the severity of operating conditions.

The staff's review and evaluation of SLRA AMP Sections B.2.2.1 (Fatigue Monitoring), B.2.3.2 (Water Chemistry), B.2.3.4 (Boric Acid Corrosion), B.2.3.8 (Flow-Accelerated Corrosion), B.2.3.12 (Closed Treated Water Systems), B.2.3.20 (One-Time Inspection), B.2.3.23 (External Surfaces Monitoring), B.2.3.25 (Internal Surfaces in Miscellaneous Piping and Ducting Components), B.2.3.26 (Lubricating Oil Analysis), B.2.3.30 (ASME Section XI, Subsection IWE), and portions of B.2.3.33 (the visual inspection aspects of the 10 CFR Part 50, Appendix J AMP) are documented in SER Sections 3.0.3.2.1, 3.0.3.1.1, 3.0.3.2.7, 3.0.3.2.10, 3.0.3.2.14, 3.0.3.1.4, 3.0.3.2.22, 3.0.3.1.6, 3.0.3.2.24, 3.0.3.2.26, respectively. This resolves the staff's concern described in RAI B.2.3.33-1 regarding aging management of all pressure-retaining components of containment.

During its evaluation of the applicant's response to RAI B.2.3.33-1, regarding the definitions of Type A, B, and C tests, the staff noted that the applicant plans to make the definitions in its procedures for Type A, B, and C identical to those in 10 CFR Part 50, Appendix J during the subsequent period of extended operation. The staff finds the applicant's response acceptable because this would make the definitions consistent with 10 CFR Part 50, Appendix J.

The staff also reviewed Commitment No. 37 associated with this enhancement, which is further described in the UFSAR section below.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL SLR Report. Based on its review of the SLRA, amendments, and response to RAI B.2.3.33-1, the staff finds that the "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.S4, with the exception of the staff-identified difference between the applicant's program and GALL-SLR Report AMP XI.S4. The staff also reviewed the staff-identified difference between the applicant's program and GALL-SLR Report XI.S4 associated with the "corrective actions" program element, and its justification, and finds that the AMP, with the exception (difference), is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancement associated with the "scope of program" program element and finds that when implemented it will make the AMP adequate to manage the applicable aging effects.

<u>Operating Experience</u>. SLRA Section B.2.3.33 summarizes operating experience related to the 10 CFR Part 50, Appendix J AMP. The applicant stated that the existing AMP formerly known as "Containment Leak Rate Testing program," was not previously credited for license renewal, but is a mature, established program and, in conjunction with the containment inservice inspection program, has been effective in preventing unacceptable leakage through the

containment pressure boundary. The applicant also stated that review of the current program and recent industry operating experience did not identify any major issues regarding the 10 CFR Part 50, Appendix J AMP. The applicant further stated that, with its enhancement, the 10 CFR Part 50, Appendix J AMP will provide reasonable assurance that the effects of aging will be managed so that the intended function(s) of components within the scope of the AMP will be maintained consistent with the CLB during the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying its proposed program beyond that incorporated during the SLRA review.

Based on its audit and its review of the application and the applicant's response to RAI B.2.3.33-1, 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 A.17.2.2.33 provides the UFSAR supplement for the 10 CFR Part 50, Appendix J AMP. The staff reviewed this UFSAR supplement description of the program against the recommended description for this type of program as described in GALL-SLR Report Table XI-01 and noted that it does not include information regarding corrective actions, and other guidance and regulatory requirements. The licensing basis for this program for the subsequent period of extended operation may not be adequate if the applicant does not incorporate this information into its UFSAR supplement, which resulted in the issuance of an RAI. RAI 17.2.2.33-1 and the applicant's response are documented in ADAMS Accession No. ML18334A182.

During its evaluation of the applicant's response to RAI 17.2.2.33-1, the staff noted that the applicant supplemented SLRA Section A.17.2.2.33 by adding that corrective actions are taken if leakage rates exceed acceptance criteria, and confirming the 10 CFR Part 50, Appendix J implementing documents and the AMP's conformance to 10 CFR Part 54 regulatory requirements during the subsequent period of extended operation. The staff finds the applicant's response and changes to the UFSAR supplement acceptable because it clarifies the program's implementation during the subsequent period of extended operation. Therefore, the UFSAR supplement for the 10 CFR Part 50, Appendix J AMP is consistent with the corresponding program description in GALL-SLR Report Table XI-01.

The staff also noted that the applicant committed to continue using the existing Turkey Point 10 CFR Part 50, Appendix J AMP and augmenting it to ensure that all containment pressure-retaining components are managed for age related degradation and that it will align its 10 CFR Part 50, Appendix J Type A, Type B, and Type C definitions with those in the regulations. The staff further noted that the applicant committed to implement this enhancement no later than 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 November 28, 2018, is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's 10 CFR Part 50, Appendix J AMP, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report AMP XI.S4, are consistent, with the exception of a staff-identified difference between the applicant's program and GALL-SLR Report AMP XI.S4. In addition, the staff reviewed the staff-identified exception (difference) between the applicant's program and GALL-SLR Report AMP XI.S4 and determined that the AMP, with the exception (difference), is adequate to manage the applicable aging effects. Also, the staff reviewed the enhancement and confirmed that its implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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).

3.0.3.2.30 Masonry Walls

SLRA Section B.2.3.34 describes the existing Masonry Walls program as consistent, with an enhancement, with GALL-SLR Report AMP XI.S5, "Masonry Walls."

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.S5.

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

Enhancement. SLRA Section B.2.3.34 includes an enhancement to the "scope of program" program element. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S5 and finds it acceptable because when it is implemented it will expand the scope of the program to ensure that all masonry walls within the scope of subsequent license renewal are inspected appropriately.

Based on its audit, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.S5. In addition, the staff reviewed the enhancement associated with the "scope of program" program element and finds that when implemented it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.34 summarizes operating experience related to the Masonry Wall program. The applicant stated that the program was found to be ineffective by the most recent AMP effectiveness assessment. The applicant noted that this ineffectiveness is being addressed under the Structures Monitoring program, which implements the structural walkdowns for the Masonry Walls program. As such, the applicant stated that there is reasonable assurance that the Masonry Walls program will manage the effects of aging through the period of subsequent license renewal.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

The staff identified operating experience for which it determined that it needed additional information, which resulted in the issuance of an RAI related to the effectiveness of the Structures Monitoring program, which is the program that implements the Masonry Walls program. RAI B.2.3.35-5 addresses issues related to structural degradation and effectiveness of the existing program, which the staff identified during the in-office and onsite audits. The RAI, along with the applicant's response, is documented in ADAMS Accession No. ML18334A182. Because the Masonry Walls program is implemented as part of the Structures Monitoring program, and because the effectiveness findings were related specifically to the Structures Monitoring program, the detailed discussion of the RAI and the staff's review is included with the staff's review of the Structures Monitoring program (SER Section 3.0.3.2.31).

Based on its audit and its review of the application and the applicant's response to RAI B.2.3.35-5, the staff finds that the conditions and operating experience at the plant are bounded by those for which the Masonry Walls program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.34 provides the UFSAR supplement for the Masonry Walls program. The staff reviewed the UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01 The staff also noted that the applicant committed to ongoing implementation of the existing Masonry Walls program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implement the enhancement to the program no later than 6 months prior to entering 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 audit and its review of the applicant's Masonry Walls program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancement and confirmed that its implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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).

3.0.3.2.31 Structures Monitoring

SLRA Section B.2.3.35 describes the existing Structures Monitoring program as consistent, with enhancements, with GALL-SLR Report AMP XI.S6, "Structures Monitoring," with exceptions. The applicant amended this SLRA section by letters dated November 2, 2018, November 28, 2018, December 14, 2018, and February 13, 2019.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.S6.

For the "parameters monitored or inspected" and "detection of aging effects" program elements, the staff determined that it needed additional information, which resulted in the issuance of RAIs. RAIs B.2.3.35-1 and B.2.3.35-2, and the applicant's responses, are documented in ADAMS Accession Nos. ML18311A299 and ML18352A885.

During its evaluation of the applicant's response to RAI B.2.3.35-1, the staff noted that the applicant revised SLRA Section B.2.3.35 to include a new enhancement to the "detection of aging effects" program element to ensure that inspectors are qualified in accordance with the qualification requirements from the American Concrete Institute (ACI) 349.3R. The staff also noted that the applicant revised Commitment No. 39 to address the implementation of this new requirement by no later than 6 months prior to the subsequent period of extended operation. The staff finds the applicant's response, changes to the Structures Monitoring program, and item 39 in SLRA Table 17-3 acceptable because the proposed enhancement will ensure that inspectors have qualifications that are consistent with industry guidelines and standards as recommended by the GALL-SLR Report.

During its evaluation of the applicant's response to RAI B.2.3.35-2, the staff noted that the applicant revised SLRA Section B.2.3.35 to include a new enhancement to the "detection of aging effects" program element that relates to the evaluation and monitoring of volume and water chemistry, including pH, mineral, chlorides, sulfate, and iron levels, for identified through-wall leakage or groundwater infiltration when volume permits. The staff also noted that the applicant's response revised Commitment No. 39 to address the implementation of this new requirement by no later than 6 months prior to the subsequent period of extended operation. The staff finds the applicant's response and changes to the Structures Monitoring program and item 39 in SLRA Table 17-3 acceptable because the proposed enhancement will ensure that any identified groundwater infiltration or through-concrete leakage is assessed and monitored, when volume permits, for signs of concrete or steel reinforcement degradation as recommended by the GALL-SLR Report.

For the "detection of aging effects" program element, the staff noted that the provided enhancement did not implemented plant-specific AMP criteria or actions that are consistent with the GALL-SLR Report recommendations for plants with an aggressive groundwater/soil environment, to ensure that the effects of aging in inaccessible concrete structural areas will be adequately managed during the subsequent period of extended operation. To resolve this inconsistency, the staff determined that it needed additional information, which resulted in the issuance of RAIs. RAI B.2.3.35-3, followup RAI B.2.3.35-3a, and the applicant's responses are documented in ADAMS Accession Nos. ML18352A885 and ML19050A420.

During its evaluation of the applicant's responses to RAI B.2.3.35-3 and followup RAI B.2.3.35-3a, the staff noted that the applicant revised SLRA Section B.2.3.35 to include new enhancements to the "scope of program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements that relate to the implementation of plant-specific actions intended to manage the aging effects of inaccessible concrete exposed to an aggressive groundwater/soil environment. These actions include, in part, performing a baseline visual inspection of leading indicator areas to assess the current condition of the structures and to determine if any additional action needs to be implemented prior to the subsequent period of extended operation, and to implement periodic focused inspections of inaccessible concrete areas at an interval not to exceed 5 years to adequately manage the aging effects during the subsequent period of extended operation. The staff also noted that the applicant response revised Commitment No. 39 from SLRA Table 17-3 and SLRA Sections A.17.2.2.35 to address these changes, and to implement the new requirements by no later than 6 months prior to the subsequent period of extended operation. The staff finds the applicant's response and changes to Commitment No. 39 in SLRA Table 17-3, and SLRA Sections A.17.2.2.35 and B.2.3.35 acceptable because (1) it is consistent with the GALL Report recommendations to implement a plant-specific AMP that will demonstrate that the aging effects associated with plants exposed to an aggressive groundwater/soil environments will be adequately managed during the subsequent period of extended operation, and (2) the plant-specific AMP enhancements are being implemented in accordance with the SRP-SLR Section A.1.2.3 criteria for each applicable program element.

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

Exception 1. SLRA Section B.2.3.35, includes an exception to the "scope of program," "parameters monitored or inspected," and "detection of aging effects" program elements associated with the periodic sampling and testing of groundwater to assess the impact on below-grade concrete structures. The staff notes that, as described in the applicant's response to RAI B.2.3.35-3a, the applicant intends to monitor the pH and chloride concentration from below-grade concrete structures as part of the plant-specific periodic inspections of inaccessible concrete areas exposed to an aggressive groundwater/soil environment. The staff reviewed this exception against the corresponding program elements in GALL-SLR Report AMP XI.S6 and finds it acceptable because the applicant identified the plant's groundwater/soil environment as aggressive, and incorporated plant-specific actions within the Structures Monitoring program to ensure that the impacts of aggressive groundwater/soil environment on below-grade concrete structures is assessed and adequately managed during the subsequent period of extended operation.

Exception 2. During its review of SLRA Section B.2.3.35, the staff identified a difference in the "parameters monitored or inspected" and "acceptance criteria" program elements. The staff noted that the Structures Monitoring program does not monitor or inspect the effects of aging for elastomeric vibration isolators and does not include the associated acceptance criteria recommended by the GALL-SLR Report. The staff reviewed this difference against the corresponding program elements in GALL-SLR Report AMP XI.S6 and finds it acceptable because there are no elastomeric vibration isolation elements that need to be managed by the Structures Monitoring program, because the elastomeric vibration isolation elements that are within the scope of subsequent license renewal are located inside the containment structure and are being managed by the ASME Section XI, Subsection IWF program.

Exception 3. During its review of SLRA Section B.2.3.35, the staff identified a difference in the "scope of program," "parameters monitored or inspected," and "acceptance criteria" program elements. In this difference, the staff noted that the Structures Monitoring program does not monitor or inspect the effect of aging for sliding surfaces and does not include the acceptance criteria recommended by the GALL-SLR Report. The staff noted that the "program description" of the Structures Monitoring program states that the program inspects accessible sliding surfaces for indication of significant loss of material due to wear or corrosion, and for accumulation of debris or dirt. To resolve this inconsistency, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.35-4 and the applicant's response is documented in ADAMS Accession No. ML18311A299.

During its evaluation of the applicant's response to RAI B.2.3.35-4, the staff noted that the applicant revised the "program description" from SLRA Section B.2.3.35 to state that there are no sliding surface components outside of containment that require aging management. The applicant also revised SLRA Section B.2.3.32 to clarify that sliding surfaces located inside containment are being managed for the associated aging effects by the ASME Section XI, Subsection IWF program. The staff finds the applicant's response and changes to SLRA Sections B.2.3.32 and B.2.3.35 acceptable because they clarify the inconsistency identified in the application.

Considering the applicant's response, the staff reviewed this difference against the corresponding program elements in GALL-SLR Report AMP XI.S6 and finds it acceptable because there are no sliding surface components that need to be managed by the Structures Monitoring program, because the sliding surface components that are within the scope of subsequent license renewal are located inside the containment structure and are being managed by the ASME Section XI, Subsection IWF program.

Enhancement 1. SLRA Section B.2.3.35 includes an enhancement to the "scope of program" program element that relates to the addition of the listed additional components and commodity groups to the scope of the program. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to include all structures and structural components and commodities in the scope of license renewal that will be managed by the Structures Monitoring program.

Enhancement 2. SLRA Section B.2.3.35 includes an enhancement to the "preventive actions" program element that relates to the use of preventive actions requirements for proper storage of high-strength bolts. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to include preventive actions to provide reasonable assurance that structural bolting integrity is maintained.

Enhancement 3. SLRA Section B.2.3.35 includes an enhancement to the "parameters monitored or inspected" program element that relates to the monitoring of loss of material, loose bolts, missing or loose nuts, and other conditions indicative of loss of preload. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations to monitor the listed parameters to ensure that loss of preload is adequately managed and detected prior to loss of the bolt's intended function.

Enhancement 4. SLRA Section B.2.3.35 includes an enhancement to the "parameters monitored or inspected" program element that relates to the addition of SEI/ASCE 11 and American Institute of Steel Construction (AISC) into the procedure's references to account for any design parameters used for evaluation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendations for considering parameters that are commensurable with industry codes, standards, and guidelines.

Enhancement 5. SLRA Section B.2.3.35, as revised by the applicant's response to the followup RAI B.2.3.35-3a documented in ADAMS Accession No. ML19050A420, includes an enhancement to the "detection of aging effects" program element that relates to the use of periodic visual inspection in excavated inaccessible concrete areas at a frequency not to exceed 5 years, and the use to pH and chloride level analysis to detect and manage the aging effects associated with concrete structures exposed to an aggressive groundwater/soil environment. Because this enhancement incorporates plant-specific actions, the staff reviewed the applicant's enhancement to the "detection of aging effects" program element against the criteria in SRP-SLR Section A.1.2.3.4. The staff finds the applicant's plant-specific enhancement to the "detection of aging effects" program element acceptable because the use of periodic visual inspections and chemical analysis of excavated (leading-indicator) areas at a frequency not to exceed 5 years will ensure that structures exposed to an aggressive groundwater/soil environment are adequately managed, and that age-related degradation is detected and evaluated prior to the loss of intended function.

Enhancement 6. SLRA Section B.2.3.35 includes an enhancement to the "detection of aging effects" program element that relates to the monitoring of cracking due to expansion from reaction with aggregates in concrete structures. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with industry operating experience, and it will ensure that cracking due to expansion from reaction with aggregates is detected through visual inspections prior to a loss of intended function.

Enhancement 7. SLRA Section B.2.3.35 includes an enhancement to the "detection of aging effects" program element that relates to the use of tactile inspection for detecting elastomer hardening. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to supplement visual inspections with tactile inspection to detect hardening, and it will be capable of detecting the aging effect prior to a loss of intended function.

Enhancement 8. SLRA Section B.2.3.35 includes an enhancement to the "acceptance criteria" program element to ensure that identified loose bolts and nuts are not acceptable unless accepted by an engineering evaluation. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to ensure that identified loose bolts and nuts are evaluated to determine if the observed degradation does or does not affect the ability of the structure or component to perform its intended function.

Enhancement 9. SLRA Section B.2.3.35 includes an enhancement to the "acceptance criteria" program element to ensure that observed degradation in structural sealants is not acceptable unless the observed degradation will not result in loss of sealing. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to ensure that observed degradation in structural sealants is evaluated to determine if the observed degradation does or does not affect the ability of the component to perform its intended function.

Enhancement 10. SLRA Section B.2.3.35, as revised by the applicant's response to the RAI B.2.3.35-1 documented in ADAMS Accession No. ML18311A299, includes an enhancement to the "detection of aging effects" program element that relates to the use of ACI 349.3R criteria for the qualification of inspector. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to ensure that personnel performing the inspections and evaluations are qualified in accordance with industry guidelines and standards (i.e., ACI 349.3R) for concrete structures.

Enhancement 11. SLRA Section B.2.3.35, as revised by the applicant's response to RAI B.2.3.35-2 documented in ADAMS Accession No. ML18352A885, includes an enhancement to the "detection of aging effects" program element that relates to the requirement for monitoring water volume, performing chemistry analysis, and conducting an engineering evaluation for identified through-wall leakage or groundwater infiltration when volume permits. The staff reviewed this enhancement against the corresponding program element in GALL-SLR Report AMP XI.S6 and finds it acceptable because when it is implemented it will be consistent with the GALL-SLR Report recommendation to adequately detect and assess the aging effects from groundwater infiltration or through-concrete leakage prior to a loss of intended function.

Enhancement 12. SLRA Section B.2.3.35, as revised by the applicant's response to the RAI 3.5.1.100-1 documented in ADAMS Accession No. ML18311A299, includes an enhancement to the "parameters monitored or inspected" and "detection of aging effects" program elements, which relates to the monitoring and detection of cracking due to SCC using surface examination inspection methods for stainless steel and aluminum structural components. 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 ensure that cracking due to SCC in stainless steel and aluminum structural components is adequately managed by using enhanced examination methods that are capable of detecting this aging effect prior to a loss of intended function.

Enhancement 13. SLRA Section B.2.3.35, as revised by the applicant's response to followup RAI B.2.3.35-3a and documented in ADAMS Accession No. ML19050A420, includes an enhancement to the "scope of program" program element that relates to the addition of inaccessible concrete/foundations exposed to groundwater/soil and water-flowing environments to the scope of the program. Because this enhancement incorporates plant-specific actions, the staff reviewed the applicant's enhancement to the "scope of program" program element against the criteria in SRP-SLR Section A.1.2.3.1. The staff finds the applicant's plant-specific enhancement to the "scope of program" program element acceptable because it ensures that the program includes the specific structures and structural components that will be managed by the AMP.

Enhancement 14. SLRA Section B.2.3.35, as revised by the applicant's response to followup RAI B.2.3.35-3a and documented in ADAMS Accession No. ML19050A420, includes an enhancement to the "parameters monitored or inspected" program element, which relates to the condition monitoring of inaccessible concrete areas exposed to a groundwater/soil and water-flowing environment for evidence of aggressive chemical attack, or leaching and carbonation, and pH levels and chloride concentration. Because this enhancement incorporates plant-specific actions, the staff reviewed the applicant's enhancement to the "parameters monitored or inspected" program element against the criteria in SRP-SLR Section A.1.2.3.3. The staff finds the applicant's plant-specific enhancement to the "parameters monitored or inspected" program element acceptable because the identified parameters to be monitored during the excavated inspections will be capable of detecting the presence and extent of the age-related degradations, and will ensure adequate aging management of the inaccessible concrete structures.

Enhancement 15. SLRA Section B.2.3.35, as revised by the applicant's response to followup RAI B.2.3.35-3a and documented in ADAMS Accession No. ML19050A420, includes an enhancement to the "monitoring and trending" program element, which relates to the development of a baseline inspection prior to the subsequent period of extended operation. The inspection is to determine whether the aging effects are occurring or causing adverse effects in concrete susceptible to an aggressive environment, and to determine additional inspection/evaluation requirements and intervals for the periodic inspections. Because this enhancement incorporates plant-specific actions, the staff reviewed the applicant's enhancement to the "monitoring and trending" program element against the criteria in SRP-SLR Section A.1.2.3.5. The staff finds the plant-specific enhancement to the "monitoring and trending" program element acceptable because the monitoring and trending activities will provide inspection results that will be used as input for the periodic inspections prior to the subsequent period of extended operation, and allow for trending.

Enhancement 16. SLRA Section B.2.3.35, as revised by the applicant's response to followup RAI B.2.3.35-3a and documented in ADAMS Accession No. ML19050A420, includes an enhancement to the "acceptance criteria" program element, which relates to the use of acceptance criteria consistent with ACI 349.3R for concrete inspections, and considers the correlation between chloride concentration and necessary concrete cover to induce corrosion. Because this enhancement incorporates plant-specific actions, the staff reviewed the applicant's enhancement to the "acceptance criteria" program element against the criteria in SRP-SLR Section A.1.2.3.6. The staff finds the applicant's plant-specific enhancement to the "acceptance criteria" program element acceptable because inspection results are evaluated based on criteria derived from applicable codes and standards to ensure that the need for corrective action is identified before a loss of intended function.

Enhancement 17. SLRA Section B.2.3.35, as revised by the applicant's response to followup RAI 3.5.1.100-1a and documented in ADAMS Accession No. ML19050A420, includes an enhancement to the "corrective actions" program element, which relates to including stainless steel (SS) ASME Class 1, 2, 3, and MC support members, welds, bolted connections, or anchorage in the engineering evaluation if cracking due to SCC is detected for SS mechanical or non-ASME structural components. The staff noted in the response that the applicant stated that an augmented examination plan, in accordance with ASME Section XI, Subsection IWF-2430, will be developed to manage this aging effect for the SS ASME components, if necessary, based on the Structures Monitoring program evaluation results. Because this enhancement incorporates plant-specific actions, the staff reviewed the applicant's enhancement to the "corrective actions" program element against the criteria in SRP-SLR Section A.1.2.3.7. The staff finds the applicant's plant-specific enhancement to the "corrective actions" program element acceptable because it establishes actions to be taken when the acceptance criteria are not met for components monitored as leading indicators, and ensures that a periodic inspection program is developed, if needed, to adequately manage the aging effects for the components.

Enhancement 18. SLRA Section B.2.3.35, as revised by the applicant's response to RAI B.2.3.35-5 and documented in ADAMS Accession No. ML18334A182, includes an enhancement to the "monitoring and trending" program element, which relates to providing detailed evaluation and trending of ongoing degradations that include: best estimate projection of functionality based on quantitative criteria; consistent classification with previous inspections; adjusting inspection frequency or requirements as necessary to ensure that the functionality is maintained between inspections; and ensuring that evaluations are documented in an accessible location/database. 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 identified degradation is projected until the next scheduled inspection, that results are evaluated against the acceptance criteria to confirm that the timing of subsequent inspections will maintain the components' intended function, and that results of periodic-inspections are documented to help identify changes from prior inspections.

The staff conducted an audit to verify the applicant's claim of consistency with the GALL-SLR Report. Based on a review of the SLRA, amendments, and responses to RAI B.2.3.35-1, RAI B.2.3.35-2, RAI B.2.3.35-3, followup RAI B.2.3.35-3a, RAI B.2.3.35-4, RAI B.2.3.35-5, RAI 3.5.1.100-1, and followup RAI 3.5.1.100-1a, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.S6. The staff also reviewed the exceptions and staff-identified differences between the applicant's program and GALL-SLR Report AMP XI.S6 associated with the "scope of program," "parameters monitored or inspected," and "acceptance criteria" program elements and their justifications, and finds that the AMP with exceptions is adequate to manage the applicable aging effects. In addition, the staff reviewed the enhancements associated with the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements and finds that when implemented they will make the AMP adequate to manage the applicable aging effects.

<u>Operating Experience</u>. SLRA Section B.2.3.35 summarizes operating experience related to the Structures Monitoring program. The applicant stated that the Structures Monitoring program, with exceptions and enhancements, will provide reasonable assurance that the effects of aging will be managed so that the intended functions of structures and components will be maintained consistent with the CLB through the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

During its review, the staff identified operating experience for which it determined that it needed additional information, which resulted in the issuance of RAIs. RAIs B.2.3.35-5 and B.2.3.35-6, and the applicant's responses, are documented in ADAMS Accession No. ML18334A182.

During its evaluation of the applicant's response to RAI B.2.3.35-5, the staff noted that the applicant stated the following:

- Inspection frequency has been increased as appropriate to consider previously identified degraded conditions that were found to warrant future attention and repair. The applicant stated that routine periodic inspections and evaluations are performed at an interval of no greater than 5 years with identified degraded conditions receiving more frequent inspection, as warranted, until repaired. When followup inspection finds the repairs acceptable, the deficiency may be closed and routine periodic inspection is maintained.

- The implementation procedure will be enhanced to direct a detailed evaluation and trending of on-going degradation to ensure that (a) estimated projection of functionality is based on quantitative criteria or link to the criteria for comparative evaluations, (b) inspection frequencies are adjusted to ensure that functionality is maintained between inspections, and (c) to ensure that evaluations provide a classification consistent with previous inspections. The applicant also stated that these evaluations will either quantify that the structure remains functional until the next scheduled routine inspection or direct more frequent inspections.

The staff finds the applicant's response and changes to the Structures Monitoring program, UFSAR supplement, and Commitment No. 39 in SLRA Table 17-3 acceptable because (a) they clarify that inspections performed under the Structures Monitoring program account for the observed plant-specific operating experience by increasing the inspection frequency, as warranted, for the identified degraded conditions until evaluated and/or repaired, and (b) the use of quantitative criteria to evaluate and trend ongoing degradation will ensure that structures and components are adequately managed so that the intended functions are maintained between inspections during the subsequent period of extended operation.

During its evaluation of the applicant's response to RAI B.2.3.35-6, the staff noted that the applicant is performing more frequent inspections of the degraded areas of the fuel handling building in accordance with the Structures Monitoring program. The staff also noted that the applicant established an increased inspection frequency based on quantitative criteria and the corresponding best estimate of functionality projections obtained from the latest structural assessment. In the response to RAI B.2.3.35-5, the applicant also stated that the identified issues are trended quarterly through program health reports and are planned to be resolved at least 10 years prior to the end of the initial period of extended operation (prior to the subsequent period of extended operation), allowing the repaired conditions to be more clearly bounded by the operating experience considered in the GALL-SLR Report AMP XI.S6. The staff finds the applicant's response acceptable because the monitoring of degradation using an increased inspection frequency based on quantitative criteria and structural assessment will ensure that the structures' intended functions are maintained with the CLB between inspections and through the subsequent period of extended operation.

Based on its audit and its review of the application and the applicant's responses to RAIs B.2.3.35-5 and B.2.3.35-6, the staff finds that the conditions and operating experience at Turkey Point are bounded by those for which the Structures Monitoring program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.35, as amended, 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 the applicant committed to ongoing implementation of the existing Structures Monitoring program for managing the effects of aging for applicable components during the subsequent period of extended operation, and that the applicant committed (SLRA Commitment No. 39) to implement the program enhancements no later than 6 months prior to the subsequent period of extended operation. The staff finds that the information in the UFSAR supplement, as amended by letters dated November 28, 2018, December 14, 2018, and February 13, 2019, is an adequate summary description of the program.

Conclusion. On the basis of its audit and its review of the applicant's Structures Monitoring program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent, with the exceptions and staff-identified differences, between the applicant's program and GALL-SLR Report AMP XI.S6. In addition, the staff reviewed the exceptions and their justification and staff-identified differences between the applicant's program and GALL-SLR Report AMP XI.S6, and determined that the AMP, with the exceptions, is adequate to manage the applicable aging effects. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended 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).

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

SLRA Section B.2.3.36, as amended, describes the new Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP, formerly a portion of the Turkey Point Systems and Structures Monitoring program, as consistent with the program elements of GALL-SLR Report AMP XI.S7, "Inspection of Water-Control Structures Associated with Nuclear Power Plants." The applicant amended this SLRA section by letter dated October 17, 2018 (ADAMS Accession No. ML18292A641).

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6 of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.S7.

Based on a review of the SLRA, as amended, the staff finds that the "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions" program elements are consistent with the corresponding program elements of the GALL-SLR Report AMP XI.S7.

Operating Experience. SLRA Section B.2.3.36 summarizes operating experience related to the Inspection of Water-Control Structures Associated with Nuclear Power Plants program, formerly a portion of the Turkey Point Systems and Structures Monitoring program. The applicant stated, as described in SLRA Section B.1.1, that the existing Systems and Structures Monitoring program was found to be "ineffective" at managing the effects of aging. However, the applicant further stated that this ineffectiveness is being addressed as a corrective action to resolve the issues associated with the Systems and Structures Monitoring program, which implemented the structural walkdowns for the Inspection of Water-Control Structures Associated with Nuclear Power Plants program. As such, the applicant stated that there is reasonable assurance that the Inspection of Water-Control Structures Associated with Nuclear Power Plants program will manage the effects of aging through the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

The staff identified operating experience for which it determined that it needed additional information, which resulted in the issuance of an RAI related to the effectiveness of the Systems and Structures Monitoring program, which is the program that formerly implemented the Inspection of Water-Control Structures Associated with Nuclear Power Plants program. RAI B.2.3.35-5 addresses issues related to structural degradation and effectiveness of the existing program, which the staff identified during the in-office and onsite audits. The RAI, along with the applicant's response, is documented in ADAMS Accession No. ML18334A182. Because the Inspection of Water-Control Structures Associated with Nuclear Power Plants program was formerly implemented as part of the Systems and Structures Monitoring program, and because the effectiveness findings were related specifically to the Systems and Structures Monitoring program, the detailed discussion of the RAI and the staff's review is included with the staff's review of the Structures Monitoring program (SER Section 3.0.3.2.31).

Based on its audit and its review of the application and the applicant's response to RAI B.2.3.35-5, 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 program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.36 provides the UFSAR supplement for the Inspection of Water-Control Structures Associated with Nuclear Power Plants program. The staff reviewed this UFSAR supplement description of the program and noted that it is consistent with the recommended description in GALL-SLR Report Table XI-01. The staff also noted that the applicant committed to implement the new Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP no later than 6 months prior to the subsequent period of extended operation for managing the effects of aging for applicable components. The staff also noted that the applicant committed to perform a baseline survey of the cooling canal system 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 audit and its review of the applicant's Inspection of Water-Control Structures Associated with Nuclear Power Plants program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.33 Protective Coating Monitoring and Maintenance

SLRA Section B 2.3.37 describes the existing Protective Coating Monitoring and Maintenance program as consistent, with enhancements, with GALL-SLR Report AMP XI.S8, "Protective Coating Monitoring and Maintenance."

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 6, and 10, of the applicant's program to the corresponding program elements of GALL-SLR Report AMP XI.S8.

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

Enhancement 1. SLRA Section B.2.3.37 includes an enhancement to the "parameters monitored or inspected" program element. This enhancement will update the appropriate procedure for the Protective Coatings Monitoring and Maintenance program to reference the guidance found in the ASTM standard D 5163-08, "Standard Guide for Establishing a Program for Condition Assessment of Coating Service Level I Coating Systems in Nuclear Power Plants." The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S8 and finds it acceptable because when it is implemented it will provide guidance for identifying the appropriate parameters to be monitored or inspected, which are any visible defects such as blistering, cracking, flaking, peeling, rusting, or physical damage.

Enhancement 2. SLRA Section B.2.3.37 includes an enhancement to the "detection of aging effects" program element. This enhancement will update the appropriate procedure for the Protective Coatings Monitoring and Maintenance program to specify that individuals performing inspections shall be trained in the applicable reference standards found in ASTM D 5498, "Guide for Developing a Training Program for Personnel Performing Coating and Lining Work Inspection for Nuclear Facilities." The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S8 and finds it acceptable because when it is implemented it will provide the appropriate guidance for training individuals that perform inspections under the Protective Coatings Monitoring and Maintenance program.

Enhancement 3. SLRA Section B.2.3.37 includes an enhancement to the "acceptance criteria" program element. This enhancement will update the appropriate procedure for the Protective Coatings Monitoring and Maintenance program to include specific inspection and documentation parameters found in subparagraphs 10.2.1 through 10.2.6, 10.3, and 10.4, of ASTM D 5163-08. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S8 and finds it acceptable because when it is implemented it will provide an acceptable method to characterize, document, and test defective or deficient coating surfaces.

Enhancement 4. SLRA Section B.2.3.37 includes an enhancement to the "acceptance criteria" program element. This enhancement will update the appropriate procedure for the Protective Coatings Monitoring and Maintenance program to include the observation and testing methods found in subparagraphs 10.2.3 and 10.2.4 of ASTM D 5163-08. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S8 and finds it acceptable because when it is implemented it will provide an acceptable method to characterize, document, and test defective or deficient coating surfaces.

Enhancement 5. SLRA Section B.2.3.37 includes an enhancement to the "operating experience" program element. This enhancement will update the appropriate procedure for the Protective Coatings Monitoring and Maintenance program to be in accordance with Regulatory Position C4 of RG 1.54, Revision 2, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants," dated October 2010 (ADAMS Accession No. ML102230344). The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.S8 and finds it acceptable because when it is implemented it will provide appropriate guidance for establishing an in-service coating monitoring program.

Based on its audit, the staff finds that program elements 1 through 6 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.S8. In addition, the staff reviewed the enhancements associated with the "parameters monitored or inspected," "detection of aging effects," "acceptance criteria," and "operating experience" program elements and finds that when implemented they will make the AMP adequate to manage the applicable aging effects

Operating Experience. SLRA Section B.2.3.37 summarizes operating experience related to the Protective Coating Monitoring and Maintenance program. The applicant stated that the Protective Coating Monitoring and Maintenance program, with enhancements, will provide reasonable assurance that the effects of aging will be adequately managed so that the intended function(s) of components within the scope of the AMP will be maintained consistent with the CLB during the subsequent period of extended operation." In addition, the applicant stated that the program considers the technical information and industry operating experience provided in RG 1.54 and GL 04-02, and the concerns related to Generic Safety Issue 191.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 A.17.2.2.37 provides the UFSAR supplement for the Protective Coating Monitoring and Maintenance program.

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

The staff also noted that the applicant committed to ongoing implementation of the existing Protective Coating Monitoring and Maintenance program for managing the effects of aging for applicable components during the subsequent period of extended operation. The staff also noted that the applicant committed to implement the enhancements to the program no later than 6 months prior to entering 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 audit and its review of the applicant's Protective Coating Monitoring and Maintenance program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent with GALL-SLR Report AMP XI.S8. Also, the staff reviewed the enhancements and confirmed that their implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the 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).

3.0.3.2.34 Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements

SLRA Section B.2.3.38 describes the existing Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements as consistent, with an enhancement, with GALL-SLR Report AMP XI.E1, “Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.” The applicant amended this SLRA section by letter dated January 31, 2019.

Staff Evaluation. During its audit, the staff reviewed the applicant’s claim of consistency with the GALL-SLR Report. The staff compared program elements 1 through 7 of the applicant’s program to the corresponding program elements of GALL-SLR Report AMP XI.E1.

For the “detection of aging effects” program element, the staff noted that many cables were coated with Flamastic fire retardant material. The staff noted that the SLRA amendment, dated January 31, 2019, addressed the inspection of the condition of cable jacket material when covered with Flamastic. The staff finds the inspection method described in the supplement acceptable because the inspection will be effective in determining the condition of the cable jacket and insulation material.

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

Enhancement. SLRA Section B.2.3.38 includes an enhancement to the “scope of program,” “parameters monitored or inspected,” “detection of aging effects,” and “operating experience” program elements in order to bring the existing AMP in alignment with the GALL-SLR Report AMP XI.E1. The staff reviewed this enhancement against the corresponding program elements in GALL-SLR Report AMP XI.E1 and finds it acceptable because when it is implemented it will be capable of both detecting and trending the aging effects of adverse localized environments on in-scope insulated electrical cables and connections; therefore, it is consistent with the 10 elements of GALL SLR Report AMP XI.E1.

Based on its audit, the staff finds that program elements 1 through 7 for which the applicant claimed consistency with the GALL-SLR Report are consistent with the corresponding program elements of GALL-SLR Report AMP XI.E1. In addition, the staff reviewed the enhancement associated with the “scope of program,” “parameters monitored or inspected,” “detection of aging effects,” and “operating experience” program elements and finds that when implemented it will make the AMP adequate to manage the applicable aging effects.

Operating Experience. SLRA Section B.2.3.38 summarizes operating experience related to the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements. The applicant stated that site-specific operating experience during the first period of extended operation, including past corrective actions, provides objective evidence that the Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49

Environmental Qualification Requirements AMP will be effective in ensuring that intended functions of insulated cables and connections within the scope of the program are maintained during the subsequent period of extended operation.

The staff reviewed operating experience information in the application and during the audit. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation.

The staff did not identify any operating experience that would indicate that the applicant should consider modifying 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 EQ Requirements Aging Management program was evaluated.

UFSAR Supplement. SLRA Section A.17.2.2.38 provides the UFSAR supplement for the Electrical Insulation for the Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements 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 the applicant committed to ongoing implementation of the existing Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Aging Management program for managing the effects of aging for applicable components during the subsequent period of extended operation. This enhanced AMP is to be implemented with inspections starting no earlier than 10 years prior to the subsequent period of extended operation and completed no later than 6 months prior to entering the subsequent period of extended operation, or no later than the last RFO 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 audit and its review of the applicant's Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Aging Management program, the staff determined that those program elements for which the applicant claimed consistency with the GALL-SLR Report are consistent. Also, the staff reviewed the enhancement and confirmed that its implementation prior to the subsequent period of extended operation will make the AMP adequate to manage the applicable aging effects. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended 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).

3.0.3.3 AMPs Not Consistent with or Not Addressed in the GALL-SLR Report

In SLRA Appendix B (as amended), the applicant identified the following AMPs as plant-specific:

- Pressurizer Surge Line Fatigue
- Polymer High-Voltage Insulators

For AMPs not consistent with or not addressed in the GALL-SLR Report, the staff performed a complete review to determine their adequacy to monitor or manage aging. The following sections document the staff's review of these plant-specific AMPs.

3.0.3.3.1 Pressurizer Surge Line Fatigue

SLRA Section B.2.4.1 describes the existing Pressurizer Surge Line Fatigue program as a site-specific AMP. The SLRA states that the AMP was formerly called the "Pressurizer Surge Line Welds Inspection program."

Staff Evaluation. The staff reviewed program elements 1 through 6 of the applicant's program against the acceptance criteria for the corresponding elements as stated in SRP-SLR Section A.1.2.3. The staff's review focused on how the applicant's program manages aging effects through the effective incorporation of these program elements. The staff's evaluation of each of these program elements follows. The staff's review of the "corrective actions," "confirmation process," and "administrative controls" program elements is documented in SER Section 3.0.4.

Scope of Program. The staff reviewed the applicant's "scope of program" program element against the criteria in SRP-SLR Section A.1.2.3.1.

The staff finds the applicant's "scope of program" program element to be adequate because the scope of the program includes the specific structures and components, the aging of which the program manages.

Based on its review of the application, the staff confirmed that the "scope of program" program element satisfies the criteria defined in SRP-SLR Section A.1.2.3.1 and, therefore, the staff finds it acceptable.

Preventive Actions. The staff reviewed the applicant's "preventive actions" program element against the criteria in SRP-SLR Section A.1.2.3.2.

The staff finds the applicant's "preventive actions" program element to be adequate because the program is an inspection-based program that uses successive inspections to manage the effects of cracking due to fatigue, and the applicant has provided information that clearly identifies the program as being a condition monitoring program only, without crediting any preventive actions.

Based on its review of the application, the staff confirmed that the "preventive actions" program element satisfies the criteria defined in SRP-SLR Section A.1.2.3.2 and, therefore, the staff finds it acceptable.

Parameters Monitored or Inspected. The staff reviewed the applicant's "parameters monitored or inspected" program element against the criteria in SRP-SLR Section A.1.2.3.3.

The staff reviewed the "parameters monitored or inspected" program element and noted that the inspections for the pressurizer surge line welds will consist of volumetric and surface examinations that are capable of detecting age-related degradation, including cracking that may be caused by environmentally assisted fatigue.

The staff reviewed the applicant's "parameters monitored or inspected" program element against the criteria in SRP-SLR Section A.1.2.3.3, which state that for a condition monitoring program, the parameters monitored or inspected should be capable of detecting the presence and extent of the aging effect, such as detection and sizing of cracks. The staff finds the "parameters monitored or inspected" program element to be adequate because the program is a condition monitoring program that is using volumetric and surface examinations capable of detecting the aging effect.

Based on its review, the staff confirmed that the "parameters monitored or inspected" program element satisfies the criteria defined in SRP-SLR Section A.1.2.3.3 for condition monitoring programs and, therefore, the staff finds it acceptable.

Detection of Aging Effects. The staff reviewed the applicant's "detection of aging effects" program element against the criteria in SRP-SLR Section A.1.2.3.4, which state that detection of aging effects should occur before there is a loss of structure, or loss of component intended function(s). Therefore, the "detection of aging effects" program element should address how the program element will be capable of detecting or identifying the occurrence of age-related degradation prior to the loss of intended function.

The staff finds the "detection of aging effects" program element to be adequate because the applicant will be performing periodic inspections to identify age-related degradation during the subsequent period of extended operation. Additionally, the frequency of inspections was determined to be adequate by flaw tolerance evaluations, and was previously found acceptable by the NRC (ADAMS Accession No. ML13141A595).

Based on its review of the application, the staff confirmed that the "detection of aging effects" program element satisfies the criteria defined in SRP-SLR Section A.1.2.3.4 and, therefore, the staff finds it acceptable.

Monitoring and Trending. The staff reviewed the applicant's "monitoring and trending" program element against the criteria in SRP-SLR Section A.1.2.3.5.

The staff finds the applicant's "monitoring and trending" program element to be adequate because the frequency and the scope of subsequent inspections will maintain the components' intended function through the subsequent period of extended operation based on postulated flaw growth evaluation.

Based on its review of the application, the staff confirmed that the "monitoring and trending" program element satisfies the criteria defined in SRP-SLR Section A.1.2.3.5 and, therefore, the staff finds it acceptable.

Acceptance Criteria. The staff reviewed the applicant's "acceptance criteria" program element against the criteria in SRP-SLR Section A.1.2.3.6, which states in part that it is not necessary to justify any acceptance criteria that have been established in either NRC-accepted or NRC-endorsed methodology, such as those that may be given in NRC-approved or NRC-endorsed topical reports or NRC-endorsed codes and standards incorporated by reference into NRC regulations, because these have been subject to prior NRC review and have been approved or endorsed for use. The staff noted that the program will use the acceptance criteria of ASME Code Section XI, Subsection IWB-3500 for Class 1 components, which are applicable to the pressurizer surge piping.

Based on its review of the application, the staff confirmed that the "acceptance criteria" program element satisfies the criteria defined in SRP-SLR Section A.1.2.3.6 and, therefore, the staff finds it acceptable.

Operating Experience. SLRA Section B.2.4.1 summarizes operating experience related to the Pressurizer Surge Line Fatigue program. The applicant stated that nuclear industry operating experience indicates that cracking due to fatigue can cause structural degradation and loss of pressure boundary function to susceptible ASME Class 1 components. The applicant further stated that degradation of the pressurizer surge line welds is assessed by surface and volumetric examinations. The applicant further stated that while this AMP is a site-specific AMP, it has performed numerous surface and volumetric examinations that have proven to be effective in detecting cracking. The applicant stated that multiple surface and volumetric examinations have been performed on the pressurizer surge line welds for both units and no recordable indications have been identified.

The staff reviewed operating experience information in the application and during the audit against the acceptance criteria in SRP-SLR Section A.1.2.3.10. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant's corrective action program database; and (b) provide a basis for the staff's conclusions on the ability of the applicant's proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying its proposed program.

Based on its review of the application, the staff finds that the "operating experience" program element satisfies the criteria in SRP-SLR Section A.1.2.3.10 and, therefore, the staff finds it acceptable.

UFSAR Supplement. SLRA Section A.17.2.3.1 provides the UFSAR supplement for the Pressurizer Surge Line Fatigue program. The staff reviewed this UFSAR supplement description of the program and noted that it is in alignment with similar program descriptions in GALL SLR Report Table XI 01. The staff also noted that the applicant committed to ongoing implementation of the existing Pressurizer Surge Line Fatigue program for managing the effects of aging for the 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 technical review of the applicant's Pressurizer Surge Line Fatigue AMP, the staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

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

3.0.3.3.2 Polymer High-Voltage Insulators

SLRA Section B.2.4.2 (as amended by letter dated October 16, 2018, revised in response to RAI B.2.3.44-1, ADAMS Accession No. ML18296A024) describes the new Polymer High-Voltage Insulators program as site-specific.

Staff Evaluation. While reviewing the applicant's SLRA Section B.2.3.44, "High-Voltage Insulators," the staff noted that Turkey Point utilizes polymer high-voltage insulators that are not addressed in the proposed program. The staff issued RAI B.2.3.44-1, requesting the applicant to include and evaluate polymer high-voltage insulators. In its response, documented in ADAMS Accession No. ML18296A024, the applicant revised the SLRA and added this new site-specific AMP under the SLRA, new Section B.2.4.2, titled, "Polymer High-Voltage Insulators."

The staff reviewed program elements 1 through 6 of the applicant's new proposed program against the acceptance criteria for the corresponding elements as stated in SRP-SLR Section A.1.2.3. The staff's review focused on how the applicant's program manages aging effects through the effective incorporation of these program elements. The staff's evaluation of each of these program elements follows. The applicant provided "corrective actions," "confirmation process," and "administrative controls" programs elements discussions as part of SLRA Section B.1.3 and the staff's review of these elements are documented in SER Section 3.0.4.

Scope of Program. The staff reviewed the applicant's "scope of program" program element against the criteria in SRP-SLR Section A.1.2.3.1.

The staff noted that the applicant correctly included SCs and aging that this AMP manages. The staff finds the applicant's "scope of program" program element to be adequate because the program includes aging of polymer high-voltage insulators on the station blackout (SBO) recovery path.

Based on its review of the application, the staff confirmed that the "scope of program" program element satisfies the criteria defined in SRP-SLR Section A.1.2.3.1 and, therefore, the staff finds it acceptable.

Preventive Actions. The staff reviewed the applicant's "preventive actions" program element against the criteria in SRP-SLR Section A.1.2.3.2.

The staff noted that the applicant correctly identified this AMP as a condition monitoring program. The staff finds the applicant's "preventive actions" program element to be adequate because the program includes visual inspection of in-scope polymer high-voltage insulators throughout the subsequent period of extended operation.

Based on its review of the application, the staff confirmed that the "preventive actions" program element satisfies the criteria defined in SRP-SLR Section A.1.2.3.2 and, therefore, the staff finds it acceptable.

Parameters Monitored or Inspected. The staff reviewed the applicant's "parameters monitored or inspected" program element against the criteria in SRP-SLR Section A.1.2.3.3.

The staff noted that the applicant correctly identified parameters to be monitored and inspected in this condition monitoring program. The staff finds the applicant's "preventive actions" program element to be adequate because the program includes visual inspection of in-scope polymer high-voltage insulators for reduced insulation resistance and contaminations as well as loss of material on a frequency based on industry and plant operating experience.

Based on its review of the application, the staff confirmed that the "preventive actions" program element satisfies the criteria defined in SRP-SLR Section A.1.2.3.3 and, therefore, the staff finds it acceptable.

Detection of Aging Effects. The staff reviewed the applicant's "detection of aging effects" program element against the criteria in SRP-SLR Section A.1.2.3.4.

The staff noted that the applicant addressed detection of aging effects before there is a loss of intended function in this condition monitoring program. The staff finds the applicant's "detection of aging effects" program element to be adequate because the program includes visual inspection of in-scope polymer high-voltage insulators for reduced insulation resistance and contaminations as well as loss of material. Visual inspections may also be supplemented with infrared thermography and corona scans. The first of these inspections will be completed prior to the subsequent period of extended operation.

Based on its review of the application, the staff confirmed that the "detection of aging effects" program element satisfies the criteria defined in SRP-SLR Section A.1.2.3.4 and, therefore, the staff finds it acceptable.

Monitoring and Trending. The staff reviewed the applicant's "monitoring and trending" program element against the criteria in SRP-SLR Section A.1.2.3.5.

The staff noted that this is a condition monitoring program (not a performance monitoring program) and trending actions are not necessary. The staff finds the applicant's "monitoring and trending" program element to be adequate because visual inspections are not generally trendable and performance of these components are not tracked per this condition monitoring program.

Based on its review of the application, the staff confirmed that the "monitoring and trending" program element satisfies the criteria defined in SRP-SLR Section A.1.2.3.5 and, therefore, the staff finds it acceptable.

Acceptance Criteria. The staff reviewed the applicant's "acceptance criteria" program element against the criteria in SRP-SLR Section A.1.2.3.6.

The staff noted that the applicant defined qualitative acceptance criteria for visual inspections, thermography, and corona scans for signs of aging effects before there is a loss of intended function in this condition monitoring program. The staff finds the applicant's "acceptance criteria" program element to be adequate because the program includes characterization of surface anomalies and signs of degradation, as well as loss of material for visual inspection of in-scope polymer high-voltage insulators. Also, infrared thermography and corona scans acceptance criteria are addressed based on temperature rise above ambient as well as location and amount of arcing observed.

Based on its review of the application, the staff confirmed that the “acceptance criteria” program element satisfies the criteria defined in SRP-SLR Section A.1.2.3.6 and, therefore, the staff finds it acceptable.

Operating Experience. SLRA Section B.2.4.2 summarizes operating experience related to the Polymer High-Voltage Insulators program. The applicant stated that site operating experience demonstrates that potential damage to high-voltage insulators has been identified and measures have been taken to prevent loss of intended function. In addition, site-specific and industry operating experience will be used to inform and enhance this AMP as appropriate.

The staff reviewed operating experience information in the application and during the audit against the acceptance criteria in SRP-SLR Section A.1.2.3.10. As discussed in the Audit Report (ADAMS Accession No. ML18183A445), the staff conducted an independent search of the plant operating experience information to: (a) to identify examples of age-related degradation, as documented in the applicant’s corrective action program database; and (b) provide a basis for the staff’s conclusions on the ability of the applicant’s proposed AMPs and TLAAs to manage the effects of aging in the subsequent period of extended operation. The staff did not identify any operating experience that would indicate that the applicant should consider modifying its proposed program.

Based on its review of the application and the applicant’s response to RAI B.2.3.44-1, the staff finds that the “operating experience” program element satisfies the criteria in SRP-SLR Section A.1.2.3.10 and, therefore, the staff finds it acceptable.

UFSAR Supplement. SLRA Section A.17.2.3.2 (as amended by letter dated October 16, 2018, revised by response to RAI B.2.3.44-1, ADAMS Accession No. ML18296A024), provides the UFSAR supplement for the Polymer High-Voltage Insulators program. During its evaluation of the applicant’s response to RAI B.2.3.44-1, the staff noted that the proposed UFSAR supplement program description adequately addresses the Polymer High-Voltage Insulators program. The staff finds the applicant’s response acceptable because the program description is in alignment with similar program descriptions in GALL-SLR Report Table XI-01.

The staff also noted that the applicant committed to implement the new Polymer High-Voltage Insulators program no later than 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 October 16, 2018, is an adequate summary description of the program

Conclusion. On the basis of its technical review of the applicant’s Polymer High-Voltage Insulators program, the staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the 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).

3.0.4 QA Program Attributes Integral to Aging Management Programs

The regulations in 10 CFR 54.21(a)(3) require license renewal applicants to demonstrate that for structures and components subject to an AMR, they will adequately manage aging in a way that maintains intended function(s) consistent with the CLB for the period of extended operation. The SRP-SLR, Appendix A.1, "Aging Management Review‑Generic," describes 10 elements of an acceptable aging management program. Program elements 7, 8, and 9 are associated with the QA activities of corrective actions, confirmation process, and administrative controls, respectively. 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.

SRP-SLR, Appendix A.2, "Quality Assurance for Aging Management Programs," notes that AMP aspects that affect the quality of safety-related structures, systems, and components are subject to the QA requirements of 10 CFR Part 50 Appendix B. Additionally, for nonsafety-related structures and components 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"). SRP-SLR, Appendix A.2 provides the following guidance on the QA attributes of aging management programs:

- Safety-related structures and components are subject to 10 CFR Part 50 Appendix B requirements, which are adequate to address all quality-related aspects of an aging management program consistent with the current licensing basis of the facility for the subsequent period of extended operation.
- For nonsafety-related structures and components that are subject to an aging management review, applicants have an option to expand the scope of their 10 CFR Part 50 Appendix B program to include these structures and components to address Program Element 7 (corrective actions), Program Element 8 (confirmation process), and Program Element 9 (administrative controls) for aging management during the subsequent period of extended operation. In this case, the applicant should document such commitment in the UFSAR 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 SRP-SLR, Appendix A.1.

3.0.4.1 Summary of Technical Information in Application

SLRA Appendix A, "Updated Final Safety Analysis Report Supplement," Section A.17.1.3, "Quality Assurance Program and Administrative Controls," and SLRA Appendix B, "Aging Management Programs," Section 1.3, "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 Section A.17.1.3, states:

> The FPL Quality Assurance (QA) Program for [Turkey Point] implements the requirements of 10 CFR Part 50, Appendix B, and is consistent with the summary in Appendix A.2, "Quality Assurance for Aging Management Programs (Branch Technical Position IQMB-1)," of NUREG-2192. The FPL QA Program includes the elements of corrective action, confirmation process, and administrative controls, and is applicable to the safety-related and nonsafety-related SSCs and commodity groups that are included within the scope of the AMPs.

SLRA Section B.1.3, states:

> The FPL Quality Assurance (QA) Program for [Turkey Point] implements the requirements of 10 CFR Part 50, Appendix B, "Quality Assurance Requirements for Nuclear Power Plants and Fuel Reprocessing Plants," and is consistent with the summary in Appendix A.2, "Quality Assurance for Aging Management Programs (Branch Technical Position IQMB-1)," of NUREG-2192. The FPL QA Program includes the elements of corrective action, confirmation process, and administrative controls, and is applicable to the safety-related and nonsafety-related SSCs and commodity groups that are included within the scope of the AMPs.

3.0.4.2 Staff Evaluation

The staff reviewed SLRA Section A.17.1.3, and Appendix B, Section B.1.3, which describe how the applicant's existing QA program includes the QA-related elements ("corrective actions," "confirmation process," and "administrative controls") for AMPs consistent with the staff's guidance described in SRP-SLR, Appendix A. The staff also reviewed a sample of the applicant's AMP basis documents and verified that the AMPs 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 attributes presented in the aging management program basis documents and the associated AMPs are consistent with the staff's position regarding QA for aging management.

3.0.4.3 Conclusion

On the basis of the staff's review of SLRA Section A.17.1.3, and SLRA Appendix B, Section B.1.3, and the aging management program basis documents, the staff finds that the QA attributes presented in the aging management program basis documents and the associated AMPs are consistent with 10 CFR 54.21(a)(3) and SRP-SLR, Appendix A.

3.0.5 Operating Experience for Aging Management Programs

3.0.5.1 Summary of Technical Information in the Application

SLRA Appendix A, "Updated Final Safety Analysis Report Supplement," Section A.17.1.4, "Operating Experience Program," and SLRA Appendix B, "Aging Management Programs," Section 1.4, "Operating Experience," describe the consideration of operating experience for

AMPs. SLRA Sections A.17.1.4 and B.1.4 state that the applicant does a systematic review of plant-specific and industry operating experience concerning aging management and age-related degradation to ensure that the 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 is reviewed to identify corrective actions that may result in program enhancements. The applicant provided additional information in a letter dated March 6, 2019 (ADAMS Accession No. ML19070A135), modifying Sections A.17.1.4 and B.1.4 to indicate that operating experience assessments would be performed on a periodic basis not to exceed 5 years.

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 consistent with the CLB for the period of extended operation. SRP-SLR, Appendix A.4, “Operating Experience for Aging Management Programs,” states that the systematic review of plant-specific and industry 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 A.17.1.4 and B.1.4 to determine how the applicant will use future operating experience to ensure that the AMPs are effective. The staff evaluated the applicant’s operating experience review activities, as described in the 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.

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 evaluating 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 3-196 Staff,” in NUREG-0737, “Clarification of TMI Action Plan Requirements,” dated November 1980 (ADAMS Accession No. ML051400209). 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) program endorsed in NRC GL 82-04, “Use of INPO SEE IN Program,” dated March 9, 1982).

SLRA Sections A.17.1.4 and B.1.4 state that the applicant uses its operating experience program to systematically capture and review operating experience from plant-specific and industry sources. The applicant stated that the operating experience program meets the requirements of NUREG-0737. The applicant further states that the operating experience program interfaces 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 A.17.1.4 and B.1.4 state that operating experience from plant-specific and industry sources are systematically captured and 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. SLRA Sections A.17.1.4 and B.1.4 state that the ongoing evaluation of operating experience included a review of corrective actions resulting 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. In addition, the SLRA states that program owners contributed evidence of program success or weakness and identified applicable self-assessments, QA audits, peer evaluations, and NRC reviews.

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 to include nonsafety-related SCs.

SLRA Sections A.17.1.4 and B.1.4 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 Section B.1.4 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 A.17.1.4 and B.1.4 state that the sources of external operating experience include an active participation in the INPO operating experience program, GALL-SLR Report revisions, and other NRC review and guidance documentation.

The staff finds the sources of industry operating experience acceptable because 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. The applicant's consideration of industry guidance documents as operating experience is therefore consistent with the guidance in SRP-SLR Section A.4.2.

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 A.17.1.4 and B.1.4 state that internal and external operating experience is captured and systematically reviewed on an ongoing basis and that the operating experience program provides for evaluation of the effectiveness of their self-assessment process for each AMP described in the UFSAR supplement. 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 the applicant's operating experience review processes acceptable because, after enhancement, these processes will include screening of all new operating experience to identify and evaluate items that have the potential to impact the aging management activities. The applicant's screening of plant-specific and industry operating experience is therefore consistent with the guidance in SRP-SLR Section A.4.2.

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 Section B.1.4 states that the corrective action includes aging type codes to identify either plant conditions related to aging or industry operating experience related to aging.

The staff finds the applicant's identification of operating experience related to aging acceptable because the applicant has a means at a programmatic level to identify, trend, and evaluate operating experience that involves age-related degradation. The applicant's identification of age-related operating experience applicable to the plants is therefore consistent with the guidance in SRP-SLR Section A.4.2.

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 A.17.1.4 and B.1.4 state that the applicant's program requires that when evaluations indicate that the effects of aging are not being adequately managed, the affected AMPs are either enhanced or new AMPs are developed, as appropriate.

The staff determined that the applicant's evaluations of age-related operating experience 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 use of the operating experience program and corrective action program to ensure that the effects of aging are adequately managed is 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.

For inspection programs, the staff reviewed reports of recent inspections, examinations, or tests to determine whether aging effects have been identified on applicable components. For monitoring programs, the staff reviewed reports of sample results to determine whether parameters are being maintained as required by the program. In addition, program owners contributed evidence of program success or weakness and identified applicable self-assessments, QA audits, peer evaluations, and NRC reviews.

SLRA Sections A.17.1.4 and B.1.4 state that the Turkey Point operating experience program also meets the requirements of NEI 14-12 for periodic program assessments. In addition, SLRA Sections A.17.1.4 and B.1.4 state that AMP and operating experience assessments would be performed on a periodic basis not to exceed 5 years.

The staff reviewed the SLRA and conducted audits and finds the applicant's treatment of AMP implementation results as operating experience acceptable because the applicant will evaluate these results and use the information to determine whether to adjust the aging management activities. The applicant's activities for the evaluation of AMP implementation results are therefore consistent with the guidance in SRP-SLR Section A.4.2.

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 for those personnel that 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 A.17.1.4 and B.1.4 state that the operating experience program provides for training for those responsible for activities including screening, evaluating, and communicating operating experience items related to aging management and aging-related degradation. This training will be commensurate with their role in the process, will be provided periodically, and will continue to include provisions to accommodate personnel turnover.

The staff reviewed the SLRA and determined that the scope of personnel included in the applicant's training program is consistent with the guidelines in SRP-SLR Section A.4.2. The staff also determined that the applicant has demonstrated that its training program will cover age-related degradation and aging management topics. The applicant's training activities are therefore consistent with the guidance in SRP-SLR Section A.4.2.

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

The staff finds the applicant's operating experience program acceptable because the applicant has established appropriate expectations and guidelines for identifying plant-specific operating experience concerning aging management and age-related degradation to the industry.

The applicant's establishment of these guidelines is therefore consistent with the guidance in SRP-SLR Section A.4.2.

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.

SLRA Sections A.17.1.4 and B.1.4 state that the applicant's self-assessment process provides for periodic evaluation of the effectiveness of this operating experience program described in the UFSAR supplement. SLRA Sections A.17.1.4 and B.1.4 state that the operating experience program will be implemented on an ongoing basis throughout the terms of the renewed licenses. SLRA Section A.17.1.4 provides the UFSAR supplement summary description of the applicant's enhanced programmatic activities for ongoing review of the operating experience. On issuance of the subsequent renewed licenses in accordance with 10 CFR 54.31(c), this summary description of enhanced programmatic activities 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.

3.0.5.2.5 Summary

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 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. On the basis of its review and its audit, and the consistency of the applicant's operating experience review activities with the guidance in SRP-SLR Section 4.2, the staff finds the applicant's programmatic activities for the ongoing review of operating experience acceptable.

3.0.5.3 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 A.17.1.4 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.

The staff reviewed SLRA Section A.17.1.4 and found that the summary description of the ongoing evaluation of operating experience related to aging management will consider: (a) SSCs; (b) materials; (c) environments; (d) aging effects; (e) aging mechanisms; and (f) AMPs and that procedures will be revised to specify these evaluations.

Based on its review, the staff finds that the content of the applicant's summary description is consistent with the recommendations provided in the GALL-SLR Report and also 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 acceptable.

3.0.5.4 Conclusion

Based on its review and its audit of the applicant's programmatic activities for the ongoing review of operating experience, the NRC 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 concludes that it provides an adequate summary description, as required by 10 CFR 54.21(d).

3.1 <u>Aging Management of Reactor Coolant System</u>

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 Coolant System," as being subject to an AMR. SLRA Table 3.1-1, "Summary of Aging Management Evaluations for the Reactor Vessel, Internals, and Reactor Coolant System," is a summary comparison of the applicant's aging management reviews with those evaluated in the GALL-SLR Report for the RCS components and component groups.

3.1.2 Staff Evaluation

Table 3.1-1, below, summarizes the NRC staff's evaluation of the component groups listed in SLRA Section 3.1 and addressed in the GALL-SLR Report.

Table 3.1-1 Staff Evaluation for Reactor Vessel, Internals, and Reactor Coolant System Components in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1-1-001	Consistent with the GALL-SLR Report (see 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 Turkey Point (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 Turkey Point (see SER Section 3.1.2.2.3, item 3)
3.1-1-016	Not applicable to PWRs (see SER Section 3.1.2.2.4, item 1)
3.1-1-017	Not applicable to PWRs (see SER Section 3.1.2.2.4, item 2)
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)
3.1-1-020	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.6)
3.1-1-021	Not applicable to PWRs (see SER Section 3.1.2.2.7)
3.1-1-022	Not applicable to Turkey Point (see SER Section 3.1.2.2.8)
3.1-1-023	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1-024	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1-025	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.11)
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	Consistent with the GALL-SLR Report (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	Consistent with the GALL-SLR Report
3.1-1-033	Consistent with the GALL-SLR Report
3.1-1-034	Not applicable to Turkey Point
3.1-1-035	Consistent with the GALL-SLR Report
3.1-1-036	Consistent with the GALL-SLR Report
3.1-1-037	Consistent with the GALL-SLR Report
3.1-1-038	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)

Component Group (SRP-SLR Item No.)	Staff Evaluation
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	This item number not used by Turkey Point
3.1-1-049	Consistent with the GALL-SLR Report
3.1-1-050	Consistent with the GALL-SLR Report
3.1-1-051a	Not applicable to Turkey Point (see SER Section 3.1.2.2.9)
3.1-1-051b	Not applicable to Turkey Point (see SER Section 3.1.2.2.9)
3.1-1-052a	Not applicable to Turkey Point (see SER Section 3.1.2.2.9)
3.1-1-052b	Not applicable to Turkey Point (see SER Section 3.1.2.2.9)
3.1-1-052c	Not applicable to Turkey Point (see SER Section 3.1.2.2.9)
3.1-1-053a	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.9)
3.1-1-053b	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.9)
3.1-1-053c	Consistent with the GALL-SLR Report (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 Turkey Point (see SER Section 3.1.2.2.9)
3.1-1-055b	Not applicable to Turkey Point (see SER Section 3.1.2.2.9)
3.1-1-055c	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.9)
3.1-1-056a	Not applicable to Turkey Point (see SER Section 3.1.2.2.9)
3.1-1-056b	Not applicable to Turkey Point (see SER Section 3.1.2.2.9)
3.1-1-056c	Not applicable to Turkey Point (see SER Section 3.1.2.2.9)
3.1-1-057	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.1-1-058a	Not applicable to Turkey Point (see SER Section 3.1.2.2.9)
3.1-1-058b	Not applicable to Turkey Point (see SER Section 3.1.2.2.9)
3.1-1-059a	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.9)
3.1-1-059b	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.9)
3.1-1-059c	Consistent with the GALL-SLR Report (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	Consistent with the GALL-SLR Report
3.1-1-063	Not applicable to PWRs
3.1-1-064	Consistent with the GALL-SLR Report
3.1-1-065	Not applicable to Turkey Point
3.1-1-066	Consistent with the GALL-SLR Report
3.1-1-067	Consistent with the GALL-SLR Report
3.1-1-068	Not applicable to Turkey Point
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
3.1-1-072	Consistent with the GALL-SLR Report
3.1-1-073	Consistent with the GALL-SLR Report
3.1-1-074	Consistent with the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.1-1-075	Not applicable to Turkey Point
3.1-1-076	Consistent with the GALL-SLR Report
3.1-1-077	Consistent with the GALL-SLR Report
3.1-1-078	Not applicable to Turkey Point (see SER Section 3.1.2.1.1)
3.1-1-079	Not applicable to PWRs
3.1-1-080	Not applicable to Turkey Point
3.1-1-081	Not applicable to Turkey Point
3.1-1-082	Not applicable to Turkey Point
3.1-1-083	Consistent with the GALL-SLR Report
3.1-1-084	Not applicable to PWRs
3.1-1-085	Not applicable to PWRs
3.1-1-086	Not applicable to Turkey Point
3.1-1-087	Consistent with the GALL-SLR Report
3.1-1-088	Consistent with the GALL-SLR Report
3.1-1-089	Consistent with the GALL-SLR Report
3.1-1-090	Not applicable to Turkey Point
3.1-1-091	Not applicable to PWRs
3.1-1-092	Consistent with the GALL-SLR Report
3.1-1-093	Not applicable to Turkey Point
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 3.1.2.2.13)
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 3.1.2.2.12)
3.1-1-104	Not applicable to PWRs
3.1-1-105	Not applicable to Turkey Point (see SER Section 3.1.2.2.15)
3.1-1-106	This item number not used by Turkey Point
3.1-1-107	Consistent with the GALL-SLR Report (see SER Section 3.1.2.1.2)
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	This item number not used by Turkey Point
3.1-1-115	Not applicable to Turkey Point (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	Consistent with the GALL-SLR Report (see SER Section 3.1.2.2.10)
3.1-1-118	Consistent with the GALL-SLR Report (see SER Sections 3.1.2.2.9 and 3.1.2.1.3)
3.1-1-119	Consistent with the GALL-SLR Report (see SER Sections 3.1.2.2.9 and 3.1.2.1.4)

Component Group (SRP-SLR Item No.)	Staff Evaluation
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
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 Turkey Point
3.1-1-134	Not applicable to Turkey Point
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	Not applicable to Turkey Point
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)

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 Turkey Point 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 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 3.1.2-5 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.

Additionally, Section 3.1.2.1.1 documents the staff's review of AMR items that the applicant determined to 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, 3.1-1-030, 3.1-1-031, 3.1-1-043, 3.1-1-060, 3.1-1-063, 3.1-1-079, 3.1-1-084, 3.1-1-085, 3.1-1-091, 3.1-1-094 through 3.1-1-098, 3.1-1-100 through 3.1-1-102, 3.1-1-104, 3.1-1-110, 3.1-1-113, 3.1-1-113, 3.1-1-128, and 3.1-1-129, 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 Turkey Point because it is a PWR.

For SLRA Table 3.1-1, items 3.1-1-034, 3.1-1-065, 3.1-1-068, 3.1-1-075, 3.1-1-080 through 3.1-1-82, 3.1-1-086, 3.1-1-090, 3.1-1-093, 3.1-1-133, 3.1-1-134, and 3.1-1-137, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to Turkey Point. 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 3.1-1, item 3.1-1-078, the applicant claimed that the corresponding item in the GALL-SLR Report is not used because "[a]ll nickel alloy components on the secondary side of the steam generator are addressed using more specific line items." The staff reviewed the SLRA AMR results and noted that there is no component, material, environment, and aging effect combination present at Turkey Point that corresponds to GALL-SLR Report item 3.1-1-078. Therefore, the staff concludes that this item is more appropriately considered to be "not applicable" to Turkey Point.

3.1.2.1.2 No Aging Effect Management

SLRA Table 3.1-1, item 3.1-1-107, states that there are no aging effects requiring management for stainless steel piping and piping components exposed to gas or air with borated water leakage. The applicant stated that, "[c]onsistent with item number 3.1-1-107, this line item is not used to recognize the lack of aging effects in stainless steel piping and piping components exposed to air with borated water leakage." The staff noted that there are no Table 2 entries in SLRA Section 3.1 associated with stainless steel components exposed to air with treated borated water. The staff finds this acceptable because, consistent with GALL-SLR Report AMR item EP-19, there are no aging effects associated with stainless steel components exposed to air with borated water leakage.

3.1.2.1.3 Stainless Steel or Nickel Alloy PWR Reactor Vessel Internals – Cracking Due to Stress Corrosion Cracking, Irradiation-Assisted Stress Corrosion Cracking, and/or Fatigue

SLRA Table 3.1-1, item 3.1-1-118 addresses stainless steel or nickel alloy PWR reactor vessel internal (RVI) components exposed to reactor coolant and neutron flux, which will be managed for cracking due to SCC, IASCC, and/or fatigue. For the AMR items in SLRA Table 3.1.2-4 that cite generic note E, the SLRA credits the RVI AMP, which is consistent with GALL-SLR Report AMP XI.M16A, instead of the plant-specific AMP to manage this aging effect for stainless steel and nickel alloy RVI components that reference item 3.1-1-118. All SLRA Table 3.1.2-4 AMR items that cite generic note E also cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect.

Based on its review of the RVI components associated with item 3.1-1-118, for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the RVI AMP acceptable because the staff's evaluation of the RVI AMP and MRP-227-A Gap Analysis in SLRA Appendix C has determined that the effects of aging on the Turkey Point RVI components will be adequately managed using the RVI AMP for the subsequent period of extended operation.

3.1.2.1.4 Stainless Steel or Nickel Alloy PWR Reactor Vessel Internals – Loss of Fracture Toughness, Changes in Dimensions, Loss of Preload, Loss of Material

SLRA Table 3.1-1, item 3.1-1-119 addresses stainless steel or nickel alloy PWR RVI components exposed to reactor coolant and neutron flux, which will be managed for loss of fracture toughness due to IE and/or TE, changes in dimensions due to VS, loss of preload due to ISR, and/or loss of material due to wear. For the AMR items in SLRA Table 3.1.2-4 that cite generic note E, the SLRA credits the RVI AMP, which is consistent with GALL-SLR Report AMP XI.M16A, instead of the plant-specific AMP to manage these aging effects for stainless steel and nickel alloy RVI components that reference item 3.1-1-119. All SLRA Table 3.1.2-4 AMR items that cite generic note E also cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect.

Based on its review of the RVI components associated with item 3.1-1-119, for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the RVI AMP acceptable because the staff's evaluation of the RVI AMP and MRP-227-A Gap Analysis in SLRA Appendix C has determined that the effects of aging on the Turkey Point RVI components will be adequately managed using the RVI AMP for the subsequent period of extended operation.

3.1.2.2 Aging Management Review Results for which Further Evaluation is Recommended by the GALL-SLR Report

In SLRA Section 3.1.2.2, the applicant further evaluates aging management, as recommended by the GALL-SLR Report, for the RCS components and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of component groups of which the GALL-SLR Report recommends further evaluation 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 through 3.1-1-011, indicates that TLAAs for RCS components are evaluated in accordance with 10 CFR 54.21(c)(1) and that the evaluation of this TLAA is addressed in Section 4.3. Additionally, RVI components are subject to inspections to monitor for cracking due to fatigue in components that may be susceptible. The staff noted that these inspections are performed in accordance with the Reactor Vessel Internals program or the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program for core support components, which is consistent with the GALL-SLR Report. The staff finds that the applicant's approach is consistent with SRP-SLR Section 3.1.2.2.1 and is, therefore, acceptable. The staff's evaluation of the TLAA for RCS components is documented in SER Section 4.3.1.

Regarding the AMR item associated with SLRA Table 3.1-1 item 3.1-1-005, which cites generic note E, the applicant stated that "the pressurizer surge line is not sufficiently managed based on the analysis and [the Pressurizer Surge Line Fatigue program] is required to manage the pressurizer surge line for cumulative fatigue damage." The staff reviewed the applicant's proposed AMP and found that it provides an acceptable way to manage the applicable aging effect. The staff's review of the Pressurizer Surge Line Fatigue program is documented in SER Section 3.0.3.3.1.

Based on its review of components associated with item 3.1-1-005 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Pressurizer Surge Line Fatigue program acceptable.

The applicant stated that Table 3.1-1 item 3.1-1-004 is not applicable because the reactor vessel is nozzle-supported and there is no support skirt. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.1 and finds it acceptable because the staff's review of SLRA Section 3.5.2.2.2.6 and UFSAR Section 5.1.9.3 confirmed that Turkey Point does not have a support skirt and related attachment welds.

The applicant stated that Table 3.1-1 items 3.1-1-006 and 3.1-1-007 are not applicable because they only apply to BWRs. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.1 and finds it acceptable because the staff's review of the SRP-SLR confirmed that these items are only applicable to BWRs and Turkey Point Units 3 and 4 are PWRs.

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

Item 1. SLRA Section 3.1.2.2.2, item 1, associated with SLRA Table 3.1-1 item 3.1-1-012, addresses loss of material due to general, pitting, and crevice corrosion for the steel steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam. The applicant indicated that this aging effect is managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program and the Water Chemistry program.

The criteria in SRP-SLR Section 3.1.2.2.2, item 1, state that loss of material due to general, pitting, and crevice corrosion could occur for steel steam generator upper and lower shells and transition cones exposed to secondary feedwater and steam. The SRP-SLR also indicates that, as discussed in IN 90-04, "Cracking of the Upper Shell-to-Transition Cone Girth Welds in Steam Generators," dated January 26, 1990, if general, pitting, and crevice corrosion of the shell exists, the program may not be sufficient to detect general, pitting, and crevice corrosion. As described in the SRP-SLR, the GALL-SLR Report recommends augmented inspection to manage this aging effect and further clarifies that this issue is limited to Westinghouse Model 44 and Model 51 steam generators where a high-stress region exists at the shell-to-transition cone weld. The staff's review verified that the applicant has proposed a program that will manage loss of material due to general, pitting, and crevice corrosion by providing enhanced inspection and supplemental methods to detect loss of material and will ensure that the components' intended functions will be maintained during the subsequent period of extended operation.

The SLRA states that Turkey Point uses Westinghouse Model 44 steam generators and that their design includes a high-stress region at the shell-to-transition cone welds. Loss of material due to general, pitting, and crevice corrosion in the lower shell-to-transition cone weld and transition cone to upper shell weld will be managed by the Water Chemistry program and ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program. The two welds (lower shell-to-transition cone and transition cone-to-upper shell) are original welds. The staff noted that the applicant uses enhanced techniques for its examination of the welds and that the enhanced techniques currently used in Turkey Point's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program for the original transition cone welds are consistent with the techniques described in IN 90-04. Therefore, no further augmented inspection is required.

The staff's evaluations of the applicant's ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program and Water Chemistry program are documented in SER Sections 3.0.3.2.10 and 3.0.3.1.9, respectively. In its review of components associated with item 3.1-1-012, the staff finds that the applicant has met the further evaluation criteria and that the applicant's proposal to manage the effects of aging using these programs is acceptable because (1) the Inservice Inspection program includes enhanced 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 programs identified, the staff determined that the applicant's programs meet the criteria of SRP-SLR Section 3.1.2.2.2, item 1. For those 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Item 2</u>. 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 for the new transition cone closure weld exposed to secondary feedwater and steam. The criteria in SRP-SLR Section 3.1.2.2.2, item 2, indicate that this item is applied to a partially replaced steam generator that has a replaced bottom part by generating a cut in the middle of the transition cone and a new transition cone closure weld. GALL-SLR Report guidance recommends that volumetric examinations be performed in addition to the requirements of ASME Section XI for the new weld for managing loss of material due to general, pitting, and crevice corrosion in the welds for Westinghouse Model 44 steam generators. The reason is that the ASME Section XI criteria would only perform a VT-2 visual leakage examination of the weld as part of the system leakage test performed pursuant to ASME Section XI requirements, which may not be sufficient.

The SLRA states that the steam generator transition cones at Turkey Point Units 3 and 4 were cut to replace the bottom portion of the steam generator. The resulting new circumferential weld is a field weld. The surface conditions of the new circumferential weld may result in flow conditions more conducive to initiation of general, pitting, and crevice corrosion. The new circumferential closure weld will be managed by the Water Chemistry program. In addition, a one-time inspection in accordance with the One-Time Inspection program of the new circumferential closure weld will be conducted to verify the effectiveness of the Water Chemistry program in managing general, pitting, and crevice corrosion of the shell weld. This inspection will be a volumetric inspection consistent with the techniques currently in place for the original transition cone welds and will be performed prior to entering the subsequent period of extended operation.

The staff's evaluations of the applicant's One-Time Inspection program and Water Chemistry program are documented in SER Sections 3.0.3.1.11 and 3.0.3.1.9, respectively. In its review of components associated with item 3.1-1-012, the staff finds that the applicant has met the further evaluation criteria and that the applicant's proposal to manage the effects of aging using these programs is acceptable because (1) the One-Time Inspection program includes volumetric examinations to confirm the integrity of the steam generator shell welds and verify the effectiveness of the Water Chemistry program, (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 programs identified, the staff determined that the applicant's programs meet the criteria of SRP-SLR Section 3.1.2.2.2, item 2. For those 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.3 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement

Item 1. SLRA Section 3.1.2.2.3, item 1, associated with SLRA Table 3.1-1, item 3.1-1-013, addresses carbon or low-alloy steel exposed to reactor coolant and neutron flux that will be managed for loss of fracture toughness due to neutron IE by the Reactor Pressure Vessel Neutron Embrittlement TLAA. SLRA Section 3.1.2.2.3, item 1, states that TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1) and that the evaluation of this TLAA is addressed in Section 4.2, "Reactor Pressure Vessel Neutron Embrittlement." This is consistent with SRP-SLR Section 3.1.2.2.3, item 1, and is, therefore, acceptable. The staff's evaluation of the TLAAs for loss of fracture toughness due to neutron IE is documented in SER Section 4.2.

Item 2. SLRA Section 3.1.2.2.3, associated with SLRA Table 3.1-1, item 3.1-1-014, addresses carbon or low-alloy steel exposed to reactor coolant and neutron flux that will be managed for loss of fracture toughness due to neutron IE by the Reactor Vessel Material Surveillance and Neutron Fluence Monitoring AMPs. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.3, item 2.

These criteria essentially are that an applicant may manage loss of fracture toughness of the applicable components using a plant-specific or integrated reactor vessel material surveillance program in accordance with GALL-SLR Report AMP XI.M31 and may also use a neutron fluence monitoring program in accordance with GALL-SLR Report AMP X.M2 in conjunction with the reactor vessel material surveillance program. The staff found that the applicant's Reactor Vessel Material Surveillance program is consistent with the GALL-SLR Report, with one acceptable exception, as documented in SER Section 3.0.3.1.3, and that the applicant's Neutron Fluence Monitoring program is consistent with the GALL-SLR Report, with enhancements, as documented in SER Section 3.0.3.2.2. The staff found that both programs will adequately manage the applicable effects of aging 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 SRP-SLR also states that in accordance with 10 CFR Part 50, Appendix H, an applicant is required to submit its proposed withdrawal schedule for approval prior to implementation. The SRP-SLR further states that untested capsules placed in storage must be maintained for future insertion and thus further staff evaluation is required for a subsequent license renewal. The SRP-SLR further states that specific recommendations for an acceptable AMP are provided in GALL-SLR Report AMP XI.M31, "Reactor Vessel Material Surveillance." The staff notes that the NRC previously approved the surveillance capsule withdrawal schedule for Turkey Point Units 3 and 4. As a result of a staff RAI related to the Reactor Vessel Material Surveillance program, the applicant proposed an incremental change to the withdrawal schedule for one capsule, which the staff determined to be acceptable as documented in SER Section 3.0.3.1.3.

In its review of components associated with item 3.1-1-014, the staff finds that the applicant has met the further evaluation criteria and that the applicant's proposal to manage the effects of aging using the Reactor Vessel Material Surveillance program and Neutron Fluence Monitoring program is acceptable because (1) the capsule withdrawal schedule has previously been approved by the NRC and, with an incremental schedule adjustment, remains applicable for the subsequent period of extended operation and (2) the staff concluded that the applicant demonstrated that the Reactor Vessel Material Surveillance program and Neutron Fluence Monitoring program would adequately manage the applicable effects of aging 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).

Based on the programs identified, the staff determined that the applicant's programs meet the criteria of SRP-LR Section 3.1.2.2.3, item 2. For those items associated with SLRA Section 3.1.2.2.3, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended 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 3.1.2.2.3, associated with SLRA Table 3.1-1, item 3.1-1-015, addresses the TLAA for reduction in fracture toughness for Babcock & Wilcox (B&W) reactor vessel internal (RVI) components. The applicant stated that this item is not applicable to the Turkey Point RVI components because Turkey Point is a Westinghouse design. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.3 item 3 and finds it acceptable because this item only applies to B&W RVI components, and there is no TLAA in the CLB concerning reduction in fracture toughness for the Turkey Point RVI components.

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 Intergranular Stress Corrosion Cracking (IGSCC) in BWR vessel flange leak detection piping. The applicant stated that this item is not applicable because it only applies to BWRs. The staff evaluated the applicant's claim and finds it acceptable because SRP-SLR Table 3.1-1 limits the applicability of this item to BWRs and Turkey Point is a PWR.

Item 2. The staff reviewed SLRA Section 3.1.2.2.4, item 2, associated with SRP-SLR Table 3.1-1, item 3.1-1-017, against the criteria in SRP-SLR Section 3.1.2.2.4. The applicant stated that this item is not applicable to Turkey Point Units 3 and 4, which are PWR units. The staff noted that the associated item in the SRP-SLR 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 the evaluation of the TLAA concerning underclad crack growth in RPV forgings due to cyclic loading is addressed in SLRA Section 4.7. The staff noted that this TLAA is provided in SLRA Section 4.3.4. This is consistent with SRP-SLR Section 3.1.2.2.5 and is, therefore, acceptable. The staff's evaluation of the TLAA for underclad crack growth and associated fracture mechanics analysis for RPV forgings is documented in SER Section 4.3.4.

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 reactor vessel (RV) bottom mounted instrumentation (BMI) guide tubes exposed to a reactor coolant environment. The SLRA states that the Turkey Point 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 AERM is not present for this material and environment combination. In an unlikely scenario where 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 Inservice Inspection, Subsections IWB, IWC, and IWD program acceptable.

Based on the programs identified, the staff determined that the applicant's programs meet the criteria of 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, item 2, is associated with SLRA Table 3.1-1, item 3.1-1-020, and addresses aging of cast austenitic stainless steel (CASS) Class 1 piping, piping components, and piping elements exposed to reactor coolant that will be managed for cracking due to SCC by the Water Chemistry program. The applicant stated that SRP-SLR Section 3.1.2.2.6.2 refers to the guidance provided in NUREG-0313, Revision 2, "Technical Report on Material Selection and Process Guidelines for BWR Coolant Pressure Boundary Piping," dated January 1988 (ADAMS Accession No. ML031470422). The applicant further stated that SRP-SLR Section 3.1.2.2.6.2 suggests that SCC could also occur in Class 1 PWR CASS reactor coolant system piping and piping components exposed to reactor coolant that do not meet the NUREG-0313 guidelines with regard to ferrite and carbon content.

The applicant addressed the further evaluation criteria of SRP-SLR Section 3.1.2.2.6.2 by stating that it reviewed industry operating experience and did not note any instances of SCC reported for CASS components exposed to PWR reactor coolant. Additionally, the applicant also stated that it reviewed plant-specific operating experience at Turkey Point and did not note any instances of SCC for its Class 1 CASS components.

In its review of components associated with SLRA Table 3.1-1, item 3.1-1-020, the staff noted that the applicant cited generic note E, and credited the Water Chemistry program to manage the effects of SCC for its CASS Class 1 piping, piping components, and piping elements. However, the staff noted that these components are also covered within the applicant's Inservice Inspection program, which uses visual, volumetric, and/or surface examinations that can monitor for SCC of the CASS components.

The staff's evaluations of the applicant's Water Chemistry program and Inservice Inspection program are documented in SER Sections 3.0.3.1.9 and 3.0.3.2.10, respectively.

In its review of components associated with item 3.1-1-020, the staff finds that the applicant has met the further evaluation criteria and that the applicant's proposal to manage the effects of aging of the CASS components is acceptable because (a) the Water Chemistry program demonstrated its ability to control the primary water chemistry to manage for SCC of the CASS components and (b) the existing Inservice Inspection program provides adequate inspection methods to ensure detection of cracking in the CASS components due to SCC, should it occur.

Based on the programs identified, the staff determined that the applicant's programs meet the criteria of SRP-SLR Section 3.1.2.2.6, item 2. For those items associated with SLRA Section 3.1.2.2.6, item 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging of the CASS components will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of subsequent extended operation as required by 10 CFR 54.21(a)(3).

<u>Item 3</u>. SLRA Section 3.1.2.2.6, item 3, associated with SLRA Table 3.1-1, item 3.1-1-139, addresses stainless steel and nickel alloy reactor vessel top head enclosure flange leak detection piping exposed to uncontrolled indoor air and reactor coolant leakage, which will be managed for cracking due to SCC by the External Surfaces Monitoring of Mechanical Components program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.6, item 3. In its review of components associated with item 3.1-1-139, the staff finds that the applicant has met the further evaluation criteria and that the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components program is acceptable because the program's visual inspections can detect indications of cracking prior to a loss of intended function through the identification of borated water leakage.

Based on the program identified, the staff determined that the applicant's program meets the criteria of SRP-SLR Section 3.1.2.2.6, item 3. For those items associated with SLRA Section 3.1.2.2.6, item 3, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.7 Cracking Due to Cyclic Loading

The staff reviewed SLRA Section 3.1.2.2.7, associated with SRP-SLR Table 3.1-1, item 3.1-1-027, against the criteria in SRP-SLR Section 3.1.2.2.7. The applicant stated that this item is not applicable to Turkey Point Units 3 and 4, which are PWR units, because the associated item in the SRP-SLR 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, item 3.1-1-022, addresses loss of material due to erosion in steam generator feedwater impingement plates and supports exposed to secondary feedwater. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.8 and finds it acceptable because the applicant's Westinghouse Model 44 steam generators do not have feedwater impingement plates.

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, items 3.1-1-028, 3.1-1-053a, 3.1-1-053b, 3.1-1-053c, 3.1-1-055c, 3.1-1-059a, 3.1-1-059b, and 3.1-1-059c, addresses stainless steel or nickel alloy Westinghouse RVI components exposed to reactor coolant and neutron flux, which will be managed for cracking due to SCC, IASCC, and/or fatigue; loss of fracture toughness due to IE and/or TE; changes in dimensions due to VS; loss of preload due to ISR; and/or loss of material due to wear using the Reactor Vessel Internals program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.9.

The staff noted that the applicant's evaluation identifies that the Reactor Vessel Internals program is based on the existing MRP-227-A framework and modified by a gap analysis, which is described in SLRA Appendix C, "MRP-227-A Gap Analysis." The staff's evaluation of the applicant's program based on MRP-227-A, as supplemented by the MRP-227-A Gap Analysis, addresses the consistency of the program with the recommendations of GALL-SLR Report AMP XI.M16A. The staff's evaluation of the Reactor Vessel Internal program and MRP-227-A Gap Analysis is documented in SER Section 3.0.3.2.9. In its review of components associated with items 3.1-1-028, 3.1-1-053a, 3.1-1-053b, 3.1-1-053c, 3.1-1-055c, 3.1-1-059a, 3.1-1-059b, and 3.1-1-059c, the staff finds that the applicant has met the further evaluation criteria and that the applicant's proposal to manage the effects of aging using the Reactor Vessel Internals program is acceptable because the staff's evaluation of this program determined that it is consistent with the recommendations of GALL-SLR Report AMP XI.M16A.

Based on the program identified, the staff determined that the applicant's program meets the criteria of SRP-SLR Section 3.1.2.2.9. For those items associated with SLRA Section 3.1.2.2.9, the staff concludes that the SLRA program is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.1.2.2.10 Loss of Material Due to Wear

Item 1. SLRA Section 3.1.2.2.10, associated with SLRA Table 3.1-1, item 3.1-1-116, addresses aging management of loss of material due to wear in the nickel alloy reactor vessel head CRDM nozzles exposed to reactor coolant. The applicant proposed that the aging effect of the CRDM nozzle wear be managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program. The applicant also proposed enhancements to the AMP to ensure that this aging effect is adequately monitored during the subsequent period of extended operation. The enhancements include: (1) monitoring the industry operating experience on the CRDM nozzle wear issues and the latest recommendations for inspections; (2) inspecting Turkey Point CRDM nozzles for wear and measuring depth of wear at the accessible locations; and (3) developing an analysis for wear depth and wall thickness assessment.

In accordance with criteria in SRP-SLR Section 3.1.2.2.10, item 1, industry operating experience indicates that loss of material due to wear can occur in the nickel alloy CRDM nozzles due to the interactions between the nozzle and the thermal sleeve centering pads of the nozzle. Therefore, the GALL-SLR Report recommends that (1) the applicant manages the aging effect associated with loss of material due to wear in the CRDM nozzles by a plant-specific program and (2) the applicant perform a further evaluation to confirm the adequacy of its plant-specific AMP.

The staff's evaluation of ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program is documented in SER Section 3.0.3.2.5. In its review of components associated with SLRA Table 3.1-1, item 3.1-1-116, the staff finds that the applicant met the further evaluation criteria and that the applicant's proposal to manage the effects of aging using this program is acceptable because: (1) the inspections and wear depth measurements at accessible locations will confirm that the integrity of the subject components is adequately maintained; (2) the results of the inservice inspections will be capable of demonstrating whether wear is occurring in the CRDM nozzle and whether corrective actions are needed for the components; and (3) the use of this program is consistent with the guidance in the GALL-SLR Report.

Based on the program identified, the staff determined that the applicant's program meets the criteria of SRP-SLR Section 3.1.2.2.10, item 1. For those items associated with SRP-SLR Section 3.1.2.2.10, item 1, the staff concludes that the SLRA is consistent with the GALL-SLR Report and the applicant has demonstrated that the effects of aging will be 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 3.1.2.2.10, associated with SLRA Table 3.1-1, item 3.1-1-117, addresses aging management of loss of material due to wear in the stainless steel thermal sleeves of the nickel alloy CRDM nozzles exposed to reactor coolant. The applicant claims that this item is not applicable because Turkey Point CRDM thermal sleeves do not perform a subsequent license renewal intended function. The staff reviewed the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.10, item 2, and the regulations in 10 CFR 54.4(a)(1) and (2).

In accordance with criteria in SRP-SLR Section 3.1.2.2.10, item 2, loss of material due to wear can occur in the stainless steel thermal sleeves of the CRDM nozzles due to interactions between the nozzle and the thermal sleeve. Industry operating experience has also confirmed that unexpected wear could occur in the CRDM thermal sleeves during normal operating conditions. Therefore, the GALL-SLR Report recommends that (1) the applicant manage the aging effect associated with loss of material due to wear in the CRDM thermal sleeves by a plant-specific program and (2) the applicant perform a further evaluation to confirm the adequacy of its plant-specific AMP.

The staff noted that the recent operating experience in Westinghouse guidance letters dated May 23, 2018, and July 17, 2018 (ADAMS Accession Nos. ML18143B678 and ML18198A275) and NRC IN 2018-10 (ADAMS Accession No. ML18214A710) provides additional details on the CRDM thermal sleeves wear, its consequences to reactor safety, and the inspection procedure for wear detection and measurement. The mitigations could be needed to provide assurance that the plant remains consistent with its licensing basis. The recent industry operating experience has confirmed that unexpected wear in CRDM thermal sleeve could occur at the top flange location, centering pads location, and bottom location where the thermal sleeve exits the nozzle. IN 2018-10 noted that there have been cases in which the CRDM thermal sleeve wear adversely impacted the CRDM control rod functionality.

In its review of components associated with SLRA Table 3.1-1, item 3.1-1-117, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI No. B.2.3.1-2 is documented in ADAMS Accession Nos. ML18269A227 and ML18269A228, and the applicant's response is documented in ADAMS Accession No. ML18311A299.

During its evaluation of the applicant's response to RAI No. B.2.3.1-2, the staff verified that the applicant amended SLRA Table 2.3.1-3, Section 3.1.2.2.10 item 2, Table 3.1-1, Table 3.1.2-3, Section B.2.3.1, Section B.3, and Appendix A Table 17-3 to include the CRDM thermal sleeves into the scope of the SLRA. The staff also verified that the applicant proposes to manage the aging effect of loss of materials due to wear in the CRDM thermal sleeves by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program. Further, the staff verified that the applicant proposes enhancements to the "detection of aging effects" program element of the AMP to ensure adequate monitoring of this aging effect during the subsequent period of extended operation. The enhancements are: (1) to monitor the industry operating experience on the CRDM thermal sleeve wear issues and (2) to inspect Turkey Point CRDM thermal sleeves for wear in accordance with the latest Westinghouse NSAL-18-1 recommendations. The staff evaluated the applicant's proposed enhancements against SRP-SLR, Appendix A.1 acceptance criteria and finds it adequate because when it is implemented it will determine the presence, severity, and extent of aging effects associated with loss of material due to wear in the subject component. The staff finds the applicant's response acceptable because the applicant's plant-specific program provides adequate aging management of the subject components by performing inspections in accordance with the industry and NRC guidelines to detect the potential aging effect during the subsequent period of extended operation.

The staff's evaluation of the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program is documented in SER Section 3.0.3.2.5. In its review of components associated with SLRA Table 3.1-1, item 3.1-1-117, the staff finds that the applicant met the further evaluation criteria and that the applicant's proposal to manage the effects of aging using this program is acceptable because: (1) the inspections will confirm that the integrity of the subject components is adequately maintained; (2) the results of the inservice inspections will be capable of demonstrating whether wear is occurring in the thermal sleeve and whether corrective actions are needed for the components; and (3) the use of this program is consistent with the guidance in the GALL-SLR Report.

Based on the program identified, the staff determined that the applicant's program meets the criteria of SRP-SLR Section 3.1.2.2.10, item 2. For those items associated with SRP-SLR Section 3.1.2.2.10, item 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.11 Cracking Due to Primary Water Stress Corrosion Cracking

Item 1. SLRA Section 3.1.2.2.11, associated with SLRA Table 3.1-1, item 3.1-1-025, addresses nickel alloy divider plate assemblies and associated nickel alloy weld materials exposed to reactor coolant that will be managed for cracking due to primary water stress corrosion cracking by the Steam Generators and Water Chemistry AMPs. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.11, item 1. The staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.10-1 and the applicant's response are documented in ADAMS Accession Nos. ML18269A228 and ML18311A299.

In its response to RAI B.2.3.10-1, the applicant amended Section 3.1.2.2.11 to state that the industry analyses in EPRI TR-3002002850 are assumed to not be bounding for the Turkey Point steam generators. During its evaluation of the applicant's response to RAI B.2.3.10-1, the staff noted that SLRA Section B.2.3.20 was revised to incorporate a description of the one-time inspection of the divider plates. In addition, Enhancement 1 to the Steam Generators program was revised to only include reference lists and additional means for monitoring loose parts. The staff's evaluation of this enhancement is documented in SER Section 3.0.3.2.1. Although an enhancement was not cited for the One-Time Inspection program, Commitment No. 14 for the Steam Generators program was revised, in part, to implement an enhancement to "perform a one-time inspection of the steam generator divider plate assemblies and associated welds as part of the One-Time Inspection AMP." The staff finds the applicant's response and changes to SLRA Section 3.1.2.2.11, Table 3.1.2-5, Appendix A Table 17-3, Table 3.1-1, Section B.2.3.10, and Section B.2.3.20 acceptable because they are consistent with the staff's position documented in SRP-SLR Section 3.1.2.2.11.

In its review of components associated with item 3.1-1-025, the staff finds that the applicant has met the further evaluation criteria and that the applicant's proposal to manage the effects of aging using the Steam Generators, Water Chemistry, and One-Time Inspection programs is acceptable because the applicant assumed that the analyses under EPRI TR 3002002850 are not bounding for the applicant's steam generators, and, as a result, is following the appropriate recommendations in SRP-SLR Section 3.1.2.2.11.

Item 2. SLRA Section 3.1.2.2.11, item 2, associated with SLRA Table 3.1-1, item 3.1-1-025, addresses nickel alloy T/TS welds exposed to reactor coolant. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.11, item 2 and finds it acceptable because the applicant has a permanently approved H* alternate repair criteria (ADAMS Accession No. ML12292A342), which takes no credit for the portion of the tube greater than 18.11 inches below the top of the tubesheet (including the T/TS weld) to resist tube end cap pressure loads and removes the T/TS weld from a pressure boundary function. Consistent with SRP-SLR Section 3.1.2.2.11, item 2, the weld is no longer part of the reactor coolant pressure boundary and a plant-specific AMP is not necessary.

Based on the programs identified, the staff determined that the applicant's programs meet the criteria of SRP-SLR Section 3.1.2.2.11, items 1 and 2. For those items associated with SLRA Section 3.1.2.2.11, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation as required by 10 CFR 54.21(a)(3).

3.1.2.2.12 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 IASCC in nickel alloy reactor internal components exposed to reactor coolant. The applicant stated that these items are not applicable because they only apply to BWRs. The staff evaluated the applicant's claim and finds it acceptable because SRP-SLR Table 3.1-1 limits the applicability of these items to BWRs and Turkey Point is a PWR.

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

SLRA Section 3.1.2.2.13, associated with SLRA Table 3.1-1, item 3.1-1-099, addresses loss of fracture toughness due to thermal aging or neutron IE in stainless steel reactor internal components exposed to reactor coolant and neutron flux. The applicant stated that this item is not applicable because it only applies to BWRs. The staff evaluated the applicant's claim and finds it acceptable because SRP-SLR Table 3.1-1 limits the applicability of this item to BWRs and Turkey Point is a PWR.

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 thermal or irradiation-enhanced stress relaxation in stainless steel components exposed to reactor coolant and neutron flux. The applicant stated that this item is not applicable because it only applies to BWRs. The staff evaluated the applicant's claim and finds it acceptable because SRP-SLR Table 3.1-1 limits the applicability of this item to BWRs and Turkey Point is a PWR.

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, items 3.1-1-105 and 3.1-1-115, states that there are no reactor coolant system stainless steel or steel piping exposed to concrete. The applicant stated that these items are not applicable. During its review of components associated with items 3.1-1-105 and 3.1-1-115, the staff identified that it needed clarification, which resulted in the issuance of an RAI. RAI 3.1.2.2.15-1 and the applicant's response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257.

In its response, the applicant stated that: (1) although the concrete containment and auxiliary building base slabs are susceptible to groundwater penetration, there is no piping within the scope of subsequent license renewal embedded in the base slabs and (2) there is no stainless steel piping embedded in concrete that could be exposed to groundwater. In its response, the applicant also revised SLRA Section 3.3.2.2.9 and Table 3.2-1, items 3.2-1-053 and 3.2-1-078. The staff's evaluation of these changes is documented in SER Sections 3.3.2.2.9 and 3.2.2.1.1, respectively.

The staff finds the applicant's response acceptable because it was confirmed that there is no RCS piping within the scope of subsequent license renewal that is embedded in concrete.

The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.1.2.2.15 and finds it acceptable because there are no components within the scope of subsequent license renewal that are exposed to concrete in the reactor coolant systems.

3.1.2.2.16 Loss of Material Due to Pitting and Crevice Corrosion in Stainless Steel and Nickel Alloys

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 components exposed to air and condensation, which will be managed for loss of material due to pitting and crevice corrosion by the External Surfaces Monitoring of Mechanical Components program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.1.2.2.16. In its review of components associated with item 3.1-1-136, the staff finds that the applicant has met the further evaluation criteria and that the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components program is acceptable because the program's visual inspections are capable of detecting loss of material prior to a loss of intended function.

Based on the program identified, the staff determined that the applicant's program meets the criteria of SRP-SLR Section 3.1.2.2.16. For those items associated with SLRA Section 3.1.2.2.16, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended 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).

3.1.2.2.17 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

The following subsections document the staff's review of AMR results listed in SLRA Tables 3.1.2-1 through 3.1.2-5 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.

3.1.2.3.1 Reactor Coolant and Connected Piping

Pressurizer Relief Tank Coating Exposed to Gas Environment

In SLRA Table 3.1.2-1, the applicant identified that for the pressurizer relief tank internal coating exposed to a gas environment, there is no AERM and no AMP is proposed. The AMR item cites generic note G because the GALL-SLR Report does not address a gas environment for internal coatings in tanks. This AMR item also cites plant-specific note 1, identifying that the pressurizer relief tank coating has nitrogen cover gas. Note 1 states that the aging effect of "none" is chosen consistent with other material interactions with nitrogen gas. Note 1 further states that this coating requires management per AMR item V.D1.E-401 of the GALL-SLR Report because it is also exposed to a reactor coolant environment.

The staff reviewed this AMR item in the SLRA to confirm that no credible aging effects are applicable for this component, material, and environment combination. The staff noted that the GALL-SLR Report identifies that inert or nonreactive gas environments are generally designated as a "Common Miscellaneous Material/Environment," where the environment has no impact on the ability of the structure or component to perform its intended function for the subsequent period of extended operation. The staff finds the applicant's determination of no credible aging effects to be acceptable for this item because nitrogen gas is generally recognized as a nonreactive gas environment and there are no known degradation mechanisms from exposure of coatings to nitrogen gas.

In addition to the nitrogen cover gas, the staff noted that the pressurizer relief tank coating is also exposed to a reactor coolant environment. The staff confirmed that SLRA Table 3.1.2-1 includes a separate AMR item to address the aging effect (loss of coating integrity) associated with exposure to the reactor coolant environment. The Internal Coatings AMP described in SLRA Section B.2.3.29 is used to manage this aging effect associated with the reactor coolant environment, consistent with AMR item V.D1.E-401 of the GALL-SLR report.

3.1.2.3.2 Reactor Vessel Internals

Stainless Steel Lower Core Plate Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel lower core plate exposed to reactor coolant and neutron flux, the aging effects of loss of fracture toughness due to TE and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for this component cite generic notes E and I, and they credit the Reactor Vessel Internals (RVI) AMP instead of the plant-specific AMP in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424 to manage cracking due to SCC, IASCC, and fatigue; loss of material due to wear; loss of fracture toughness due to IE; and changes in dimensions due to VS. These AMR items also cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, items 3.1-1-118 and 3.1-1-119, which address the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis, in lieu of a plant-specific AMP specified in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of loss of fracture toughness due to TE and loss of preload due to ISR are not applicable for this component, material, and environment. The staff noted that the plant-specific AMP identified in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424 is not used to manage the effects of aging for any Turkey Point RVI components. The staff finds that the applicant's proposal to manage the applicable aging effects using the RVI AMP is consistent with GALL-SLR Report AMP XI.M16A and acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed for the subsequent period of extended operation.

Stainless Steel Fuel Alignment Pins Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel fuel alignment pins exposed to reactor coolant and neutron flux, cracking due to SCC and fatigue, loss of fracture toughness due to TE, and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for this component cite generic notes E and I and they credit the RVI AMP instead of the plant-specific AMP in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424 to manage cracking due to IASCC, loss of fracture toughness due to IE, changes in dimensions due to VS, and loss of material due to wear. These AMR items also cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, items 3.1-1-118 and 3.1-1-119, which address the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis, in lieu of a plant-specific AMP specified in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of cracking due to SCC and fatigue, loss of fracture toughness due to TE, and loss of preload due to ISR are not applicable for this component, material, and environment. The staff noted that the plant-specific AMP identified in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424 is not used to manage the effects of aging for any Turkey Point RVI components. The staff finds that the applicant's proposal to manage the applicable aging effects using the RVI AMP, consistent with GALL-SLR Report AMP XI.M16A, is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed for the subsequent period of extended operation.

Stainless Steel Lower Support Forging Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel lower support forging exposed to reactor coolant and neutron flux, there are no aging effects requiring management. The AMR items for this component cite generic note I and they credit the ASME Section XI ISI AMP in GALL-SLR Report AMR item IV.B2.RP-382 for conducting inspections, but no specific aging effect or DM is identified. The AMR items cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, “MRP-227-A Gap Analysis,” where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, item 3.1-1-032, which addresses the use of the ASME Section XI ISI AMP based on the results of the MRP-227-A Gap Analysis.

The staff reviewed the associated items in the SLRA to confirm that there are no aging effects requiring management for this component, material, and environment. The staff finds that the applicant’s proposal to inspect this component is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria provided in the MRP-227-A Gap Analysis. The staff’s evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that this component will be adequately inspected using the RVI AMP and the ASME Section XI ISI AMP for the subsequent period of extended operation.

Cast Austenitic Stainless Steel (CASS) Lower Support Column Bodies Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the CASS LSC bodies exposed to reactor coolant and neutron flux, cracking due to SCC, loss of preload due to ISR, and loss of material due to wear are not applicable and no AMP is proposed. The AMR items for this component cite generic notes E and I, and they credit the RVI AMP instead of the plant-specific AMP in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424 to manage cracking due to IASCC and fatigue, loss of fracture toughness due to IE and TE, and changes in dimensions due to VS. The AMR items for this component also cite generic note I to indicate that the ASME Section XI ISI AMP in GALL-SLR Report AMR item IV.B2.RP-382 is used to manage cracking due to IASCC and fatigue but not loss of material due to wear. The AMR items cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, “MRP-227-A Gap Analysis,” where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, items 3.1-1-118 and 3.1-1-119, which address the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis, in lieu of a plant-specific AMP specified in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of cracking due to SCC, loss of preload due to ISR, and loss of material due to wear are not applicable for this component, material, and environment. The staff noted that the plant-specific AMP identified in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424 is not used to manage the effects of aging for any Turkey Point RVI components. The staff finds that the applicant’s proposal to manage the applicable aging effects using the RVI AMP is consistent with GALL-SLR Report AMP XI.M16A, and is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff’s evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed for the subsequent period of extended operation.

Stainless Steel Lower Support Column Bolting Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel LSC bolting exposed to reactor coolant and neutron flux, cracking due to SCC and loss of fracture toughness due to TE are not applicable and no AMP is proposed. The AMR items for this component cite generic notes E and I, and they credit the RVI AMP instead of the plant-specific AMP in GALL-SLR Report AMR item IV.B2.R-424 to manage cracking due to IASCC and fatigue, loss of fracture toughness due to IE, loss of material due to wear, changes in dimensions due to VS, and loss of bolt preload due to ISR. The AMR items cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, item 3.1-1-119, which addresses the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis, in lieu of a plant-specific AMP specified in GALL-SLR Report AMR item IV.B2.R-424.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of cracking due to SCC and loss of fracture toughness due to TE are not applicable for this component, material, and environment. The staff noted that the plant-specific AMP identified in GALL-SLR Report AMR item IV.B2.R-424 is not used to manage the effects of aging for any Turkey Point RVI components. The staff finds that the applicant's proposal to manage the applicable aging effects using the RVI AMP, consistent with GALL-SLR Report AMP XI.M16A, is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed for the subsequent period of extended operation.

Stainless Steel Secondary Core Support Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel secondary core support exposed to reactor coolant and neutron flux, loss of fracture toughness due to TE and IE, loss of material due to wear, changes in dimensions due to VS, and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for this component cite generic note I, and they credit the ASME Section XI ISI AMP in GALL-SLR Report AMR item IV.B2.RP-382 to manage cracking due to SCC but not loss of material due to wear. The AMR items cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, item 3.1-1-32, which addresses the use of the ASME Section XI ISI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of loss of fracture toughness due to TE and IE, loss of material due to wear, changes in dimensions due to VS, and loss of preload due to ISR are not applicable for this component, material, and environment. The staff finds that the applicant's proposal to manage the applicable aging effects using the ASME Section XI ISI AMP is consistent with GALL-SLR Report AMP XI.M1, and is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed using the ASME Section XI ISI AMP for the subsequent period of extended operation.

Stainless Steel Bottom Mounted Instrumentation Column Bodies Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel BMI column bodies exposed to reactor coolant and neutron flux, loss of material due to wear and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for this component cite generic notes E and I, and they credit the RVI AMP instead of the plant-specific AMP in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424 to manage cracking due to SCC, IASCC, and fatigue, loss of fracture toughness due to IE, and changes in dimensions due to VS. These AMR items also cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, items 3.1-1-118 and 3.1-1-119, which address the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis, in lieu of a plant-specific AMP specified in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of loss of material due to wear and loss of preload due to ISR are not applicable for this component, material, and environment. The staff noted that the plant-specific AMP identified in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424 is not used to manage the effects of aging for any Turkey Point RVI components. The staff finds that the applicant's proposal to manage the applicable aging effects using the RVI AMP, consistent with GALL-SLR Report AMP XI.M16A, is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed for the subsequent period of extended operation.

Stainless Steel Upper Core Plate Alignment Pins Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel upper core plate alignment pins exposed to reactor coolant and neutron flux, cracking due to IASCC, loss of fracture toughness due to IE and TE, changes in dimensions due to VS, and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for this component cite generic notes E and I, and they credit the RVI AMP instead of the plant-specific AMP in GALL-SLR Report AMR item IV.B2.R-423 to manage cracking due to SCC and fatigue and loss of material due to wear. These AMR items also cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, item 3.1-1-118, which address the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis, in lieu of a plant-specific AMP specified in GALL-SLR Report AMR item IV.B2.R-423.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of cracking due to IASCC, loss of fracture toughness due to IE and TE, changes in dimensions due to VS, and loss of preload due to ISR are not applicable for this component, material, and environment. The staff noted that the plant-specific AMP identified in GALL-SLR Report AMR item IV.B2.R-423 is not used to manage the effects of aging for any Turkey Point RVI components. The staff finds that the applicant's proposal to manage the applicable aging effects using the RVI AMP, consistent with GALL-SLR Report AMP XI.M16A, is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed for the subsequent period of extended operation.

Stainless Steel Internals Hold-Down Spring Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel internals hold-down spring (HDS) exposed to reactor coolant and neutron flux, cracking due to SCC, IASCC, and fatigue, loss of fracture toughness due to IE and TE, changes in dimensions due to VS, and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for this component cite generic note I, and they credit the RVI AMP in GALL-SLR Report AMR item IV.B2.RP-300 to manage loss of material due to wear, but not changes in dimensions due to VS and loss of preload due to ISR, and they also credit the ASME Section XI ISI AMP in GALL-SLR Report AMR item IV.B2.RP-382 to manage loss of material due to wear, but not cracking due to SCC, IASCC, or fatigue. The AMR items cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, items 3.1-1-059a and 3.1-1-032, which address the use of the RVI AMP and the ASME Section XI ISI AMP, respectively, to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of cracking due to SCC, IASCC, and fatigue, loss of fracture toughness due to IE and TE, changes in dimensions due to VS, and loss of preload due to ISR are not applicable for this component, material, and environment. For this specific component, the staff verified that while loss of preload due to ISR is not applicable for the stainless steel HDS, distortion due to loss of spring load (unrelated to the ISR mechanism) is applicable and is appropriately managed for the subsequent period of extended operation as part of the MRP-227-A Primary Components based on the applicant's AMR result referring to GALL-SLR Report AMR item IV.B2.RP-300 and SLRA Table 3.1-1, item 3.1-1-059a. The staff finds that the applicant's proposal to manage the applicable aging effects using the RVI AMP and the ASME Section XI ISI AMP is consistent with GALL-SLR Report AMPs XI.M16A and XI.M1, respectively, and is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed using the RVI AMP and the ASME Section XI ISI AMP for the subsequent period of extended operation.

Nickel Alloy Clevis Insert Bolting Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the nickel alloy clevis insert bolting exposed to reactor coolant and neutron flux, cracking due to IASCC and fatigue, loss of fracture toughness due to IE and TE, changes in dimensions due to VS, and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for this component cite generic note I, and they credit the RVI AMP in GALL-SLR Report AMR item IV.B2.RP-285 to manage loss of material due to wear, but not loss of preload due to ISR, as well as the RVI AMP in GALL-SLR Report AMR item IV.B2.RP-399 to manage cracking due to SCC, but not due to IASCC or fatigue. The AMR items cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, items 3.1-1-059c and 3.1-1-053c, which address the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of cracking due to IASCC and fatigue, loss of fracture toughness due to IE and TE, changes in dimensions due to VS, and loss of preload due to ISR are not applicable for this component, material, and environment. The staff finds that the applicant's proposal to manage the applicable aging effects using the RVI AMP, consistent with GALL-SLR Report AMP XI.M16A, is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed using the RVI AMP for the subsequent period of extended operation.

Stainless Steel Core Barrel Flange and Core Barrel Flange Welds Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel core barrel flange and core barrel flange welds exposed to reactor coolant and neutron flux, cracking due to IASCC and fatigue, loss of fracture toughness due to IE and TE, changes in dimensions due to VS, and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for this component cite generic note I, and they credit the RVI AMP in GALL-SLR Report AMR items IV.B2.RP-280 and IV.B2-276 to manage cracking in core barrel flange welds due to SCC, but not due to IASCC and fatigue, as well as the RVI AMP in GALL-SLR Report AMR item IV.B2.RP-345 to manage loss of material due to wear for the core barrel flange base metal. The AMR items cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, item 3.1-1-053a, for core barrel flange welds and item 3.1-1-059c for the core barrel flange base metal. These SLRA Table 3.1-1 items address the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of cracking due to IASCC and fatigue, loss of fracture toughness due to IE and TE, changes in dimensions due to VS, and loss of preload due to ISR are not applicable for this component, material, and environment. The staff finds that the applicant's proposal to manage the applicable aging effects using the RVI AMP, consistent with GALL-SLR Report AMP XI.M16A, is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed using the RVI AMP for the subsequent period of extended operation.

Stainless Steel Core Barrel Outlet Nozzle Welds Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel core barrel outlet nozzle welds exposed to reactor coolant and neutron flux, loss of material due to wear, loss of fracture toughness due to IE and TE, changes in dimensions due to VS, and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for this component cite generic note I, and they credit the RVI AMP in GALL-SLR Report AMR item IV.B2.RP-278 to manage cracking due to SCC and fatigue, but not loss of fracture toughness due to IE, as well as the ASME Section XI ISI AMP in GALL-SLR Report AMR item IV.B2.RP-382 to manage cracking due to SCC and fatigue, but not loss of material due to wear. The AMR items cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, items 3.1-1-053b and 3.1-1-032, which address the use of the RVI AMP and the ASME Section XI ISI AMP, respectively, to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of loss of material due to wear, loss of fracture toughness due to IE and TE, changes in dimensions due to VS, and loss of preload due to ISR are not applicable for this component, material, and environment. The staff finds that the applicant's proposal to manage the applicable aging effects using the RVI AMP and the ASME Section XI ISI AMP is consistent with GALL-SLR Report AMPs XI.M16A and XI.M1, respectively, and is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed using the RVI AMP for the subsequent period of extended operation.

Stainless Steel Core Barrel Cylinder Welds Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel core barrel cylinder welds exposed to reactor coolant and neutron flux, loss of material due to wear, changes in dimensions due to VS, and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for this component cite generic note I. They credit the RVI AMP in GALL-SLR Report AMR items IV.B2.RP-387 and IV.B2.RP-387a to manage cracking due to SCC and IASCC for the LCB welds and only SCC for the upper core barrel welds. These AMR items also credit the RVI AMP in GALL-SLR Report AMR items IV.B2.RP-388 and IV.B2.RP-388a to manage loss of fracture toughness due to IE, as well as the ASME Section XI ISI AMP in GALL-SLR Report AMR item IV.B2.RP-382 to manage these cracking mechanisms for the upper and lower core barrel welds. The AMR items cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, items 3.1-1-053a, 3.1-1-053b, 3.1-1-059a, and 3.1-1-059b, which address the use of the RVI AMP, and item 3.1-1-032, which addresses the use of the ASME Section XI ISI AMP, to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of loss of material due to wear, changes in dimensions due to VS, and loss of preload due to ISR are not applicable for this component, material, and environment. The staff finds that the applicant's proposal to manage the applicable aging effects using the RVI AMP and the ASME Section XI ISI AMP, consistent with GALL-SLR Report AMPs XI.M16A and XI.M1, respectively, is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed using the RVI AMP for the subsequent period of extended operation.

Stainless Steel Thermal Shield Flexures Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel thermal shield flexures exposed to reactor coolant and neutron flux, changes in dimensions due to VS are not applicable and no AMP is proposed. The AMR items for this component cite generic notes E and I, and they credit the RVI AMP instead of the plant-specific AMP in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424 to manage cracking due to IASCC and fatigue, loss of fracture toughness due to IE, loss of material due to wear, and loss of preload due to ISR. These AMR items also cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, “MRP-227-A Gap Analysis,” where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, items 3.1-1-118 and 3.1-1-119, which address the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis, in lieu of a plant-specific AMP specified in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424.

The staff reviewed the associated items in the SLRA to confirm that the aging effect of changes in dimensions due to VS is not applicable for this component, material, and environment. The staff noted that the plant-specific AMP identified in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424 is not used to manage the effects of aging for any Turkey Point RVI components. The staff finds that the applicant’s proposal to manage the applicable aging effects using the RVI AMP is consistent with GALL-SLR Report AMP XI.M16A and is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff’s evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed for the subsequent period of extended operation.

Stainless Steel Baffle and Former Assembly, Baffle and Former Plates Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel baffle and former assembly, baffle and former plates exposed to reactor coolant and neutron flux, loss of material due to wear, and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for this component cite generic note I, and they credit the RVI AMP in GALL-SLR Report AMR item IV.B2.RP-270 to manage changes in dimensions due to VS and the ASME Section XI ISI AMP in GALL-SLR Report AMR item IV.B2.RP-382 to manage cracking due to IASCC. These AMR items also cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, “MRP-227-A Gap Analysis,” where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, items 3.1-1-059a and 3.1-1-032, which address the use of the RVI AMP and the ASME Section XI ISI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of loss of material due to wear and loss of preload due to ISR are not applicable for this component, material, and environment. The staff finds that the applicant’s proposal to manage the applicable aging effects using the RVI AMP and the ASME Section XI ISI AMP is consistent with GALL-SLR Report AMPs XI.M16A and XI.M1, respectively, and is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff’s evaluation of the RVI AMP based on

MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed for the subsequent period of extended operation.

Stainless Steel Baffle-Former Bolts Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel baffle-former bolts exposed to reactor coolant and neutron flux, all aging effects are applicable; however, not all DMs screen in for each aging effect. The AMR items for these components cite generic notes E and I, and they credit the RVI AMP instead of the plant-specific AMP in GALL-SLR Report AMR item IV.B2.R-424 to manage loss of material due to wear. The AMR items credit the RVI AMP in GALL-SLR Report AMR items IV.B2.RP-271 and IV.B2.RP-272 for managing all other aging effects for baffle-former bolting, as well as the ASME Section XI ISI AMP in GALL-SLR Report AMR item IV.B2.RP-382 to manage cracking and loss of material due to wear. These AMR items also cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, “MRP-227-A Gap Analysis,” where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, item 3.1-1-119, which addresses the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis, in lieu of a plant-specific AMP specified in GALL-SLR Report AMR items IV.B2.R-424.

The staff reviewed the associated items in the SLRA and noted that the plant-specific AMP identified in GALL-SLR Report AMR item IV.B2.R-424 is not used to manage the effects of aging for any Turkey Point RVI components. The staff finds that the applicant’s proposal to manage the applicable aging effects using the RVI AMP is consistent with GALL-SLR Report AMP XI.M16A and is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff’s evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on these components will be adequately managed for the subsequent period of extended operation.

Stainless Steel Baffle Edge Bolts Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel baffle edge bolts exposed to reactor coolant and neutron flux, all aging effects are applicable; however, not all DMs screen in for each aging effect. The AMR items for these components cite generic notes E and I, and they credit the RVI AMP instead of the plant-specific AMP in GALL-SLR Report AMR item IV.B2.R-424 to manage loss of material due to wear. The AMR items credit the RVI AMP in GALL-SLR Report AMR items IV.B2.RP-275 and IV.B2.RP-354 for managing all other aging effects for baffle edge bolting, as well as the ASME Section XI ISI AMP in GALL-SLR Report AMR item IV.B2.RP-382 to manage cracking and loss of material due to wear. These AMR items also cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, “MRP-227-A Gap Analysis,” where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, item 3.1-1-119, which addresses the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis, in lieu of a plant-specific AMP specified in GALL-SLR Report AMR item IV.B2.R-424.

The staff reviewed the associated items in the SLRA and noted that the plant-specific AMP identified in GALL-SLR Report AMR item IV.B2.R-424 is not used to manage the effects of aging for any Turkey Point RVI components. The staff finds that the applicant’s proposal to manage the applicable aging effects using the RVI AMP is consistent with GALL-SLR Report

AMP XI.M16A and is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on these components will be adequately managed for the subsequent period of extended operation.

Stainless Steel Barrel-Former Bolts Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel barrel-former bolts exposed to reactor coolant and neutron flux, all aging effects are applicable; however, not all DMs screen in for each aging effect. The AMR items for these components cite generic notes E and I, and they credit the RVI AMP instead of the plant-specific AMP in GALL-SLR Report AMR item IV.B2.R-424 to manage loss of material due to wear. The AMR items credit the RVI AMP in GALL-SLR Report AMR items IV.B2.RP-273 and IV.B2.RP-274 for managing all other aging effects for barrel-former bolting. These AMR items also cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, item 3.1-1-119, which addresses the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis, in lieu of a plant-specific AMP specified in GALL-SLR Report AMR items IV.B2.R-424.

The staff reviewed the associated items in the SLRA and noted that the plant-specific AMP identified in GALL-SLR Report AMR item IV.B2.R-424 is not used to manage the effects of aging for any Turkey Point RVI components. The staff finds that the applicant's proposal to manage the applicable aging effects using the RVI AMP is consistent with GALL-SLR Report AMP XI.M16A and is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on these components will be adequately managed for the subsequent period of extended operation.

Stainless Steel Upper Support Plate Exposed to Reactor Coolant and Neutron Flux

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel upper support plate exposed to reactor coolant and neutron flux, loss of fracture toughness due to TE and IE, loss of material due to wear, changes in dimensions due to VS, and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for this component cite generic note I, and they credit the ASME Section XI ISI AMP in GALL-SLR Report AMR item IV.B2.RP-382 to manage cracking due to fatigue, but not loss of material due to wear. The AMR items cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, item 3.1-1-032, which addresses the use of the ASME Section XI ISI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of loss of fracture toughness due to TE and IE, loss of material due to wear, changes in dimensions due to VS, and loss of preload due to ISR are not applicable for this component, material, and environment. The staff finds that the applicant's proposal to manage the applicable aging effects using the ASME Section XI ISI AMP is consistent with GALL-SLR Report AMP XI.M1 and is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed using the ASME Section XI ISI AMP for the subsequent period of extended operation.

<u>Stainless Steel Upper Core Plate Exposed to Reactor Coolant and Neutron Flux</u>

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel upper core plate exposed to reactor coolant and neutron flux, changes in dimensions due to VS and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for this component cite generic notes E and I, and they credit the RVI AMP instead of the plant-specific AMP in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424 to manage cracking due to IASCC and loss of fracture toughness due to IE. The AMR items also credit the RVI AMP in GALL-SLR Report AMR items IV.B2.RP-290b and IV.B2.RP-291b for managing loss of material due to wear and cracking due to fatigue for the upper core plate. These AMR items also cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, items 3.1-1-118 and 3.1-1-119, which address the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis, in lieu of a plant-specific AMP specified in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of changes in dimensions due to VS and loss of preload due to ISR are not applicable for this component, material, and environment. The staff noted that the plant-specific AMP identified in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424 is not used to manage the effects of aging for any Turkey Point RVI components. The staff finds that the applicant's proposal to manage the applicable aging effects using the RVI AMP is consistent with GALL-SLR Report AMP XI.M16A and is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed for the subsequent period of extended operation.

<u>CASS Upper Support Columns Bases Exposed to Reactor Coolant and Neutron Flux</u>

In SLRA Table 3.1.2-4, the applicant stated that for the CASS upper support column bases exposed to reactor coolant and neutron flux, loss of material due to wear, changes in dimensions due to VS, and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for this component cite generic note I, and they credit the ASME Section XI ISI AMP in GALL-SLR Report AMR item IV.B2.RP-382 to manage cracking due to SCC and IASCC, but not loss of material due to wear. The AMR items cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, item 3.1-1-032, which addresses the use of the ASME Section XI ISI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of loss of material due to wear, changes in dimensions due to VS, and loss of preload due to ISR are not applicable for this component, material, and environment. The staff finds that the applicant's proposal to manage the applicable aging effects using the ASME Section XI ISI AMP is consistent with GALL-SLR Report AMP XI.M1 and is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on this component will be adequately managed using the ASME Section XI ISI AMP for the subsequent period of extended operation.

<u>Stainless Steel Upper Support Columns Exposed to Reactor Coolant and Neutron Flux</u>

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel upper support columns exposed to reactor coolant and neutron flux, there are no aging effects requiring management. The AMR items for this component cite generic note I, and they credit the ASME Section XI ISI AMP in GALL-SLR Report AMR item IV.B2.RP-382 for conducting inspections but no specific aging effect or DM is identified. The AMR items cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, item 3.1-1-032, which addresses the use of the ASME Section XI ISI AMP based on the results of the MRP-227-A Gap Analysis.

The staff reviewed the associated items in the SLRA to confirm that there are no aging effects requiring management for this component, material, and environment. The staff finds that the applicant's proposal to inspect this component using the ASME Section XI ISI AMP is consistent with GALL-SLR Report AMP XI.M1 and is acceptable based on its review of the DM screening and aging effects evaluation provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that this component will be adequately managed using the ASME Section XI ISI AMP for the subsequent period of extended operation.

<u>Stainless Steel Guide Tube Assembly (GTA) Lower Flanges and Flange Welds</u>

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel guide tube assembly (GTA) lower flanges and flange welds exposed to reactor coolant and neutron flux, loss of material due to wear, changes in dimensions due to VS, and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for these components cite generic notes E and I, and they credit the RVI AMP instead of the plant-specific AMP in GALL-SLR Report AMR item IV.B2.R-423 to manage cracking due to IASCC. The AMR items credit the RVI AMP in GALL-SLR Report AMR items IV.B2.RP-297 and IV.B2.RP-298 for managing all other aging effects for the GTA lower flange welds. The AMR items cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, item 3.1-1-118, which addresses the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis, in lieu of a plant-specific AMP specified in GALL-SLR Report AMR items IV.B2.R-423.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of loss of material due to wear, changes in dimensions due to VS, and loss of preload due to ISR are not applicable for this component, material, and environment. The staff noted that the plant-specific AMP identified in GALL-SLR Report AMR item IV.B2.R-423 is not used to manage the effects of aging for any Turkey Point RVI components. The staff finds that the applicant's proposal to manage the applicable aging effects using the RVI AMP is consistent with GALL-SLR Report AMP XI.M16A and is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on these components will be adequately managed for the subsequent period of extended operation.

Stainless Steel GTA Control Rod Guide Cards

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel GTA control rod guide cards exposed to reactor coolant and neutron flux, loss of fracture toughness due to IE and TE, changes in dimensions due to VS, and loss of preload due to ISR are not applicable and no AMP is proposed. The AMR items for these components cite generic notes E and I, and they credit the RVI AMP instead of the plant-specific AMP in GALL-SLR Report AMR item IV.B2.R-423 to manage cracking due to SCC and fatigue. The AMR items also credit the RVI AMP in GALL-SLR Report AMR item IV.B2.RP-296 for managing loss of material due to wear for the guide cards. The AMR items cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, item 3.1-1-118, which addresses the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis, in lieu of a plant-specific AMP specified in GALL-SLR Report AMR items IV.B2.R-423.

The staff reviewed the associated items in the SLRA to confirm that the aging effects of loss of fracture toughness due to IE and TE, changes in dimensions due to VS, and loss of preload due to ISR are not applicable for this component, material, and environment. The staff noted that the plant-specific AMP identified in GALL-SLR Report AMR item IV.B2.R-423 is not used to manage the effects of aging for any Turkey Point RVI components. The staff finds that the applicant's proposal to manage the applicable aging effects using the RVI AMP, consistent with GALL-SLR Report AMP XI.M16A, is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for this component provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on these components will be adequately managed for the subsequent period of extended operation.

Stainless Steel GTA Support Pins

In SLRA Table 3.1.2-4, the applicant stated that for the stainless steel GTA support pins exposed to reactor coolant and neutron flux, changes in dimensions due to VS are not applicable and no AMP is proposed. The AMR items for these components cite generic notes E and I. The AMR items credit the RVI AMP instead of the plant-specific AMP in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424 to manage cracking due to IASCC, loss of fracture toughness due to IE, and loss of preload due to ISR. The AMR items also credit the RVI AMP in GALL-SLR Report AMR items IV.B2.RP-355 and IV.B2.RP-356 for managing cracking due to fatigue and loss of material due to wear, but not cracking due to SCC. The AMR items cite plant-specific note 1, which states that the component-specific aging effect screening for the RVI is included in SLRA Appendix C, "MRP-227-A Gap Analysis," where further information is provided for each component and aging effect. These AMR items refer to SLRA Table 3.1-1, items 3.1-1-028, 3.1-1-053c, 3.1-1-118 and 3.1-1-119, which address the use of the RVI AMP to manage the effects of aging for the RVI components based on the results of the MRP-227-A Gap Analysis.

The staff reviewed the associated items in the SLRA to confirm that the aging effect of changes in dimensions due to VS is not applicable for this component, material, and environment. The staff noted that the plant-specific AMP identified in GALL-SLR Report AMR items IV.B2.R-423 and IV.B2.R-424 is not used to manage the effects of aging for any Turkey Point RVI components. The staff finds that the applicant's proposal to manage the applicable aging effects using the RVI AMP is consistent with GALL-SLR Report AMP XI.M16A and is acceptable based on its review of the DM screening, aging effects evaluation, and inspection criteria for these components provided in the MRP-227-A Gap Analysis. The staff's evaluation of the RVI AMP based on MRP-227-A, as supplemented by the gap analysis, has determined that the effects of aging on these components will be adequately managed for the subsequent period of extended operation.

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 Evaluations for the Engineered Safety Features," is a summary comparison of the applicant's AMRs with those evaluated in the GALL-SLR Report for the engineered safety features 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 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	Not applicable to Turkey Point
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 (see SER Section 3.0.3.2.11)
3.2-1-009	Consistent with the GALL-SLR Report
3.2-1-010	Not applicable to Turkey Point
3.2-1-011	Not applicable to Turkey Point
3.2-1-012	Not applicable to Turkey Point (see SER Section 3.2.2.1.1)
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

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2-1-015	Consistent with the GALL-SLR Report
3.2-1-016	This item number not used by Turkey Point
3.2-1-017	Not applicable to Turkey Point
3.2-1-018	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1-019	Consistent with the GALL-SLR Report
3.2-1-020	Consistent with the GALL-SLR Report
3.2-1-021	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1-022	Consistent with the GALL-SLR Report
3.2-1-023	Not applicable to Turkey Point
3.2-1-024	Not applicable to Turkey Point
3.2-1-025	Not applicable to Turkey Point
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 Turkey Point
3.2-1-028	Not applicable to Turkey Point
3.2-1-029	Not applicable to Turkey Point
3.2-1-030	Consistent with the GALL-SLR Report
3.2-1-031	Consistent with the GALL-SLR Report
3.2-1-032	Consistent with the GALL-SLR Report
3.2-1-033	Consistent with the GALL-SLR Report
3.2-1-034	Consistent with the GALL-SLR Report
3.2-1-035	Consistent with the GALL-SLR Report
3.2-1-036	Consistent with the GALL-SLR Report (see SER Section 3.2.2.1.1)
3.2-1-037	Not applicable to Turkey Point
3.2-1-038	Not applicable to Turkey Point
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 Turkey Point (see SER Section 3.2.2.2.10)
3.2-1-043	Not applicable to Turkey Point
3.2-1-044	Consistent with the GALL-SLR Report
3.2-1-045	Not applicable to Turkey Point
3.2-1-046	Consistent with the GALL-SLR Report
3.2-1-047	Not applicable to Turkey Point
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 Turkey Point
3.2-1-050	Not applicable to Turkey Point
3.2-1-051	Consistent with the GALL-SLR Report
3.2-1-052	Not applicable to Turkey Point
3.2-1-053	Not applicable to Turkey Point
3.2-1-054	Not applicable to PWRs
3.2-1-055	Not applicable to Turkey Point (see SER Section 3.2.2.2.9)
3.2-1-056	Not applicable to Turkey Point (see SER Section 3.2.2.2.10)
3.2-1-057	Consistent with the GALL-SLR Report
3.2-1-058	This item number not used by Turkey Point
3.2-1-059	Consistent with the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
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 Turkey Point
3.2-1-063	Consistent with the GALL-SLR Report
3.2-1-064	Consistent with the GALL-SLR Report
3.2-1-065	Consistent with the GALL-SLR Report
3.2-1-066	Not applicable to Turkey Point (see SER Section 3.2.2.2.7)
3.2-1-067	Not applicable to Turkey Point
3.2-1-068	Consistent with the GALL-SLR Report
3.2-1-069	Not applicable to Turkey Point
3.2-1-070	Consistent with the GALL-SLR Report
3.2-1-071	Not applicable to Turkey Point
3.2-1-072	Consistent with the GALL-SLR Report (see SER Section 3.2.2.1.2)
3.2-1-073	This item number not used by Turkey Point
3.2-1-074	This item number not used by Turkey Point (see SER Section 3.2.2.1.1)
3.2-1-075	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1-076	Not applicable to Turkey Point
3.2-1-077	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1-078	Not applicable to Turkey Point
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	Not applicable to Turkey Point
3.2-1-088	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1-089	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1-090	Consistent with the GALL-SLR Report (see SER Section 3.2.2.1.3)
3.2-1-091	Consistent with the GALL-SLR Report (see SER Section 3.2.2.2.9)
3.2-1-092	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1-093	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1-094	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1-095	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.2-1-096	Not applicable to Turkey Point
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 Turkey Point
3.2-1-099	Not applicable to Turkey Point (see SER Section 3.2.2.2.2)
3.2-1-100	Not applicable to Turkey Point (see SER Section 3.2.2.2.8)
3.2-1-101	Not applicable to Turkey Point (see SER Section 3.2.2.2.8)
3.2-1-102	Not applicable to Turkey Point (see SER Section 3.2.2.2.8)
3.2-1-103	Not applicable to Turkey Point (see SER Section 3.2.2.2.4)
3.2-1-104	Not applicable to Turkey Point

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.2-1-105	Not applicable to Turkey Point (see SER Section 3.2.2.2.10)
3.2-1-106	Not applicable to Turkey Point (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 Turkey Point (see SER Section 3.2.2.2.8)
3.2-1-110	Not applicable to Turkey Point (see SER Section 3.2.2.2.8)
3.2-1-111	Not applicable to Turkey Point (see SER Section 3.2.2.2.10)
3.2-1-112	Consistent with the GALL-SLR Report (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 Turkey Point
3.2-1-115	Not applicable to Turkey Point
3.2-1-116	Not applicable to Turkey Point
3.2-1-117	Not applicable to Turkey Point
3.2-1-118	Not applicable to Turkey Point
3.2-1-119	Not applicable to Turkey Point (see SER Section 3.2.2.2.10)
3.2-1-120	Not applicable to Turkey Point
3.2-1-121	Not applicable to Turkey Point (see SER Section 3.2.2.2.10)
3.2-1-122	Not applicable to Turkey Point
3.2-1-123	Not applicable to Turkey Point
3.2-1-124	Not applicable to Turkey Point
3.2-1-125	Not applicable to Turkey Point
3.2-1-126	Not applicable to Turkey Point
3.2-1-127	Not applicable to Turkey Point
3.2-1-128	Not applicable to Turkey Point
3.2-1-129	Not applicable to Turkey Point
3.2-1-130	Consistent with the GALL-SLR Report
3.2-1-131	Not applicable to Turkey Point
3.2-1-132	Not applicable to Turkey Point
3.2-1-133	Not applicable to Turkey Point
3.2-1-134	Not applicable to Turkey Point

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 Turkey Point 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 3.2.2-6 that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat its review of the matters described in the GALL-SLR Report; however, the staff did verify that the material presented in the SLRA was applicable and that the applicant identified the appropriate GALL-SLR Report AMRs.

Additionally, 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, item 3.2-1-054, the applicant claims that the corresponding AMR item in the GALL-SLR Report is not applicable because the associated item is only applicable to BWRs. The staff reviewed the SRP-SLR, confirmed this item only applies to BWRs, and finds that this item is not applicable to Turkey Point because it is a PWR.

For SLRA Table 3.2-1, items 3.2-1-005, 3.2-1-010, 3.2-1-011, 3.2-1-017, 3.2-1-023 through 3.2-1-025, 3.2-1-027 through 3.2-1-029, 3.2-1-037, 3.2-1-038, 3.2-1-043, 3.2-1-045, 3.2-1-047, 3.2-1-049, 3.2-1-050, 3.2-1-052, 3.2-1-053, 3.2-1-062, 3.2-1-067, 3.2-1-069, 3.2-1-071, 3.2-1-076, 3.2-1-078, 3.2-1-087, 3.2-1-096, 3.2-1-098, 3.2-1-104, 3.2-1-114 through 3.2-1-118, 3.2-1-120, 3.2-1-122 through 3.2-1-129, 3.2-1-131 through 3.2-1-134, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to Turkey Point. 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 3.2-1, items 3.2-1-016, 3.2-1-058, and 3.2-1-073, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not used because the component, material, environment, and aging effect combinations are addressed by other AMR items that are associated with different Table 1 items. The staff reviewed the SLRA and confirmed that the corresponding component, material, environment, and aging effect combinations are associated with different Table 1 items. The staff's determination of acceptability for the alternate table 1 items is documented in the SER sections associated with those items.

SLRA Table 3.2-1, item 3.2-1-012 addresses closure bolting high strength steel exposed to air, soil, and underground to be managed for the aging effect of cracking due to SCC and cyclic loading. The applicant stated that this item is not applicable. However, the staff could not confirm the applicant's claim because it noted that Turkey Point's specification SPEC-M-004, Revision 15, "Maintenance Bolting Specification for St. Lucie Units 1 & 2 and Turkey Point Units 3 and 4," lists high-strength bolting material with a yield strength equal to 150 ksi and a diameter of 3 inches or less as material acceptable for use at the site. The staff noted that closure bolting material with a yield strength equal to 150 ksi and a diameter greater than 2 inches could be susceptible to this aging effect and therefore this item may be applicable for SSCs within the scope of the Bolting Integrity AMP. The staff determined that it needed additional information, which resulted in the issuance of RAIs. RAIs B.2.3.9 1 and B.2.3.9 1a are documented in ADAMS Accession Nos. ML18311A299 and ML19050A401 and evaluated by the staff in SER Section 3.0.3.2.11. The staff evaluated the applicant's claim and finds it acceptable because based on the review of the SLRA, UFSAR, and the applicant's response to RAIs B.2.3.9 1 and B.2.3.9 1a, high strength closure bolting greater than 2 inches in diameter is not acceptable for use as initial or replacement closure bolting in SSCs within the scope of the Bolting Integrity AMP.

SLRA Table 3.2-1, item 3.2-1-036 addresses loss of material due to selective leaching for gray cast and ductile iron piping and piping components exposed to closed-cycle cooling water and treated water. The SLRA originally stated that this item is not applicable; however, in its response to RAI B.2.3.21-1, by letter dated August 31, 2018 (ADAMS Accession No. ML18248A257), the applicant revised the subject item to state that the Selective Leaching program will be used to manage loss of material due to selective leaching for cast iron components exposed to treated water. The staff finds the applicant's change acceptable because managing loss of material due to selective leaching for cast iron components exposed to treated water using the Selective Leaching program is consistent with GALL-SLR Report AMP XI.M33 recommendations.

SLRA Table 3.2-1, item 3.2-1-053 addresses loss of material for stainless steel and nickel alloy piping, piping components, and tanks exposed to soil and concrete. The applicant stated that this item is not applicable; however, in its response to RAI 3.1.2.2.15-1, dated August 31, 2018 (ADAMS Accession No. ML18248A257), the applicant revised the subject item to state that stainless steel piping exposed to concrete in the engineered safety features systems is not exposed to groundwater; therefore, there are no aging effects that require management. The staff finds the applicant's change acceptable because loss of material is not an applicable AERM for stainless steel components exposed to concrete not subject to groundwater intrusion.

SLRA Table 3.2-1, item 3.2-1-074 addresses gray cast iron or ductile iron piping and piping components with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or waste water. The applicant stated that this item is not used because "[m]aterial coatings and underlying materials have been addressed using the appropriate line items for coatings and the underlying materials." Based on a search of the UFSAR and SLRA Section 3.2, the staff noted that there are no internally coated ductile iron components. In its response to RAI B.2.3.21-1, the applicant proposed to manage loss of material due to selective leaching in cast iron under item 3.2-1-036 using the Selective Leaching program. The staff finds the applicant's proposal acceptable because managing loss of material in cast iron using the Selective Leaching program is consistent with the GALL-SLR Report. The staff's evaluation of the applicant's response to RAI B.2.3.21-1 is documented in SER Section 3.0.3.1.5.

SLRA Table 3.2-1, item 3.2-1-078 addresses cracking for stainless steel, steel, and aluminum piping, piping components, and tanks exposed to soil and concrete. The applicant stated that this item is not applicable; however, in its response to RAI 3.1.2.2.15-1, dated August 31, 2018 (ADAMS Accession No. ML18248A257), the applicant revised the subject item to state that stainless steel piping exposed to concrete in the engineered safety features systems is not exposed to groundwater; therefore, there are no aging effects that require management. The staff finds the applicant's change acceptable because cracking is not an applicable AERM for stainless steel components exposed to concrete not subject to groundwater intrusion.

3.2.2.1.2 Loss of Coating or Lining Integrity due to Blistering, Cracking, Flaking, Peeling, Delamination, Rusting, or Physical Damage

SLRA Table 3.2-1, item 3.2-1-072 addresses any type of material piping, piping components, heat exchangers, and tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, or treated borated water, which will be managed for loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage and for loss of material or cracking for cementitious coatings/linings. During its review of components associated with the item for which the applicant cited generic note A, the staff noted that the SLRA credits the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program to manage the aging effect for the steel pressurizer relief tank exposed to reactor coolant. During its review, the staff identified that it needed clarification, resulting in the issuance of an RAI. RAI 3.2.2.1.2-1 and the applicant's response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257.

In its response, the applicant stated that: (a) the internal coating for the pressurizer surge tank is Amercoat 55; (b) the tank has a temperature rating of 180° F immersed; (c) the tank has a temperature alarm setpoint of 120° F; and (d) plant-specific operating procedures direct the operator to return the temperature to below 120° F.

During its evaluation of the applicant's response to RAI 3.2.2.1.2-1, the staff noted that: (a) as stated by the applicant, this coating system is the same as that used at Indian Point Nuclear Generating Plant (Indian Point) as documented in RAI 3.0.3-16 (ADAMS Accession No. ML15251A237) and (b) the staff's evaluation of it is documented in Supplement 3 to NUREG-1930, "Safety Evaluation Report Related to the License Renewal of Indian Point Nuclear Generating Plant, Units 2 and 3" (ADAMS Accession Nos. ML18200A333). The staff finds the applicant's response acceptable because there is reasonable assurance that the coating system will remain within design parameters due to the alarm setpoint for the pressurizer surge tank and operator procedures for intervention. Based on remaining within design parameters, the inspections cited in the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program can adequately manage loss of coating integrity.

3.2.2.1.3 Long-Term Loss of Material Due to General Corrosion and Loss of Material Due to General Corrosion

SLRA Table 3.2.2-2 cited Table 3.2-1, item 3.2-1-090 to address carbon steel piping internally exposed to treated borated water, which will be managed for long-term loss of material, and loss of material using the One-Time Inspection program, and cited generic note A. By letter dated December 14, 2018 (ADAMS Accession No. ML18352A885), SLRA Table 3.2.2-2 was amended to state that carbon steel piping exposed internally to treated borated water will be managed for loss of material and long-term loss of material using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, and to cite generic note H.

The staff noted that previous inspections of the containment spray system showed through-wall corrosion of the carbon steel piping exposed internally to treated borated water. This being the case, a periodic inspection program is recommended because the GALL-SLR Report states that the One-Time Inspection program cannot be used for structures or components with known age-related DMs. Based on its review of components associated with SLRA Table 3.2.2-2, for which the applicant cited generic note H, the staff finds that the applicant's proposal to manage the effects of aging using the Inspection of Internal Surfaces in Miscellaneous Piping and

Ducting Components program is acceptable because this is a periodic inspection program that uses ultrasonic testing, which is capable of detecting loss of material and long-term loss of material.

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, as recommended by the GALL-SLR Report, for the engineered safety features components and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of component groups of which the GALL-SLR Report recommends further evaluation, 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 Table 3.2-1, item 3.2-1-001, indicates that TLAAs for engineered safety features components are evaluated in accordance with 10 CFR 54.21(c)(1) and that the evaluation of this TLAA is addressed in Section 4.3.2. The staff finds the applicant's approach is consistent with SRP-SLR Section 3.2.2.2.1 and is, therefore, acceptable. The staff's evaluation of the TLAA for engineered safety features components is documented in SER Section 4.3.2.

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, items 3.2-1-004, 3.2-1-048, 3.2-1-107, and 3.2-1-112, addresses stainless steel and nickel alloy piping, piping components, and heat exchanger components exposed to air-indoor uncontrolled, air-outdoor, or underground environments, which will be managed for loss of material by the External Surfaces Monitoring of Mechanical Components program, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, or Buried and Underground Piping and Tanks program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.2.2.2.2.

The staff noted that SLRA Section 3.2.2.2.2 only addressed the air-indoor uncontrolled and air-outdoor environments. The cited environments in SRP-SLR Section 3.2.2.2.2 are air, condensation, and underground, which can include environments such as air-indoor controlled. Based on its review of the engineered safety features system's AMR items, the staff noted that the only air-related environment cited besides the air-indoor uncontrolled and air-outdoor environments are air with borated water leakage, air-dry, and the underground environment. The staff also noted that: (a) air with borated water leakage is a unique environment principally included in the GALL-SLR Report to identify AMR items that should be in the scope of AMP XI.M10, "Boric Acid Corrosion"; (b) the air-dry environment is a unique environment cited for the internal surfaces of components downstream of the instrument air dryers and would therefore not be exposed to potential halogens being transported to the surface due to packing or gasket leaks; and (c) the AMR items associated with loss of material for stainless steel components exposed to the underground environment cite item 3.2-1-112, which is associated with SRP-SLR Section 3.2.2.2.2. As a result, the staff has concluded that these stainless steel AMR items citing air with borated water leakage, air-dry, or underground as an environment are consistent with the GALL-SLR Report.

During its review of components associated with items 3.2-1-004 and other Table 1 items in SLRA Sections 3.2 and 3.3, the staff identified that it needed clarification, resulting in the issuance of an RAI. RAI 3.2.2.2.2-1 and the applicant's response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257.

In its response, the applicant stated that:

(a) The heat exchanger in SLRA Table 3.3.2-9, which cites SLRA Table 3.3-1, items 3.3-1-004 and 3.3-1-006, is within a population of stainless steel components exposed to outdoor air. Given that the inspections recommended by GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," are sampling-based, the condition of this component may be assessed based on inspection of other components with the same material and environment, such as the stainless steel piping downstream of the heat exchanger. The applicant also stated that, "[t]he heat exchanger tubes may be made available for inspection if required based on the results of the representative components within the material-environment population."

(b) The external surfaces of the heat exchanger fins in SLRA Tables 3.3.2-12, 3.3.2-14, and 3.3.2-16, which cite SLRA Table 3.3-1, items 3.3-1-242 and 3.3-1-254, can be made accessible by maintenance activities during which ASME Section XI VT-1 or surface examinations will be conducted.

(c) The head and tubesheet of the heat exchanger in SLRA Table 3.2.2-6, which cites SLRA Table 3.2-1, items 3.2-1-004 and 3.2-1-007, are only exposed to containment air on the external surfaces. The interior surfaces are exposed to treated borated water or closed-cycle cooling water. The inspections recommended by GALL-SLR Report AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," can be performed. SLRA Table 3.2.2-6 was revised to add an internal treated borated water environment for the component.

(d) Similarly, the heat exchanger tubesheet in SLRA Table 3.2.2-5, which cites SLRA Table 3.2-1s items 3.2-1-004 and 3.2-1-007, is only exposed to air-indoor uncontrolled on its exterior surfaces, for which the inspections recommended by GALL-SLR Report AMP XI.M36 can be conducted.

(e) The heat exchanger housings in SLRA Table 3.3.2-16, which cites SLRA Table 3.3-1, items 3.3-1-004 and 3.3-1-006, are within a population of stainless steel components exposed to outdoor air and the air intake of each diesel generator can be disassembled to inspect the aftercooler housing, if required. Given that the inspections recommended by GALL-SLR Report AMP XI.M38 are sampling-based, the condition of these components may be assessed based on inspection of other components with the same material and environment.

(f) The heat exchanger tubes in SLRA Tables 3.3.2-10 and 3.3.2-11, which cite SLRA Table 3.3-1, items 3.3-1-004 and 3.3-1-241, are within a population of stainless steel components exposed to condensation. Given that the inspections recommended by GALL-SLR Report AMP XI.M38 are sampling-based, the condition of these components may be assessed based on inspection of other components with the same material and environment.

(g) The strainer elements in SLRA Table 3.2.2-5, which cites SLRA Table 3.2-1s items 3.2-1-004 and 3.2-1-007, are directly exposed to the containment environment. The strainer body is an open structural support system. The applicant also stated that the External Surfaces Monitoring of Mechanical Components program is a sampling-based program. The staff noted that this is the case for managing cracking as an aging effect and not for loss of material.

During its evaluation of the applicant's response to RAI 3.2.2.2.2-1, the staff noted that the population of aluminum and stainless steel components exposed to air-indoor uncontrolled, outdoor air, or condensation that cite the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage cracking or loss of material includes many components that could be readily inspected (e.g., piping, piping components, duct, dryers, valve bodies, filter housing, tank). The staff finds the applicant's response acceptable because: (a) either the stainless steel or aluminum surfaces exposed to air or condensation can be inspected by the inspections recommended in AMP XI.M36 or, for aging effects being managed by the components that cite the Internal Surfaces in Miscellaneous Piping and Ducting Components program, there is reasonable assurance that a population of components with the same material, environment, and aging effect exist sufficient to meet the sampling recommendations of GALL-SLR Report AMP XI.M38 and (b) for items not readily accessible, the applicant stated that they can be made accessible. In regard to the strainer elements in SLRA Table 3.2.2-5, although not all the external surfaces of the strainer would be available to inspect using the External Surfaces Monitoring of Mechanical Components program, the staff finds the proposal acceptable because there is reasonable assurance that with the open structural support system for the strainer, sufficient stainless steel surfaces are observable.

In its review of components associated with items 3.2-1-004, 3.2-1-048, 3.2-1-107, and 3.2-1-112, the staff finds that the applicant has met the further evaluation criteria. In addition, the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components program, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, or the Buried and Underground Piping and Tanks program is acceptable because periodic inspections are conducted that can detect loss of material.

SLRA Section 3.2.2.2.2, associated with SLRA Table 3.2-1, items 3.2-1-099 and 3.2-1-106, address loss of material for stainless steel or nickel alloy tanks and tanks within the scope of GALL Report AMP XI.M29. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.2 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 and tanks within the scope of AMP XI.M29 in the engineered safety features systems.

Based on the programs identified, the staff determined that the applicant's programs meet the criteria of SRP-SLR Section 3.2.2.2.2. For those items associated with SLRA Section 3.2.2.2.2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended 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).

3.2.2.2.3 Loss of Material Due to General Corrosion and Flow Blockage Due to Fouling

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 air-indoor uncontrolled and condensation environments. 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, items 3.2-1-007, 3.2-1-080, and 3.2-1-108, addresses stainless steel piping, piping components, and heat exchanger components exposed to air-indoor uncontrolled or air-outdoor environments, which will be managed for cracking by the External Surfaces Monitoring of Mechanical Components program, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, or Buried and Underground Piping and Tanks program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.2.2.2.4. See SER Section 3.2.2.2.2 for the staff's evaluation of the applicant only addressing the air-indoor uncontrolled environment and air-outdoor environment in its response to SRP-SLR Section 3.2.2.2.4.

During its review of components associated with item 3.2-1-007, the staff identified that it needed clarification, resulting in the issuance of an RAI. RAI 3.2.2.2.2-1 and the applicant's response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257. The staff's evaluation of the applicant's response to RAI 3.2.2.2.2-1 is documented in SER Section 3.2.2.2.2

In its review of components associated with items 3.2-1-007, 3.2-1-080, and 3.2-1-108, the staff finds that the applicant has met the further evaluation criteria. In addition, the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components program, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, or Buried and Underground Piping and Tanks program, is acceptable because periodic inspections are conducted that can detect cracking.

SLRA Section 3.2.2.2.4, associated with SLRA Table 3.2-1, item 3.2-1-103, addresses cracking for stainless steel tanks within the scope of GALL Report AMP XI.M29. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.4 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 AMP XI.M29 in the engineered safety features systems.

Based on the programs identified, the staff determined that the applicant's programs meet the criteria of SRP-SLR Section 3.2.2.2.4. For those items associated with SLRA Section 3.2.2.2.4, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.5 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 waste water. The applicant stated that its review of operating experience identified no instances of recurring internal corrosion, as delineated in the SRP-SLR, in raw water, waste water, or treated water. Consequently, the applicant stated that this item 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 engineered safety features systems during its independent review of Turkey Points' operating experience database.

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, items 3.2-1-100, 3.2-1-101, 3.2-1-102, 3.2-1-109, and 3.2-1-110, addresses cracking in aluminum components exposed to various environments. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.8 and finds it acceptable because based on a review of the SLRA and UFSAR, there are no aluminum piping, piping components, and tanks in the engineered safety feature 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, items 3.2-1-055 and 3.2-1-091, addresses steel and stainless steel piping and piping components exposed to concrete for which there are no aging effects requiring management, depending on plant-specific configuration and conditions. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.2.2.2.9.

In its review of components associated with items 3.2-1-055 and 3.2-1-091, the staff finds that the applicant has met the further evaluation criteria because the stainless steel piping exposed to concrete is not also exposed to groundwater, consistent with SRP-SLR Section 3.2.2.2.9. In addition, the applicant stated that for items 3.2-1-055 and 3.2-1-091, the applicability is limited to the stainless steel piping and piping components exposed to concrete. The staff noted that its search of the applicant's SLRA and UFSAR confirmed that no in-scope steel piping and piping components exposed to concrete are present in the engineered safety features systems.

For those 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 the applicant has demonstrated that there are no aging effects requiring management 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, 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 in aluminum components exposed to various environments. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.2.2.2.10 and finds it acceptable because based on its review of the SLRA and UFSAR, there are no aluminum piping, piping components, and tanks in the engineered safety feature systems.

3.2.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL-SLR Report

The following subsections document the staff's review of AMR results listed in SLRA Tables 3.2.2-1 through 3.2.2-6 that are either not consistent with or not addressed in the GALL-SLR Report and are usually denoted with generic notes F through J. To efficiently capture and identify multiple applicable AMR items in each subsection, and because these AMR items often are not associated with 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.

3.2.2.3.1 Containment Spray

Carbon Steel Piping Exposed to Treated Borated Water

SLRA Table 3.2.2-2 originally stated that carbon steel piping exposed to treated borated water will be managed for loss of material by the Water Chemistry and One-Time Inspection programs, citing generic note H. The applicant amended the SLRA in its response to RAI B.2.3.20-2 (ADAMS Accession No. ML18296A024) and deleted this AMR item. The staff's review of the applicant's response to RAI B.2.3.20-2 is documented in SER Section 3.0.3.1.4, One-Time Inspection.

3.2.2.3.2 Safety Injection

Nickel Alloy Heat Exchanger Coil Exposed to Treated Water

SLRA Table 3.2.2-4 states that nickel alloy heat exchanger coils externally exposed to treated water will be managed for reduction of heat transfer by the Closed Treated Water Systems program. The AMR item cites generic note H.

The staff reviewed the associated item in the SLRA to determine whether the aging effect proposed by the applicant constitutes all of the credible aging effects for this component, material, and environment description. The staff noted that the applicant addressed loss of material for this component, material, and environment combination in other AMR items. The staff also noted that for other material and environment combinations in the GALL-SLR Report, reduction of heat transfer due to fouling is the only aging effect associated with an intended function of “heat transfer.” Based on its review of the GALL-SLR Report, the staff finds that the applicant has identified all credible aging effects for this component, material, and environment combination.

Nickel Alloy Heat Exchanger Coils Exposed to Treated Borated Water

In SLRA Table 3.2.2-4, the applicant stated that nickel alloy heat exchanger coils exposed to treated borated water will be managed for reduction of heat transfer by the Water Chemistry and One-Time Inspection programs. The AMR item cites generic note H, for which the applicant has identified reduction of heat transfer as an additional aging effect. The AMR item cites plant-specific note 1, which states, “The Water Chemistry and One-Time Inspection AMPs are used to manage reduction of heat transfer for stainless steel heat exchanger tubes via V.D1.E-20. As stainless steel and nickel alloy have similar aging effects when exposed to treated borated water, the Water Chemistry and One-Time Inspection AMPs are adequate to manage reduction of heat transfer for nickel alloy heat exchanger tubes exposed to treated borated water.”

The staff reviewed the associated item in the SLRA to determine whether the aging effect proposed by the applicant constitutes all of the credible aging effects for this component, material, and environment description. The staff noted that the applicant addressed loss of material for this component, material, and environment combination in other AMR items. The staff also noted that for other material and environment combinations in the GALL-SLR Report, reduction of heat transfer due to fouling is the only aging effect associated with an intended function of “heat transfer.” The staff finds that the applicant’s proposal to manage the reduction of heat transfer aging effect is acceptable because the Water Chemistry program will help to minimize deposits that could adversely impact heat transfer and the One-Time Inspection program will help to verify the effectiveness of the Water Chemistry program. Additionally, the staff finds the proposal acceptable because stainless steel has a similar aging effect when exposed to treated borated water and the GALL-SLR Report recommends use of the Water Chemistry and One-Time Inspection programs to manage the aging effect for stainless steel.

3.3 Aging Management of Auxiliary Systems

3.3.1 Summary of Technical Information in the Application

SLRA Section 3.3 provides AMR results for those components the applicant identified in SLRA Section 2.3.3, “Auxiliary Systems,” as being subject to an AMR. SLRA Table 3.3-1, “Summary of Aging Management Evaluations for the Auxiliary Systems,” is a summary comparison of FPL’s AMRs with those evaluated in the GALL-SLR Report for the auxiliary systems components.

3.3.2 Staff Evaluation

Table 3.3-1, below, summarizes the staff’s evaluation of the component groups listed in SLRA Section 3.3 and addressed in the GALL-SLR Report.

Table 3.3-1 Staff Evaluation for Auxiliary Systems Components in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3-1-001	Consistent with the GALL-SLR Report (see 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	This item number not used by Turkey Point (see SER Section 3.3.2.2.2)
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	Not applicable to Turkey Point
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 Turkey Point (see SER Section 3.3.2.1.1)
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	This item number not used by Turkey Point
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 Turkey Point
3.3-1-026	Not applicable to PWRs
3.3-1-027	Not applicable to PWRs
3.3-1-028	This item number not used by Turkey Point
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 Turkey Point
3.3-1-030a	Not applicable to Turkey Point
3.3-1-031	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-032	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-032a	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-033	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-034	Consistent with the GALL-SLR Report
3.3-1-035	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-036	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-037	Consistent with the GALL-SLR Report
3.3-1-038	Consistent with the GALL-SLR Report
3.3-1-039	This item number is not used in the SRP-SLR or the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
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 (see SER Section 3.3.2.1.2)
3.3-1-043	Consistent with the GALL-SLR Report
3.3-1-044	Not applicable to Turkey Point
3.3-1-045	Consistent with the GALL-SLR Report
3.3-1-046	Consistent with the GALL-SLR Report
3.3-1-047	Not applicable to PWRs
3.3-1-048	Not applicable to Turkey Point
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 Turkey Point
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 3.3.2.1.3)
3.3-1-065	Not applicable to Turkey Point
3.3-1-066	Not applicable to Turkey Point
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 (see SER Section 3.3.2.1.4)
3.3-1-073	Not applicable to Turkey Point
3.3-1-074	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-075	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-076	Consistent with the GALL-SLR Report
3.3-1-077	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-078	Consistent with the GALL-SLR Report
3.3-1-079	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-080	Consistent with the GALL-SLR Report
3.3-1-081	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-082	Consistent with the GALL-SLR Report
3.3-1-083	Consistent with the GALL-SLR Report
3.3-1-084	This item number is not used in the SRP-SLR or the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3-1-085	Consistent with the GALL-SLR Report (see SER Sections 3.3.2.1.5 and 3.3.2.1.6)
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 Turkey Point (see SER Section 3.3.2.1.1)
3.3-1-090	Consistent with the GALL-SLR Report
3.3-1-091	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.2)
3.3-1-092	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-093	This item number not used by Turkey Point
3.3-1-094	Consistent with the GALL-SLR Report (see SER Section 3.3.2.2.4)
3.3-1-094a	Consistent with the GALL-SLR Report (see SER Section 3.3.2.2.3)
3.3-1-095	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.7)
3.3-1-096	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.6)
3.3-1-096a	Consistent with the GALL-SLR Report
3.3-1-06b	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.8)
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 Turkey Point
3.3-1-102	Consistent with the GALL-SLR Report
3.3-1-103	Consistent with the GALL-SLR Report
3.3-1-104	Not applicable to Turkey Point
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	This item number not used by Turkey Point
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	Consistent with the GALL-SLR Report
3.3-1-112	This item number not used by Turkey Point (see SER Section 3.3.2.2.9)
3.3-1-113	Consistent with the GALL-SLR Report
3.3-1-114	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.9)
3.3-1-115	Not applicable to Turkey Point
3.3-1-116	Consistent with the GALL-SLR Report
3.3-1-117	Consistent with the GALL-SLR Report
3.3-1-118	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-119	Not applicable to Turkey Point (see SER Section 3.3.2.1.1)
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 Turkey Point
3.3-1-123	Not applicable to Turkey Point
3.3-1-124	Consistent with the GALL-SLR Report
3.3-1-125	Consistent with the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3-1-126	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.10)
3.3-1-127	Not applicable to Turkey Point (see SER Section 3.3.2.2.7)
3.3-1-128	Consistent with the GALL-SLR Report
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 SER Section 3.3.2.1.9)
3.3-1-133	Not applicable to Turkey Point
3.3-1-134	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.7)
3.3-1-135	Consistent with the GALL-SLR Report
3.3-1-136	Consistent with the GALL-SLR Report
3.3-1-137	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.1)
3.3-1-138	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.11)
3.3-1-139	Consistent with the GALL-SLR Report
3.3-1-140	This item number not used by Turkey Point
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	This item number not used by Turkey Point
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 Turkey Point
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 Turkey Point
3.3-1-150	Not applicable to Turkey Point
3.3-1-151	This item number not used by Turkey Point
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	Not applicable to Turkey Point
3.3-1-156	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-157	Consistent with the GALL-SLR Report
3.3-1-158	Consistent with the GALL-SLR Report
3.3-1-159	Not applicable to Turkey Point
3.3-1-160	This item number not used by Turkey Point (see SER Section 3.3.2.1.1)
3.3-1-161	Consistent with the GALL-SLR Report
3.3-1-162	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-163	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-164	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-165	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-166	Not applicable to Turkey Point
3.3-1-167	Not applicable to Turkey Point
3.3-1-168	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-169	Not applicable to Turkey Point
3.3-1-170	This item number not used by Turkey Point

Component Group (SRP-SLR Item No.)	Staff Evaluation
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 Turkey Point
3.3-1-173	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-174	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.3-1-175	Not applicable to Turkey Point
3.3-1-176	Not applicable to Turkey Point
3.3-1-177	Not applicable to Turkey Point
3.3-1-178	Not applicable to Turkey Point
3.3-1-179	This item number not used by Turkey Point (see SER Section 3.3.2.1.1)
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 Turkey Point
3.3-1-182	Not applicable to Turkey Point
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 Turkey Point
3.3-1-185	Not applicable to Turkey Point
3.3-1-186	Not applicable to Turkey Point (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 Turkey Point (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 Turkey Point
3.3-1-195	Not applicable to Turkey Point
3.3-1-196	Not applicable to Turkey Point
3.3-1-197	This item number not used by Turkey Point
3.3-1-198	This item number not used by Turkey Point
3.3-1-199	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.12)
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)
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	This item number not used by Turkey Point
3.3-1-208	Consistent with the GALL-SLR Report
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 Turkey Point
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 Turkey Point
3.3-1-215	Not applicable to Turkey Point

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3-1-216	Not applicable to Turkey Point
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 Turkey Point
3.3-1-219	This item number not used by Turkey Point
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 Turkey Point (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 Turkey Point
3.3-1-227	This item number not used by Turkey Point (see SER Section 3.2.2.10)
3.3-1-228	This item number not used by Turkey Point (see SER Section 3.3.2.2.4)
3.3-1-229	Not applicable to Turkey Point
3.3-1-230	Not applicable to Turkey Point
3.3-1-231	This item number not used by Turkey Point (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 Turkey Point (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 Turkey Point
3.3-1-237	Not applicable to Turkey Point
3.3-1-238	Not applicable to Turkey Point
3.3-1-239	Not applicable to Turkey Point
3.3-1-240	Not applicable to Turkey Point (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 applicable to Turkey Point (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	Not applicable to Turkey Point (see SER Section 3.3.2.2.10)
3.3-1-248	This item number not used by Turkey Point
3.3-1-249	Not applicable to Turkey Point
3.3-1-250	Consistent with the GALL-SLR Report
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 Turkey Point
3.3-1-253	Not applicable to Turkey Point
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	Consistent with the GALL-SLR Report
3.3-1-259	Not applicable to Turkey Point
3.3-1-260	Consistent with the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.3-1-261	Not applicable to Turkey Point
3.3-1-262	Not applicable to Turkey Point
3.3-1-263	Not applicable to Turkey Point

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 Turkey Point 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

The following subsections document the staff's review of AMR results listed in SLRA Tables 3.3.2-1 through 3.3.2-19 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.

Additionally, 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 3.3-1-016, 3.3-1-019, 3.3-1-021, 3.3-1-022, 3.3-1-026, 3.3-1-027, 3.3-1-047, 3.3-1-110, 3.3-1-203, and 3.3-1-244, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable because the associated items are only applicable to BWRs. The staff reviewed the SRP-SLR, confirmed that these items only apply to BWRs, and finds that these items are not applicable to Turkey Point because it is a PWR.

For SLRA Table 3.3-1, items 3.3-1-007, 3.3-1-025, 3.3-1-030, 3.3-1-030a, 3.3-1-044, 3.3-1-048, 3.3-1-051, 3.3-1-065, 3.3-1-066, 3.3-1-073, 3.3-1-101, 3.3-1-104, 3.3-1-115, 3.3-1-122, 3.3-1-123, 3.3-1-133, 3.3-1-137, 3.3-1-147, 3.3-1-149, 3.3-1-150, 3.3-1-155, 3.3-1-159, 3.3-1-166, 3.3-1-167, 3.3-1-169, 3.3-1-172, 3.3-1-175 through 3.3-1-178, 3.3-1-181 through 3.3-1-186, 3.3-1-194 through 3.3-1-196, 3.3-1-208, 3.3-1-210, 3.3-1-214 through 3.3-1-216, 3.3-1-218, 3.3-1-226, 3.3-1-229, 3.3-1-230, 3.3-1-236 through 3.3-1-239, 3.3-1-249, 3.3-1-252, 3.3-1-253, 3.3-1-259, and 3.3-1-261 through 3.3-1-263, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to Turkey Point. 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 3.3-1-018, 3.3-1-028, 3.3-1-093, 3.3-1-108, 3.3-1-140, 3.3-1-146, 3.3-1-151, 3.3-1-170, 3.3-1-171, 3.3-1-197, 3.3-1-198, 3.3-1-207, 3.3-1-219, and 3.3-1-248, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not used because the component, material, environment, and aging effect combinations are addressed by other AMR items that are associated with different Table 1 items. The staff reviewed the SLRA and confirmed that the corresponding component, material, environment, and aging effect combinations are associated with different Table 1 items. The staff's determination of acceptability for the alternate Table 1 items is documented in the SER sections associated with those items.

SLRA Table 3.3-1, item 3.3-1-010 addresses closure bolting high strength steel exposed to air, soil, and underground to be managed for the aging effect of cracking due to SCC and cyclic loading. The applicant stated that this item is not applicable. However, the staff could not confirm the applicant's claim because it noted that Turkey Point's specification SPEC-M-004, Revision 15, "Maintenance Bolting Specification for St. Lucie Units 1 & 2 and Turkey Point Units 3 and 4," lists high-strength bolting material with a yield strength equal to 150 ksi and a diameter of 3 inches or less as material acceptable for use at the site. The staff noted that closure bolting material with a yield strength equal to 150 ksi and a diameter greater than 2 inches could be susceptible to this aging effect and therefore this item may be applicable for SSCs within the scope of the Bolting Integrity AMP. The staff determined that it needed additional information, which resulted in the issuance of RAIs. RAIs B.2.3.9-1 and B.2.3.9-1a are documented in ADAMS Accession Nos. ML18311A299 and ML19050A401 and evaluated by the staff in SER Section 3.0.3.2.11. The staff evaluated the applicant's claim and finds it acceptable because based on the review of the SLRA, UFSAR, and the applicant's response to RAIs B.2.3.9 1 and B.2.3.9 1a, high strength closure bolting greater than 2 inches in diameter is not acceptable for use as initial or replacement closure bolting in SSCs within the scope of the Bolting Integrity AMP.

SLRA Table 3.3-1, item 3.3-1-089 addresses steel piping and piping components exposed internally to condensation. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because based on a review of AMR items in SLRA Table 3.3.2-15, "Fire Protection - Summary of Aging Management Evaluation": (a) the cited air environments, air-outdoor and air-indoor uncontrolled, are appropriately aligned to components that would normally be within the scope of the Fire Water System program and (b) the methods to manage aging effects (i.e., visual inspection, sprinkler head testing) would be the same regardless of whether the component was exposed to air or condensation.

SLRA Table 3.3-1, item 3.3-1-119 addresses nickel alloy, polyvinyl chloride (PVC), or glass piping or piping components exposed to air with borated water leakage, air-indoor uncontrolled, condensation, waste water, or raw water (potable). The applicant stated that this item is not applicable. The staff noted that SLRA Tables 3.3.2-16 and 3.3.2-18 list sight glasses exposed to air-indoor uncontrolled for which there are no aging effects. The staff evaluated the applicant's proposal and finds it acceptable because the applicant cited SRP-SLR AMR items 3.2-1-060 and 3.3-1-117, which state that there are no aging effects for glass piping elements exposed to air. The staff reviewed the UFSAR and independently confirmed that there are no nickel alloy or PVC items exposed to the environments cited in item 3.3-1-119.

SLRA Table 3.3-1, item 3.3-1-137 addresses steel, stainless steel and aluminum tanks within the scope of GALL-SLR Report AMP XI.M29 exposed to treated water, raw water, or waste water. In the original SLRA, the applicant stated that this item is not applicable; however, in response to RAI B.2.3.17-1, the applicant added the PWST to the scope of the Outdoor and Large Atmospheric Metallic Storage Tanks program. As amended, SLRA Table 3.3.2-5 cites AMR item 3.3-1-137 for the PWST. The staff's evaluation of the applicant's response to RAI B.2.3.17-1 is addressed in SER Section 3.0.3.2.22.

SLRA Table 3.3-1, item 3.3-1-144 addresses cracking of stainless steel, steel, and aluminum piping, piping components, and tanks exposed to soil and concrete. The applicant stated that this item is not applicable; however, the staff determined that it needed additional information for why cracking due to SCC is not applicable for steel and stainless steel piping and piping components exposed to soil, which resulted in the issuance of RAI B.2.3.28-2. The staff's evaluation of the applicant's response to RAI B.2.3.28-2 is documented in SER Section 3.0.3.1.14. In addition, the staff noted that based on a review of the UFSAR, there are no buried aluminum piping, piping components, or tanks in the auxiliary systems.

SLRA Table 3.3-1, item 3.3-1-160 addresses copper alloy components with greater than 15 percent zinc exposed to closed-cycle cooling water, raw water, and waste water. The applicant stated that this item is not used, because its review of plant-specific operating experience confirmed that ammonia or ammonia compounds, which are necessary to cause cracking in copper alloys, are not present at the site. The staff evaluated the applicant's proposal and finds it acceptable because ammonia is a parameter that is monitored on a monthly basis through the site's chemistry procedures for the component cooling water system. In addition, the staff did not identify any issues with ammonia or ammonia compounds during its operating experience audit.

SLRA Table 3.3-1, item 3.3-1-179 addresses masonry walls and structural fire barriers exposed to air. The applicant stated that this item is not used. The staff evaluated the applicant's claim and finds it acceptable because, for the masonry wall items citing SLRA Table 3.5-1, item 3.5-1-070 in SLRA Tables 3.5.2-2, 3.5.2-4, 3.5.2-9, 3.5.2-11, 3.5.2-16, and 3.5.2-18, cracking will be managed using the Masonry Walls program. In Section B.2.3.34, "Masonry Walls," the applicant states: "[m]asonry walls that are fire barriers are also managed by the Fire Protection (B.2.3.15) program." The masonry wall items citing SLRA Table 3.5-1, item 3.5-1-070 do not list "fire barrier" as an intended function. Therefore, the staff finds the use of the Masonry Walls program adequate to manage aging-related degradation for these items. Additionally, for the structural fire barriers citing SLRA Table 3.5-1, item 3.3-1-060 in SLRA Tables 3.5.2-1, 3.5.2-2, 3.5.2-4, 3.5.2-8, 3.5.2-9, and 3.5.2-16, loss of material will be managed by the Fire Protection and Structures Monitoring programs.

3.3.2.1.2 Reduction of Heat Transfer due to Fouling

SLRA Table 3.3-1, item 3.3-1-042 addresses copper alloy, titanium, or stainless steel heat exchanger tubes exposed to raw water, raw water (potable), or treated water, which will be managed for cracking due to SCC (titanium only) and reduction of heat transfer due to fouling. For the AMR item that cites generic note E, the SLRA credits the Fire Water System program to manage the aging effect for copper alloy greater than 15 percent heat exchanger tubes. During its review of components associated with item 3.3-1-042, the staff identified that it needed clarification, which resulted in the issuance of an RAI. RAI 3.3.2.1.3-1 and the applicant's response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257.

In its response, the applicant confirmed that reduction of heat transfer would be managed by observing heat exchanger performance during the periodic tests of the pump and revised SLRA Table 3.3-1, item 3.3-1-042 to include treated water as an applicable environment.

The staff finds the applicant's response and change to SLRA Table 3.3-1, item 3.3-1-042 acceptable because: (a) based on an independent search of the UFSAR and SLRA, there are no titanium or stainless steel heat exchanger tubes in the fire water system and (b) managing flow blockage for heat exchanger components by surveillance flow tests of the fire water system pumps will reveal data that can be trended in regard to flow blockage affecting heat exchanger performance.

3.3.2.1.3 Loss of Material due to General, Pitting, and Crevice Corrosion, and Microbiologically-Induced Corrosion; and Flow Blockage due to Fouling

SLRA Table 3.3-1, item 3.3-1-064 addresses steel and copper-alloy piping and piping components exposed to raw water, treated water, and raw water (potable), which will be managed for loss of material and flow blockage. For the AMR items that cite generic note E, the SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage the aging effect for copper-alloy piping and piping components. The staff noted that the components have a leakage boundary (spatial) intended function.

Based on its review of components associated with item 3.3-1-064 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because it is consistent with GALL-SLR Report AMR item A-727.

During its review of components associated with item number 3.3-1-064, for which the applicant cited generic note C, the staff noted that the SLRA credits the Fire Water System program to manage the aging effect for steel, gray cast iron, and copper alloy greater than 15 percent zinc heat exchanger tubes, shell, tubesheet, and channel heads, as shown in the below chart.

Component Type	Material	Environment	AERM
Heat exchanger (tubes)	Copper alloy >15% Zn	Raw water (int)	Loss of material; flow blockage
Heat exchanger (shell)	Gray cast iron	Treated water (int)	Loss of material; flow blockage
Heat exchanger (tubesheet)	Copper alloy >15% Zn	Treated water (ext)	Loss of material; flow blockage
Heat exchanger (tubesheet)	Copper alloy >15% Zn	Raw water (int)	Loss of material
Heat exchanger (tubes)	Copper alloy >15% Zn	Treated water (ext)	Loss of material
Heat exchanger (channel head)	Copper alloy >15% Zn	Raw water (int)	Loss of material; flow blockage
Heat exchanger (shell)	Carbon steel	Treated water (int)	Loss of material

During its review, the staff identified that it needed clarification, which resulted in the issuance of RAIs. RAI 3.3.2.1.2-1 and RAI 3.3.2.1.2-1a and the applicant's responses are documented in ADAMS Accession Nos. ML18218A200, ML18248A257, and ML18334A182.

In its response to RAI 3.3.2.1.2-1, the applicant revised SLRA Table 3.3.2-15 to: (a) delete the carbon steel heat exchanger shell exposed to treated water because it was determined that this item is not applicable to the fire water system; (b) add flow blockage as an aging effect to the copper alloy greater than 15 percent zinc heat exchanger tube sheet exposed to raw water (internal); (c) delete flow blockage as an aging effect from the copper alloy greater than

15 percent zinc heat exchanger tube sheet exposed to treated water; and (d) revise the applicable AMP to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program for the copper alloy greater than 15 percent zinc heat exchanger tubes and heat exchanger tubesheets exposed to treated water or raw water. These Table 2 items citing SLRA Table 3.3-1, item 3.3-1-064 now cite generic note E because item 3.3-1-064 cites the Fire Water System program to manage aging effects. The applicant stated that aging effects associated with the two affected heat exchangers (i.e., lubricating oil cooler, diesel water system) would be monitored during surveillance testing of the diesel driven fire pump.

In its response to RAI 3.3.2.1.2-1a, the applicant revised SLRA Table 3.3.2-15 to state that loss of material and flow blockage due to fouling for the copper alloy greater than 15 percent zinc and gray cast iron heat exchanger channel head and shell will be managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. These Table 2 items citing SLRA Table 3.3-1, item 3.3-1-064 now cite generic note E because item 3.3-1-064 cites the Fire Water System program to manage aging effects.

The staff finds the applicant's response and changes to SLRA Table 3.3.2-15 acceptable because for the changes to SLRA Table 3.3.2-15: (a) an independent search of the UFSAR and SLRA did not reveal any carbon steel heat exchangers in the scope of the fire water system; (b) flow blockage is an applicable aging effect for components exposed to raw water; (c) deleting flow blockage as an aging effect for the copper alloy greater than 15 percent zinc heat exchanger tube sheet exposed to treated water is consistent with GALL-SLR Report item AP-197; (d) the staff's evaluation of the use of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage loss of material for copper alloy greater than 15 percent zinc heat exchanger components (e.g., tubes, heat exchanger) is documented in the response to RAI 3.2.2.2-1 in SER Section 3.2.2.2.2; and (e) the periodic visual examinations cited in the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program are capable of detecting loss of material and flow blockage for the gray cast iron heat exchanger channel head and shell. The staff also finds the applicant's response associated with managing flow blockage for the gray cast iron heat exchanger shell exposed to treated water and copper alloy greater than 15 percent zinc heat exchanger channel head exposed to raw water acceptable because surveillance flow tests of the fire water system pumps will reveal data that can be trended in regard to flow blockage affecting heat exchanger performance.

3.3.2.1.4 Loss of Material Due to Selective Leaching

SLRA Table 3.3-1, item 3.3-1-072 addresses copper alloy heat exchanger tubes with greater than 15 percent zinc exposed to treated water, which will be managed for loss of material due to selective leaching. During its review of components associated with item 3.3-1-072 for which the applicant cited generic note A, the staff noted that the material specified in the vendor manual for the normal containment cooler heat exchanger tubes was a copper nickel alloy with copper heat exchanger fins. Because the AMR item cited a different material and there was no AMR item for the copper heat exchanger fins, the staff issued RAI 3.3.2.10-1 to request clarification. The staff's request and the applicant's response are documented in ADAMS Accession Nos. ML18243A006 and ML18296A024.

In its response, the applicant revised SLRA Table 2.3.3-10, Table 3.3-1, item 3.3-1-096a, and Table 3.3.2-10 by adding a new component type with the corresponding heat transfer intended function for the heat exchanger fins, adding a new AMR item for the heat exchanger fins, and correcting the material for the heat exchanger tubes. Based on the revised material, the applicant also deleted the AMR item for selective leaching of the heat exchanger tubes in a treated water environment because the copper nickel alloy heat exchanger tubes are not susceptible to this aging mechanism.

The staff finds the applicant's response and changes to the SLRA acceptable because the AMR items in SLRA Table 3.3.2-10 now reflect the correct heat exchanger tube material with applicable components types and appropriate aging mechanisms for the revised material.

3.3.2.1.5 Hardening or Loss of Strength Due to Elastomer Degradation; Flow Blockage Due to Fouling (Raw Water, Waste Water Only)

SLRA Table 3.3-1, item 3.3-1-085 addresses elastomer piping, piping components, seals exposed to air, condensation, closed-cycle cooling water, treated borated water, treated water, raw water, raw water (potable), waste water, gas, fuel oil, and lubricating oil environments, for which the applicant will manage hardening or loss of strength due to elastomer degradation and flow blockage due to fouling (raw water and waste water only). The SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage this aging effect for these AMR items.

For two AMR items in SLRA Table 3.3.2-16 that cite SLRA Table 1, item 3.3-1-085, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI B.2.3.2-4 and the applicant's response are documented in ADAMS Accession Nos. ML18243A006, ML18243A007, and ML18296A024.

In its response to RAI B.2.3.2-4, the applicant stated that the SLRA should have cited the Closed Treated Water Systems program to manage aging effects for the emergency diesel generator (EDG) cooling water system, instead of the Water Chemistry program. The applicant proposed a revision to Table 3.3.2-16 to indicate the use of the Closed Treated Water Systems program to manage the effects of aging, as well as corrections to cite Table 1, item 3.3-1-049 for these AMR items.

The staff finds the applicant's response and changes to SLRA Table 3.3.2-16 acceptable because the EDG Cooling Water System is a closed system exposed to treated water and therefore the Closed Treated Water Systems program is appropriate to manage the cited aging effects. In addition, the applicant has cited the appropriate Table 1 item, 3.3-1-049 for managing loss of material of stainless steel components exposed to treated water.

3.3.2.1.6 Flow Blockage Due to Fouling

SLRA Table 3.3-1, items 3.3-1-085, 3.3-1-091, and 3.3-1-096 address components where flow blockage due to fouling is an applicable aging effect in raw and waste water environments. During its review, the staff noted that elastomeric expansion joints exposed to raw water in SLRA Table 3.3.2-15 (which cites SLRA Table 3.3-1, items 3.3-1-085 and 3.3-1-096) and gray cast iron drains exposed to waste water in SLRA Table 3.3.2-8 (which cites SLRA Table 3.3-1, item 3.3-1-091) do not include flow blockage due to fouling as an AERM. The staff determined that it needed additional information for why flow blockage due to fouling is not an applicable aging effect for the subject components, which resulted in the issuance of RAI B.2.3.25-1. The staff's evaluation of the applicant's response to RAI B.2.3.25-1 is documented in SER Section 3.0.3.1.13.

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

SLRA Table 3.3-1, item 3.3-1-095 addresses copper alloy, stainless steel, and nickel alloy piping, piping components, heat exchanger components, and tanks exposed to waste water, which will be managed for loss of material due to general (copper alloy only), pitting, and crevice corrosion and microbiologically-induced corrosion (MIC) and for flow blockage due to fouling. For the AMR item that cites generic note E, the SLRA credits the External Surfaces Monitoring of Mechanical Components program to manage loss of material for the external surfaces of copper alloy valve bodies. In addition, the AMR item cites plant-specific note 2, which states that "[t]he external surface of these valves can be submerged in water. The External Surfaces Monitoring of Mechanical Components AMP will be used to manage the loss of material aging effect for the external surface of these valves."

Based on its review of components associated with item 3.3-1-095 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components program acceptable because: (a) periodic visual inspections of component surfaces at least once per RFO is sufficient to identify the potential for corrosion; (b) managing loss of material for the external surfaces of steel components exposed to waste water using the External Surfaces Monitoring of Mechanical Components program is consistent with SRP-SLR Table 3.3-1, item 3.3-1-135; and (c) flow blockage due to fouling is not an applicable AERM for the external surfaces of valve bodies.

SLRA Table 3.3-1, item 3.3-1-134 addresses steel, stainless steel, and copper-alloy piping, piping components, and heat exchanger components exposed to raw water (for components not covered by GL 89-13), which will be managed for loss of material due to general (steel, copper alloy only), pitting, and crevice corrosion and MIC and for flow blockage due to fouling. For the AMR item that cites generic note E, the SLRA credits the External Surfaces Monitoring of Mechanical Components program to manage loss of material for the external surfaces of gray cast iron pump casings. The AMR item cites plant-specific note 2, which states that "[t]hese pump casings have a raw water external environment and loss of material is managed by the External Surfaces Monitoring of Mechanical Components AMP."

Based on its review of components associated with item 3.3-1-134 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components acceptable because (a) flow blockage due to fouling is not an applicable AERM for the external surfaces of pump casings and (b) managing the external surfaces of gray cast iron pump casings exposed to waste water, which is similar to a raw water environment, for loss of material using the External Surfaces Monitoring of Mechanical Components program is consistent with SRP-SLR Table 3.3-1, item 3.3-1-135.

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

SLRA Table 3.3-1, item 3.3-1-096b addresses steel heat exchanger components exposed to internal condensation, which will be managed for loss of material due to general, pitting, and crevice corrosion. For the AMR item that cites generic note E, the SLRA credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage the aging effect for the carbon steel heat exchanger shells of normal containment coolers.

Based on its review of components associated with item 3.3-1-096b for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the above cited program acceptable because alternate containment ventilation components with the same material, environment, and aging effects (GALL-SLR Report items A-08, A-26, and A-778) specify the use of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program.

3.3.2.1.9 No Aging Effect Requiring Management

SLRA Table 3.3-1, item 3.3-1-114 and SLRA Table 3.4-1, item 3.4-1-054 state that there are no aging effects for copper-alloy piping and piping components exposed to air, condensation, or gas. During its review of components associated with items 3.3-1-114 and 3.4-1-054 for which the applicant cited generic note A or generic note C, the staff noted that various Table 2 AMR items cite copper alloy greater than 15 percent zinc as the applicable material in lieu of copper alloy. The staff also noted that: (a) for one AMR item in SLRA Table 3.3.2-4, associated with gas as the environment, plant-specific note 2 states that the piping component is wetted and (b) for two AMR items in SLRA Table 3.3.2-16, the component is heat exchanger tubes. GALL-SLR Report AMR items S-454 and S-455 recommend that cracking due to SCC be managed for copper alloy greater than 15 percent zinc piping, piping components, and tanks exposed to air or condensation. Based on the noted issues, the staff identified that it needed clarification, which resulted in the issuance of an RAI. RAI 3.3.2.1.4-1 and the applicant's response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257.

In its response, the applicant revised SLRA Table 3.2-1, item 3.2-1-071, Table 3.3-1, item 3.3-1-132, and Table 3.4-1, item 3.4-1-106 to manage cracking of copper alloy greater than 15 percent zinc piping, piping components, and tanks exposed to air or condensation using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program for internal surfaces and the External Surfaces Monitoring of Mechanical Components program for external surfaces. In its response to RAI 3.3.2.10-1 (ADAMS Accession No. ML18296A024), the applicant also revised SLRA Tables 3.2.2-1, 3.3.2-1, 3.3.2-2, 3.3.2-4, 3.3.2-15, 3.3.2-16, and 3.4.2-1 to cite the associated above Table 1 items. The staff's evaluation of the applicant's response to RAI 3.3.2.10-1 is documented in SER Section 3.3.2.1.4.

During its evaluation of the applicant's response to RAI 3.3.2.1.4-1, the staff noted that for AMR items with generic note E that cite Table 1, items 3.2-1-071 and 3.3-1-132, the SLRA now credits the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage cracking for copper alloy greater than 15 percent zinc. The staff noted that use of this program is consistent with GALL-SLR item A-473 and although the environment for item A-473 is waste water, the cited program could be used as effectively to detect cracking for items exposed to an air or condensation environment. The staff further noted that although item 3.3-1-132 does not cite heat exchanger components, for the heat exchanger shells and channel heads cited in the Table 2s, the External Surfaces Monitoring of Mechanical Components program could be used as effectively to detect cracking. The staff finds the applicant's response and the proposal to manage the effects of aging for some components using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because cracking for copper alloy greater than 15 percent zinc piping, piping components, and heat exchanger components will be managed consistent with the recommendations in the GALL-SLR Report.

3.3.2.1.10 Loss of Material Due to Erosion

SLRA Table 3.3-1, item 3.3-1-126 addresses metallic piping and piping components exposed to various water environments (e.g., raw water, waste water), which will be managed for loss of material due to erosion. For the AMR items that cite generic note E, the SLRA credits the Open Cycle-Cooling Water System program, Fire Water System program, and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage the aging effects for various metallic components (e.g., piping, valve and strainer bodies, pump casings, heat exchanger components). Based on its review of components associated with item 3.3-1-126, for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Cycle-Cooling Water System program, Fire Water System program, and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program acceptable because each of the three AMPs specifically addresses erosion mechanisms and includes internal visual inspections capable of detecting surface irregularities indicative of erosion. Where surface irregularities are detected, the programs also include volumetric inspections that are capable of monitoring wall thicknesses.

3.3.2.1.11 Loss of Coating or Lining Integrity

SLRA Table 3.3-1, item 3.3-1-138 addresses any material piping, piping components, heat exchangers, and tanks with internal coatings/linings exposed to raw water, which will be managed for loss of coating or lining integrity. By letter dated January 31, 2019, the applicant amended its SLRA by modifying several AMR items and adding an AMR item that cites SLRA Table 3.3-1, item 3.3-1-138 and generic note E to Table 3.3.2-1. For the AMR item that cites generic note E, the SLRA credits the Open-Cycle Cooling Water System program to manage the aging effect for internally coated piping within the scope of the Open-Cycle Cooling Water System program. The AMR item cites plant-specific note 3, which states that the Open-Cycle Cooling Water System AMP is enhanced to manage the loss of coating or lining integrity aging effect.

Based on its review of components associated with item 3.3-1-138 for which the applicant cited generic note E, the staff finds the applicant's proposal to manage the effects of aging using the Open-Cycle Cooling Water System program acceptable because the program includes the guidance provided in the "scope of program" program element of GALL-SLR Report AMP XI.M42, "Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks," which is consistent with GALL-SLR Report AMP XI.M20 "Open-Cycle Cooling Water System."

3.3.2.1.12 Loss of Preload Due to Self-Loosening, Loss of Material Due to General Corrosion, and Cracking.

SLRA Table 3.3-1, item 3.3-1-199 addresses steel structural bolting of cranes exposed to air, which will be managed for loss of preload due to self-loosening, loss of material due to general corrosion, and cracking. During its review of components associated with item 3.3-1-199 for which the applicant cited generic note A, the staff noted that the SLRA credits the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program to manage the aging effects for steel structural bolting of cranes. However, the staff noted that for SLRA Table 3.5.2-11, "Intake Structures," component types "intake structures cranes and ICW valve pit rigging beam," and SLRA Table 3.5.2-12, "Main Steam and Feedwater," component type "main steam platform rails" there are no Table 2 AMR results included to manage this aging effect for the structural bolting of these cranes. Therefore, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI 3.3.1.199-1 and the applicant's response are documented in ADAMS Accession No. ML18311A299.

During its evaluation of the applicant's response, the staff noted that there are bolted components installed in the intake structure bridge crane, ICW valve pit rigging beam, and main steam platform rails for which the applicant stated that the aging effects of loss of preload, loss of material, and cracking for these bolts will be managed under its Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program. The staff also noted that the applicant revised SLRA Tables 3.5.2-11 and 3.5.2-12 to incorporate Table 2 AMR items corresponding to item 3.3-1-199, and therefore addresses the management of the aging effects for the bolts installed in the above stated components. The staff finds the applicant's response to RAI 3.3.1.199-1 acceptable because the applicant clarified that there are bolts in the intake structure bridge crane, ICW valve pit rigging beam, and main steam platform rails and revised its SLRA accordingly to include Table 2 items to manage the associated aging effects under the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems program, which is consistent with the GALL-SLR Report recommendation.

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, as recommended by the GALL-SLR Report, for the auxiliary systems 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 3.3.2.2. The following subsections document the staff's review.

3.3.2.2.1 Cumulative Fatigue Damage

SLRA Section 3.3.2.2.1, associated with Table 3.3-1, items 3.3-1-001 and 3.3-1-002, indicates that TLAAs for auxiliary system components are evaluated in accordance with 10 CFR 54.21(c)(1), and that the evaluation of this TLAA is addressed in Section 4.3.2. Furthermore, the applicant indicated that structural components related to SRP-SLR item 3.3-1-001 for the auxiliary systems are evaluated as a TLAA in SLRA Section 4.7.

The staff finds that the applicant's approach is consistent with SRP-SLR Section 3.3.2.2.1 and is, therefore, acceptable. The staff's evaluation of the TLAA for auxiliary system components is documented in SER Section 4.3.2 and the evaluation of structural components related to SRP-SLR item number 3.3-1-001 for the auxiliary systems is documented in SER Section 4.7.

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, item 3.3-1-003, addresses stainless steel heat exchanger tubing exposed to treated borated water greater than 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 an independent search of the applicant's corrective action database didn't find any evidence of SCC in the stainless steel non-regenerative heat exchanger in the CVCS. In its review of components associated with item 3.3-1-003, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Water Chemistry program is acceptable because no evidence was found to indicate SCC in the stainless steel heat exchanger tubing in the CVCS that satisfies the requirements of further evaluation item 3.3.2.2.2 in the SRP-SLR.

Based on the program identified, the staff determined that the applicant's program meets the criteria of SRP-SLR Section 3.3.2.2.2. For those items associated with SLRA Section 3.3.2.2.2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended 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).

3.3.2.2.3 Cracking Due to Stress Corrosion Cracking in Stainless Steel Alloys

SLRA Section 3.3.2.2.3, associated with SLRA Table 3.3-1, items 3.3-1-004, 3.3-1-094a, 3.3-1-146, and 3.3-1-205, addresses stainless steel piping, piping components, ducting, ducting components, heat exchanger components, and tanks exposed to the air-indoor uncontrolled, air-outdoor, or underground environments that will be managed for cracking by the External Surfaces Monitoring of Mechanical Components program, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, or Buried and Underground Piping and Tanks program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.3.

In the original application, the applicant stated that SLRA Table 3.3-1, items 3.3-1-146 and 3.3-1-231, associated with SLRA Section 3.3.2.2.3, were not used because the aging effects associated with these items are managed by different AMR items. The applicant amended its application (ADAMS Accession No. ML18296A024) by adding the PWST and the associated piping to the scope of license renewal in order to credit it to supply make-up water to the CCWST. As a result, item 3.3-1-146 is now cited to manage cracking for stainless steel piping exposed to an underground environment. Based on the changes to the SLRA, RAI 3.3.2.2.3-1 and the applicant's response documented in ADAMS Accession Nos. ML18218A200 and ML18248A257 are no longer pertinent to the staff's review of the SLRA. Item 3.3-1-004 is used in lieu of item 3.3-1-231. This alternative item cites the same aging effect and use of the External Surfaces Monitoring of Mechanical Components program, which includes inspections consistent with item 3.3-1-231.

The staff noted that the applicant's response to SRP-SLR Section 3.3.2.2.3 only addressed the air-indoor uncontrolled, air-outdoor, and underground environments. The cited environments in SRP-SLR Section 3.3.2.2.3 are air and condensation. Based on its review of the auxiliary system AMR items, the staff noted that there are items that cite the air-indoor controlled environment and condensation environment. The staff also noted that of the AMR items that cite the air-indoor controlled environment and the condensation environment, items 3.3-1-004, 3.3-1-094a, or 3.3-1-205, are cited consistent with SRP-SLR Section 3.3.2.2.3. For stainless steel bolting exposed to the condensation environment, the AMR item cites item 3.3-1-145, which cites the Bolting Integrity program to manage aging effects. The periodic visual inspections conducted for the Bolting Integrity program are capable of detecting cracking in stainless steel bolting. As a result, the staff has concluded that these stainless steel AMR items citing air-indoor controlled and condensation as an environment are consistent with the GALL-SLR Report.

During its review of components associated with item 3.3-1-004, the staff identified that it needed clarification, which resulted in the issuance of an RAI. RAI 3.2.2.2.2-1 and the applicant's response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257. The staff's evaluation of the applicant's response to RAI 3.2.2.2.2-1 is documented in SER Section 3.2.2.2.2.

In its review of components associated with items 3.3-1-004, 3.3-1-094a, 3.3-1-146, and 3.3-1-205, the staff finds that the applicant has met the further evaluation criteria. In addition, the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components program, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, or Buried and Underground Piping and Tanks program is acceptable because periodic inspections are conducted that can detect cracking.

Based on the programs identified, the staff determined that the applicant's programs meet the criteria of SRP-SLR Section 3.3.2.2.3. For those items associated with SLRA Section 3.3.2.2.3, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended 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).

3.3.2.2.4 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, items 3.3-1-006, 3.3-1-094, 3.3-1-222, 3.3-1-232, 3.3-1-241, and 3.3-1-246, addresses stainless steel piping, piping components, ducting, ducting components, heat exchanger components, and tanks exposed to the air-indoor uncontrolled, air-outdoor, or underground environments that will be managed for loss of material by the External Surfaces Monitoring of Mechanical Components program, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, or Buried and Underground Piping and Tanks program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.4.

In the original application, the applicant stated that SLRA Table 3.3-1, items 3.3-1-228 and 3.3-1-246, associated with SRP-SLR Section 3.3.2.2.4, were not used because the aging effects associated with these items are managed by different AMR items. The applicant amended its application (ADAMS Accession No. ML18296A024) by adding the PWST and the associated piping in order to be able to make up water to the CCWST. As a result, item 3.3-1-246 is now cited to manage loss of material for stainless steel piping exposed to an underground environment. Based on the changes to the SLRA, RAI 3.3.2.2.3-1 and the applicant's response documented in ADAMS Accession Nos. ML18218A200 and ML18248A257 are no longer pertinent to the staff's review of the SLRA. Items 3.3-1-006 and 3.3-1-222 are used in lieu of item 3.3-1-228. These alternative items cite the same aging effect and use of the External Surfaces Monitoring of Mechanical Components and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components programs, which include inspections consistent with item 3.3-1-228.

The staff noted that SLRA Table 3.3-1, item 3.3.1-222 states, "[c]onsistent with NUREG-2191 The External Surfaces Monitoring of Mechanical Components AMP is used to manage loss of material in stainless steel tanks exposed to condensation." This statement is not consistent with the AMR items that cite item 3.3.1-222 in SLRA Tables 3.3.2-3 and 3.3.2-4. However, as proposed by the applicant, using the External Surfaces Monitoring of Mechanical Components program to manage loss of material associated with an air-indoor uncontrolled external environment and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage loss of material associated with an internal condensation environment is consistent with the GALL-SLR Report.

The staff noted that SLRA Section 3.3.2.2.4 only addressed the air-indoor uncontrolled and air-outdoor environment. The cited environments in SRP-SLR Section 3.3.2.2.4 are air and condensation. Based on its review of the auxiliary system AMR items, the staff noted that there are items that cite the air-indoor controlled, air-dry, and condensation environments. The staff also noted that the AMR items that cite air-indoor controlled or condensation as an environment cite either: (a) items 3.3-1-006, 3.3-1-094, 3.3-1-222, 3.3-1-232, or 3.3-1-241, consistent with SRP-SLR Section 3.3.2.2.4 or (b) item 3.3-1-012, which cites the Bolting Integrity program to manage aging effects. The periodic visual inspections conducted for the Bolting Integrity program are capable of detecting loss of material in stainless steel bolting. The staff further noted that the air-dry environment is a unique environment cited for the internal surfaces of components downstream of the instrument air dryers and would therefore not be exposed to potential halogens transporting to the surface due to packing or gasket leaks. As a result, the staff has concluded that these stainless steel AMR items citing air-indoor controlled, condensation, or air-dry as an environment are consistent with the GALL-SLR Report.

During its review of components associated with items 3.3-1-006 and 3.3-1-241, the staff identified that it needed clarification, which resulted in the issuance of an RAI. RAI 3.2.2.2.2-1 and the applicant's response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257. The staff's evaluation of the applicant's response to RAI 3.2.2.2.2-1 is documented in SER Section 3.2.2.2.2.

In its review of components associated with items 3.3-1-006, 3.3-1-094, 3.3-1-222, 3.3-1-232, 3.3-1-241, and 3.3-1-246, the staff finds that the applicant has met the further evaluation criteria. In addition, the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components program, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, or Buried and Underground Piping and Tanks program is acceptable because periodic inspections are conducted that can detect loss of material.

Based on the programs identified, the staff determined that the applicant's programs meet the criteria of SRP-SLR Section 3.3.2.2.4. For those items associated with SLRA Section 3.3.2.2.4, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended 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).

3.3.2.2.5 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, treated water, raw water, and waste water. The applicant stated that its review of operating experience identified no instances of recurring internal corrosion, as delineated in the SRP-SLR, and concluded that this item was not applicable. However, during its independent review of plant-specific operating experience reports, the staff identified several entries where the cause of the documented leak could not be readily determined, which resulted in the issuance of RAI 3.3.2.2.7-1. The staff's request and the applicant's response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257.

In its response, the applicant provided further details on the causes of degradation for the identified entries. The staff noted that multiple leaks had occurred in a portion of the 10-inch diameter fire water system header in 2007. The applicant stated that the header had been replaced and that following the replacement, there have been no further corrective action entries identifying corrosion in this header. The staff recognizes that replacing a portion of the header should stop leaks temporarily, even if there is recurring loss of material in the header. However, the replacement of piping alone does not result in the leakage events, which preceded the pipe replacement, from being excluded as data points for recurring internal corrosion. Nevertheless, based on the applicant's review of the remaining corrective action entries, no other leakage events have occurred as a result of internal corrosion. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.7 and finds it acceptable because for the past 10 years there have been no further instances of internal corrosion sufficient to exceed the further evaluation criteria.

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, items 3.3-1-189 and 3.3-1-254, addresses aluminum piping, piping components, heat exchangers, and tanks exposed to air-indoor uncontrolled or air-outdoor environments that will be managed for cracking by the External Surfaces Monitoring of Mechanical Components program or Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.8.

The staff noted that the applicant's response to SRP-SLR Section 3.3.2.2.8 only addressed the air-indoor uncontrolled and air-outdoor environment. The cited environments in SRP-SLR Section 3.3.2.2.8 are air and condensation. Based on its review of the auxiliary system AMR items, the staff noted that there is one item that cites the condensation (internal) environment. This item cites the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage cracking and item 3.3-1-189, consistent with SRP-SLR Section 3.3.2.2.8. There is also one item that cites the air-indoor controlled (external) environment. This item cites the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage cracking and item 3.3-1-189, consistent with SRP-SLR Section 3.3.2.2.8. See SER Section 3.2.2.2.2 for the staff's evaluation of the applicant's response to RAI 3.2.2.2.2-1 associated with the use of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program to manage aging effects on an external environment.

During its review of components associated with item 3.3-1-254, the staff identified that it needed clarification, which resulted in the issuance of an RAI. RAI 3.2.2.2.2-1 and the applicant’s response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257. The staff’s evaluation of the applicant’s response to RAI 3.2.2.2.2-1 is documented in SER Section 3.2.2.2.2.

In its review of components associated with items 3.3-1-189 and 3.3-1-254, the staff finds that the applicant has met the further evaluation criteria. In addition, the applicant’s proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components program or Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is acceptable because periodic inspections are conducted that can detect cracking.

SLRA Table 3.3-1, items 3.3-1-186 and 3.3-1-192 address cracking for aluminum tanks within the scope of AMP XI.M29 and piping, piping components, and tanks in an underground environment. The applicant stated that these items are not applicable. The staff evaluated the applicant’s claim against the criteria in SRP-SLR Section 3.3.2.2.8 and finds it acceptable because based on a review of the UFSAR and SLRA, there are no in-scope aluminum tanks within the scope of AMP XI.M29 or piping, piping components, and tanks in an underground environment in the auxiliary systems.

SLRA Table 3.3-1, item 3.3-1-233 addresses insulated aluminum components exposed to air or condensation. The applicant stated that this item is not applicable. The staff evaluated the applicant’s claim and finds it acceptable because a search of the UFSAR did not reveal any insulated aluminum components in the auxiliary systems. In addition, based on a search of all aluminum AMR items in the auxiliary systems, either: (a) the component description is for an item that would not be insulated (e.g., heat exchanger fins, nozzles (sprinklers) for fire protection); (b) the item cites an internal gas or dry air environment and, as such, corrosion under insulation would not be an applicable aging effect; or (c) even if the aluminum AMR item were to be insulated, it cites an SRP-SLR AMR item and corresponding AMP consistent with SRP-SLR Section 3.3.2.2.8, which already includes inspections for corrosion under insulation.

Based on the programs identified, the staff determined that the applicant’s programs meet the criteria of SRP-SLR Section 3.3.2.2.8. For those 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

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

SLRA Section 3.3.2.2.9, associated with SLRA Table 3.3-1, items 3.3-1-112 and 3.3-1-202, addresses steel and stainless steel piping and piping components exposed to concrete, for which there are no aging effects requiring management depending on plant-specific configuration and conditions. The staff reviewed the applicant’s proposal against the criteria in SRP-SLR Section 3.3.2.2.9. During its review of components associated with items 3.3-1-112 and 3.3-1-202, the staff identified that it needed clarification, which resulted in the issuance of an RAI. RAI 3.3.2.2.9-1 and the applicant’s response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257.

In its response, the applicant stated that: (a) the stainless steel components embedded in concrete are not exposed to rainwater or groundwater and (b) loss of material for the steel components exposed to concrete is managed by the Buried and Underground Piping and Tanks program. The applicant also revised SLRA Table 3.3-1, item 3.3-1-202 and SLRA Table 3.3.2-8 to state that cracking and loss of material are not applicable aging effects for stainless steel piping exposed to concrete because there are no piping components embedded in concrete that would be susceptible to groundwater penetration. The staff noted that the applicant had revised SLRA Section 3.3.2.2.9 in its response to RAI 3.1.2.2.15-1 to reflect the above information. In addition, the applicant revised SLRA Table 3.3-1, item 3.3-1-144 based on inconsistencies it found for stainless steel components exposed to concrete. The staff's evaluation of the change to item 3.3-1-144 is documented in SER Section 3.0.3.1.7.

In its review of item 3.3-1-202, the staff finds the applicant's response and changes cited above acceptable because based on the plant configuration, stainless steel piping embedded in concrete is not susceptible to groundwater penetration and, as a result, consistent with SRP-SLR Section 3.3.2.2.9, there are no aging effects requiring management.

In its review of item 3.3-1-112, the staff noted that the applicant cited item 3.3-1-109 to manage loss of material for piping and piping components exposed to concrete. The staff finds that the applicant has met the further evaluation criteria because aging effects associated with steel piping exposed to concrete will be managed by the Buried and Underground Piping and Tanks program. Periodic visual inspections are capable of detecting concrete degradation that could lead to loss of material in steel piping.

Based on the program identified, the staff determined that the applicant's program meets the criteria of SRP-SLR Section 3.3.2.2.9. For those 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.10 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, items 3.3-1-234 and 3.3-1-242, addresses aluminum piping, piping components, heat exchangers, and tanks exposed to air-indoor uncontrolled or air-outdoor environments that will be managed for loss of material by the External Surfaces Monitoring of Mechanical Components program or Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.3.2.2.10.

The staff noted that the applicant's response to SRP-SLR Section 3.3.2.2.10 only addressed the air-indoor uncontrolled and air-outdoor environments. The cited environments in SRP-SLR Section 3.3.2.2.10 are air and condensation. Based its review of the auxiliary system AMR items, the staff noted that there are items that cite the air-indoor controlled, air-dry, and condensation environments. The staff also noted that the AMR items that cite air-indoor controlled or condensation as an environment either cite item 3.3-1-234 or item 3.3-1-242 to manage aging effects, consistent with SRP-SLR Section 3.3.2.2.10. The staff further noted that the air-dry environment is a unique environment cited for the internal surfaces of components downstream of the instrument air dryers and would therefore not be exposed to potential halogens transporting to the surface due to packing or gasket leaks. As a result, the staff has concluded that these aluminum AMR items citing air-indoor controlled, condensation, or air-dry as an environment are consistent with the GALL-SLR Report.

During its review of components associated with item 3.3-1-242, the staff identified that it needed clarification, which resulted in the issuance of an RAI. RAI 3.2.2.2.2-1 and the applicant's response are documented in ADAMS Accession Nos. ML18218A200 and ML18248A257. The staff's evaluation of the applicant's response to RAI 3.2.2.2.2-1 is documented in SER Section 3.2.2.2.2.

In its review of components associated with items 3.3-1-234 and 3.3-1-242, the staff finds that the applicant has met the further evaluation criteria. In addition, the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components program or Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is acceptable because periodic inspections are conducted that can detect loss of material.

SLRA Table 3.3-1, items 3.3-1-223, 3.3-1-227, 3.3-1-240, and 3.3-1-247 address loss of material for aluminum piping, piping components and tanks in an underground environment, tanks within the scope of AMP XI.M29, heat exchangers exposed to waste water, and piping, piping components, and tanks exposed to raw water or waste water. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.3.2.2.10 and finds it acceptable because based on a review of the UFSAR, there are no in-scope aluminum piping, piping components, tanks in an underground environment, tanks within the scope of AMP XI.M29, heat exchangers exposed to waste water, and piping, piping components, and tanks exposed to raw water or waste water in the auxiliary systems.

SLRA Table 3.3-1, item 3.3-1-245 addresses insulated aluminum components exposed to air or condensation. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because a search of the UFSAR did not reveal any insulated aluminum components in the auxiliary systems. In addition, based on a search of all aluminum AMR items in the auxiliary systems either: (a) the component description is for an item that would not be insulated (e.g., heat exchanger fins, nozzles [sprinklers] for fire protection); (b) the item cites an internal gas or dry air environment and, as such, corrosion under insulation would not be an applicable aging effect; or (c) even if the item were to be insulated, it cites an SRP-SLR AMR item and corresponding AMP consistent with SRP-SLR Section 3.3.2.2.10, which already includes inspections for corrosion under insulation.

Based on the programs identified, the staff determined that the applicant's programs meet the criteria of SRP-SLR Section 3.3.2.2.10. For those items associated with SLRA Section 3.3.2.2.10, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL-SLR Report

The following subsections document the staff's review of AMR results listed in SLRA Tables 3.3.2-1 through 3.3.2-19 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 Fire Protection

Gray Cast Iron Heat Exchanger Shells Exposed to Lubricating Oil

In SLRA Table 3.3.2-15, the applicant stated that gray cast iron heat exchanger shells exposed to lubricating oil will be managed for selective leaching by the Selective Leaching program. The AMR item cites generic note H, for which the applicant has identified selective leaching as an additional aging effect. In addition, the AMR item cites plant-specific note 3, which states "[t]he Selective Leaching AMP is used to manage loss of material due to selective leaching for water that could pool at the bottom of lube oil coolers."

During its review, the staff noted that (a) water that would pool at the bottom of the lube oil coolers can conservatively be classified as waste water and (b) the applicant will perform periodic and opportunistic inspections on these components. The staff finds the applicant's proposal acceptable because managing selective leaching for gray cast iron heat exchanger components exposed to water that could pool at the bottom of lube oil coolers (i.e., waste water) using periodic and opportunistic inspections conducted by the Selective Leaching program is consistent with GALL-SLR Report AMP XI.M33 recommendations and GALL-SLR Report item A-547.

Elastomer Flexible Hoses Exposed to Gas.

In SLRA Table 3.3.2-15, the applicant stated that elastomer flexible hoses exposed to gas will be managed for loss of material by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The AMR item cites generic note I, for which the applicant has identified loss of material as an additional aging effect. The AMR item cites plant-specific note 2, which states "[t]he Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP is used to manage loss of material due to wear for elastomeric components."

During its review, the staff noted that the subject component is also being managed for hardening or loss of strength using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The staff finds the applicant's proposal acceptable because (a) based on the staff's review of the GALL-SLR Report, elastomers exposed to gas are not susceptible to loss of material due to wear and (b) hardening or loss of strength is appropriately being managed using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program.

3.4 Aging Management of Steam and Power Conversion Systems

3.4.1 Summary of Technical Information in the Application

SLRA Section 3.4 provides AMR results for those components the applicant identified in SLRA Section 2.3.4, "Steam and Power Conversion Systems," as being subject to an AMR. SLRA Table 3.4-1, "Summary of Aging Management Evaluations for the Steam and Power Conversion

Systems," is a summary comparison of the applicant's AMRs with those evaluated in the GALL-SLR Report for the steam and power conversion systems components.

3.4.2 Staff Evaluation

Table 3.4-1, 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 Systems Components in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4-1-001	Consistent with the GALL-SLR Report (see 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 Turkey Point (see SER Section 3.4.2.1.1)
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
3.4-1-015	Consistent with the GALL-SLR Report
3.4-1-016	Consistent with the GALL-SLR Report
3.4-1-017	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1-018	Consistent with the GALL-SLR Report
3.4-1-019	Not applicable to Turkey Point
3.4-1-020	This item number not used by Turkey Point
3.4-1-021	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1-022	Not applicable to Turkey Point
3.4-1-023	This item number not used by Turkey Point
3.4-1-024	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1-025	This item number not used by Turkey Point
3.4-1-026	Consistent with the GALL-SLR Report
3.4-1-027	Not applicable to Turkey Point
3.4-1-028	Not applicable to Turkey Point
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 Turkey Point
3.4-1-033	Consistent with the GALL-SLR Report
3.4-1-034	Consistent with the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4-1-035	Not applicable to Turkey Point (see SER Section 3.4.2.2.9)
3.4-1-036	Consistent with the GALL-SLR Report
3.4-1-037	Not applicable to Turkey Point
3.4-1-038	Not applicable to Turkey Point
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 Turkey Point
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 Turkey Point
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 Turkey Point
3.4-1-049	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1-050	Not applicable to Turkey Point
3.4-1-050a	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1-051	Not applicable to Turkey Point (See SER Section 3.4.2.2.8)
3.4-1-052	Not applicable to Turkey Point
3.4-1-053	Not applicable to Turkey Point
3.4-1-054	Consistent with the GALL-SLR Report (see SER Section 3.3.2.1.9)
3.4-1-055	Not applicable to Turkey Point
3.4-1-056	Not applicable to Turkey Point
3.4-1-057	Not applicable to Turkey Point
3.4-1-058	Not applicable to Turkey Point
3.4-1-059	Not applicable to Turkey Point
3.4-1-060	Consistent with the GALL-SLR Report
3.4-1-061	Not applicable to Turkey Point (see SER Section 3.4.2.2.6)
3.4-1-062	Consistent with the GALL-SLR Report
3.4-1-063	Consistent with the GALL-SLR Report
3.4-1-064	Not applicable to Turkey Point
3.4-1-065	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1-066	Consistent with the GALL-SLR Report
3.4-1-067	This item number not used by Turkey Point
3.4-1-068	Not applicable to Turkey Point
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 Turkey Point
3.4-1-071	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1-072	This item number not used by Turkey Point
3.4-1-073	Consistent with the GALL-SLR Report
3.4-1-074	Not applicable to Turkey Point (see SER Section 3.4.2.2.2)
3.4-1-075	Not applicable to Turkey Point
3.4-1-076	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1-077	Not applicable to Turkey Point
3.4-1-078	Not applicable to Turkey Point

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4-1-079	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1-080	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1-081	Not applicable to Turkey Point (see SER Section 3.4.2.1.1)
3.4-1-082	Not applicable to Turkey Point (see SER Section 3.4.2.2.8)
3.4-1-083	Not applicable to Turkey Point
3.4-1-084	Consistent with the GALL-SLR Report
3.4-1-085	Consistent with the GALL-SLR Report
3.4-1-086	Not applicable to Turkey Point
3.4-1-087	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1-088	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1-089	Not applicable to Turkey Point
3.4-1-090	Not applicable to Turkey Point
3.4-1-091	Not applicable to Turkey Point
3.4-1-092	Not applicable to Turkey Point
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 Turkey Point (see SER Section 3.4.2.2.9)
3.4-1-095	This item number not used by Turkey Point (see SER Section 3.4.2.2.3)
3.4-1-096	Not applicable to Turkey Point
3.4-1-097	Not applicable to Turkey Point (see SER Section 3.4.2.2.9)
3.4-1-098	Not applicable to Turkey Point (see SER Section 3.4.2.2.3)
3.4-1-099	Not applicable to Turkey Point
3.4-1-100	Not applicable to Turkey Point (see SER Section 3.4.2.2.2)
3.4-1-101	Not applicable to Turkey Point
3.4-1-102	Not applicable to Turkey Point (See SER Section 3.4.2.2.7)
3.4-1-103	Consistent with the GALL-SLR Report (See SER Section 3.4.2.2.3)
3.4-1-104	Consistent with the GALL-SLR Report (See SER Section 3.4.2.2.2)
3.4-1-105	Not applicable to Turkey Point (see SER Section 3.4.2.2.7)
3.4-1-106	This item number not used by Turkey Point
3.4-1-107	Not applicable to Turkey Point
3.4-1-108	This item number is not used in the SRP-SLR or the GALL-SLR Report
3.4-1-109	Not applicable to Turkey Point (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 Turkey Point (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 Turkey Point
3.4-1-115	Not applicable to Turkey Point
3.4-1-116	Not applicable to Turkey Point
3.4-1-117	Not applicable to Turkey Point
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 Turkey Point (see SER Section 3.4.2.2.9)
3.4-1-120	Not applicable to Turkey Point (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	Not applicable to Turkey Point
3.4-1-123	Not applicable to Turkey Point

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.4-1-124	Not applicable to Turkey Point
3.4-1-125	Not applicable to Turkey Point
3.4-1-126	Not applicable to Turkey Point
3.4-1-127	Not applicable to Turkey Point
3.4-1-128	Not applicable to Turkey Point
3.4-1-129	Not applicable to Turkey Point
3.4-1-130	Not applicable to Turkey Point
3.4-1-131	Not applicable to Turkey Point
3.4-1-132	This item number not used by Turkey Point (see SER Section 3.4.2.1.1)
3.4-1-133	Not applicable to Turkey Point
3.4-1-134	Not applicable to Turkey Point
3.4-1-135	Not applicable to Turkey Point

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 Turkey Point 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 3.4.2-6 that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat its review of the matters described in the GALL-SLR Report; however, the staff did verify that the material presented in the SLRA was applicable and that the applicant identified the appropriate GALL-SLR Report AMRs.

Additionally, 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 3.4-1-019, 3.4-1-022, 3.4-1-027, 3.4-1-028, 3.4-1-032, 3.4-1-037, 3.4-1-038, 3.4-1-042, 3.4-1-045, 3.4-1-048, 3.4-1-050, 3.4-1-052, 3.4-1-053, 3.4-1-055 through 3.4-1-059, 3.4-1-064, 3.4-1-068, 3.4-1-070, 3.4-1-075, 3.4-1-077, 3.4-1-078, 3.4-1-083, 3.4-1-086, 3.4-1-089 through 3.4-1-092, 3.4-1-096, 3.4-1-099, 3.4-1-101, 3.4-1-107, 3.4-1-114 through 3.4-1-117, 3.4-1-122 through 3.4-1-131, and 3.4-1-133 through 3.4-1-135, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to Turkey Point. 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 3.4-1, items 3.4-1-020, 3.4-1-023, 3.4-1-025, 3.4-1-067, 3.4-1-072, and 3.4-1-106, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not used because the component, material, environment, and aging effect combinations are addressed by other AMR items that are associated with different Table 1 items. The staff reviewed the SLRA and confirmed that the corresponding component, material, environment, and aging effect combinations are associated with different Table 1 items. The staff's determination of acceptability for the alternate Table 1 items is documented in the SER sections associated with those items.

SLRA Table 3.4-1, item 3.4-1-007 addresses closure bolting high strength steel exposed to air, soil, and underground to be managed for the aging effect of cracking due to SCC and cyclic loading. The applicant stated that this item is not applicable. However, the staff could not confirm the applicant's claim because it noted that Turkey Point's specification SPEC-M-004, Revision 15, "Maintenance Bolting Specification for St. Lucie Units 1 & 2 and Turkey Point Units 3 and 4," lists high-strength bolting material with a yield strength equal to 150 ksi and a diameter of 3 inches or less as material acceptable for use at the site. The staff noted that closure bolting material with a yield strength equal to 150 ksi and a diameter greater than 2 inches could be susceptible to this aging effect; therefore, this item may be applicable for SSCs within the scope of the Bolting Integrity AMP. The staff determined that it needed additional information, which resulted in the issuance of RAIs. RAIs B.2.3.9-1 and B.2.3.9-1a are documented in ADAMS Accession Nos. ML18311A299 and ML19050A401 and evaluated by the staff in SER Section 3.0.3.2.11. The staff evaluated the applicant's claim and finds it acceptable because based on the review of the SLRA, UFSAR, and the applicant's response to RAIs B.2.3.9-1 and B.2.3.9-1a, high strength closure bolting greater than 2 inches in diameter is not acceptable for use as initial or replacement closure bolting in SSCs within the scope of the Bolting Integrity AMP.

SLRA Table 3.4-1, item 3.4-1-072 addresses cracking of stainless steel, steel, and aluminum piping, piping components, and tanks exposed to soil and concrete. The applicant stated that this item is not applicable; however, the staff determined that it needed additional information for why cracking due to SCC is not applicable for stainless steel piping exposed to soil, which resulted in the issuance of RAI B.2.3.28-2. The staff's evaluation of the applicant's response to RAI B.2.3.28-2 is documented in SER Section 3.0.3.1.14. In addition, the staff noted that based on a review of the UFSAR, there are no buried steel or aluminum piping, piping components, or tanks in the steam and power conversion systems.

SLRA Table 3.4-1, item 3.4-1-081 addresses steel components exposed to treated and raw water. The applicant stated that this item is not applicable. The staff reviewed the SLRA and the UFSAR and confirmed the applicant's claim that there are no steel components exposed to raw water. For steel components exposed to treated water that are associated with 3.4-1-081, the staff determined that it needed additional information, which resulted in the issuance of RAI 3.4.2.1.2-1 (ADAMS Accession No. ML18243A006).

In its response (ADAMS Accession No. ML18296A024), the applicant stated that the steam and power conversion systems are treated with corrosion inhibitors and are, therefore, not susceptible to long-term loss of material. Additionally, the applicant revised SLRA Table 3.4-1, item 3.4-1-081 to clarify that the steam and power conversion systems are not susceptible to long-term loss of material. The staff finds the applicant's response and changes to the SLRA acceptable because the components in question are treated with corrosion inhibitors. The One-Time Inspection program is used to verify that long-term loss of material does not occur for steel components exposed to water environments that are not treated with corrosion inhibitors.

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, as recommended by the GALL-SLR Report, for the steam and power conversion systems components and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of component groups of which the GALL-SLR Report recommends further evaluation against the criteria contained in SRP-SLR Section 3.4.2.2. The following subsections document the staff's review.

3.4.2.2.1 Cumulative Fatigue Damage

SLRA Section 3.4.2.2.1, associated with Table 3.4-1 item 3.4-1-001, indicates that TLAAs for steam and power conversion systems components are evaluated in accordance with 10 CFR 54.21(c)(1) and that the evaluation of this TLAA is addressed in Section 4.3.2. The staff finds that the applicant's approach is consistent with SRP-SLR Section 3.4.2.2.1 and is, therefore, acceptable. The staff's evaluation of the TLAA for steam and power conversion systems components is documented in SER Section 4.3.2.

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, items 3.4-1-002 and 3.4-1-104, addresses stainless steel piping, piping components, heat exchanger components, and tanks exposed to air-indoor uncontrolled or air-outdoor environments that will be managed for cracking by the External Surfaces Monitoring of Mechanical Components program or Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.4.2.2.2.

The staff noted that although the applicant cited use of its Inspection of Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program in its response to SRP-SLR Section 3.4.2.2.2, based on a review of the steam and power conversion systems AMR items, there are no stainless steel items in the steam and power conversion systems exposed to air-related environments that credit the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program.

In its review of components associated with items 3.4-1-002 and 3.4-1-104, the staff finds that the applicant has met the further evaluation criteria. In addition, the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components program or Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is acceptable because periodic inspections are conducted that can detect cracking.

SLRA Table 3.4-1, items 3.4-1-074 and 3.4-1-100 address cracking for stainless steel piping, piping components, and tanks in an underground environment and tanks within the scope of AMP XI.M29. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.2 and finds it acceptable because based on a review of the UFSAR, there are no in-scope stainless steel piping, piping components, and tanks in an underground environment and tanks within the scope of AMP XI.M29 in the steam and power conversion systems.

Based on the programs identified, the staff determined that the applicant's programs meet the criteria of SRP-SLR Section 3.4.2.2.2. For those items associated with SLRA Section 3.4.2.2.2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be 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).

3.4.2.2.3 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, items 3.4-1-003 and 3.4-1-103, addresses stainless steel piping, piping components, heat exchanger components, and tanks exposed to air-indoor uncontrolled or air-outdoor environments that will be managed for loss of material by the External Surfaces Monitoring of Mechanical Components program or Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.4.2.2.3.

The staff noted that the applicant's response to SRP-SLR Section 3.4.2.2.3 only addressed the air-indoor uncontrolled and air-outdoor environment. The cited environments in SRP-SLR Section 3.4.2.2.3 are air and condensation. Based on its review of the steam and power conversion systems AMR items, the staff noted items that cite the air-dry environment. The air-dry environment is a unique environment cited for the internal surfaces of components downstream of the instrument air dryers and would therefore not be exposed to potential halogens transporting to the surface due to packing or gasket leaks. As a result, the staff has concluded that these stainless steel AMR items citing air-dry as an environment are consistent with the GALL-SLR Report. The staff also noted that although the applicant cited use of its Inspection of Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program in its response to SRP-SLR Section 3.4.2.2.3, based on a review of the steam and power conversion systems AMR items, there are no stainless steel items in the steam and power conversion systems for stainless steel components exposed to air-related environments that credit the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks program.

In its review of components associated with items 3.4-1-003 and 3.4-1-103, the staff finds that the applicant has met the further evaluation criteria. In addition, the applicant's proposal to manage the effects of aging using the External Surfaces Monitoring of Mechanical Components program or Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is acceptable because periodic inspections are conducted that can detect loss of material.

SLRA Table 3.4-1, item 3.4-1-095 addresses stainless steel piping, piping components, and tanks exposed to an underground environment. The applicant stated that this item is not used because, "stainless steel piping exposed to soil is addressed by a different line item, and there are no nickel alloy piping, piping components, or tanks in the Steam and Power Conversion Systems." The staff evaluated the applicant's claim and finds it acceptable because: (a) the underground environment is associated with air, not soil; (b) based on a review of the SLRA and

UFSAR, there are no stainless steel piping, or piping components exposed to an underground environment in the steam and power conversion systems; and (c) based on a review of the SLRA and UFSAR, there are no nickel alloy piping, piping components, or tanks in the steam and power conversion systems.

SLRA Table 3.4-1, item 3.4-1-098 addresses loss of material for stainless steel and nickel alloy tanks within the scope of AMP XI.M29. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.3 and finds it acceptable because based on a review of the UFSAR, there are no in-scope stainless steel tanks within the scope of AMP XI.M29 in the steam and power conversion systems.

Based on the programs identified, the staff determined that the applicant's programs meet the criteria of SRP-SLR Section 3.4.2.2.3. For those items associated with SLRA Section 3.4.2.2.3, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be 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).

3.4.2.2.4 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 piping components exposed to raw water and waste water. The applicant stated that there are no metallic components in the steam and power conversion systems that are exposed to raw water or waste water. Consequently, the applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.6 and finds it acceptable because, in addition to there not being components exposed to raw water and waste water in steam and power conversion systems, the staff did not identify any examples of recurring internal corrosion during its independent review of Turkey Point's operating experience database.

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, items 3.4-1-102, 3.4-1-105, 3.4-1-109, and 3.4-1-112, addresses cracking in aluminum components exposed to various environments. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.7 and finds it acceptable because based on its review of the SLRA and UFSAR, there are no aluminum piping, piping components, and tanks in the steam and power conversion systems.

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

SLRA Section 3.4.2.2.8, associated with SLRA Table 3.4-1, items 3.4-1-051 and 3.4-1-082, addresses steel and stainless steel piping and piping components exposed to concrete, for which there are no aging effects requiring management depending on plant-specific configuration and conditions. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.8 and finds it acceptable because based on its review of the SLRA and UFSAR, there are no steel or stainless steel piping and piping components exposed to concrete in the steam and power conversion systems.

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, 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 in aluminum components exposed to various environments. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.4.2.2.9 and finds it acceptable because based on its review of the SLRA and UFSAR, there are no aluminum piping, piping components, and tanks in the steam and power conversion systems.

3.4.2.3 Aging Management Review Results Not Consistent with or Not Addressed in the GALL-SLR Report

The SLRA did not identify any AMR results in SLRA Tables 3.4.2-1 through 3.4.2-6 that are not consistent with, or not addressed in, the GALL-SLR Report. Additionally, the staff did not identify any Steam and Power Conversion Systems AMR results not consistent with or not addressed in the GALL-SLR Report during the review.

3.5 Aging Management of Containment, Structures, and Component Supports

3.5.1 Summary of Technical Information in the Application

SLRA Section 3.5 provides AMR results for those components the applicant identified in SLRA Section 2.4, "Scoping and Screening Results: Structures," as being subject to an AMR. SLRA Table 3.5-1, "Summary of Aging Management Evaluations for the Containment, Structures, and Component Supports," is a summary comparison of the applicant's AMRs with those evaluated in the GALL-SLR Report for the Containment Structures and the 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	Not applicable to Turkey Point (see SER Section 3.5.2.2.1.1)
3.5-1-002	Not applicable to Turkey Point (see SER Section 3.5.2.2.1.1)
3.5-1-003	Not applicable to Turkey Point (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)
3.5-1-005	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.1.3)
3.5-1-006	Not applicable to PWRs (see SER Section 3.5.2.2.1.3)
3.5-1-007	Not applicable to PWRs (see SER Section 3.5.2.2.1.3)
3.5-1-008	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.1.4)
3.5-1-009	Consistent with the GALL-SLR Report (see SER Section 3.5.2.1.2 and 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	Not applicable to Turkey Point (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	Not applicable to Turkey Point (see SER Section 3.5.2.1.1)
3.5-1-019	Consistent with the GALL-SLR Report
3.5-1-020	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.2.1 item 4)
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 Sections 3.5.2.1.1 and 3.5.2.2.1.5)
3.5-1-028	Consistent with the GALL-SLR Report
3.5-1-029	Consistent with the GALL-SLR Report
3.5-1-030	Consistent with the GALL-SLR Report
3.5-1-031	Consistent with the GALL-SLR Report
3.5-1-032	Consistent with the GALL-SLR Report
3.5-1-033	Consistent with the GALL-SLR Report
3.5-1-034	Consistent with the GALL-SLR Report
3.5-1-035	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.1.3)
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
3.5-1-041	Not applicable to PWRs
3.5-1-042	Not applicable to Turkey Point (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	Not applicable to Turkey Point (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	Not applicable to Turkey Point (see SER Section 3.5.2.2.2.1, item 3)
3.5-1-047	Not applicable to Turkey Point (see SER Section 3.5.2.2.2.1, item 4)
3.5-1-048	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.2.2)
3.5-1-049	Not applicable to Turkey Point (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	Not applicable to Turkey Point (see SER Section 3.5.2.2.2.4)
3.5-1-053	Not applicable to Turkey Point (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
3.5-1-058	Consistent with the GALL-SLR Report
3.5-1-059	Consistent with the GALL-SLR Report
3.5-1-060	Not applicable to Turkey Point
3.5-1-061	Consistent with the GALL-SLR Report
3.5-1-062	Not applicable to Turkey Point
3.5-1-063	Consistent with the GALL-SLR Report (see SER Section 3.5.2.1.1)
3.5-1-064	Not applicable to Turkey Point (see SER Section 3.5.2.1.1)
3.5-1-065	Consistent with the GALL-SLR Report
3.5-1-066	Consistent with the GALL-SLR Report (see SER Section 3.5.2.1.2)
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	Not applicable to Turkey Point (see SER Section 3.5.2.1.1)
3.5-1-072	Consistent with the GALL-SLR Report
3.5-1-073	This item number not used by Turkey Point
3.5-1-074	Not applicable to Turkey Point
3.5-1-075	Consistent with the GALL-SLR Report
3.5-1-076	Not applicable to PWRs
3.5-1-077	Consistent with the GALL-SLR Report
3.5-1-078	Consistent with the GALL-SLR Report
3.5-1-079	Not applicable to Turkey Point
3.5-1-080	Consistent with the GALL-SLR Report
3.5-1-081	Consistent with the GALL-SLR Report
3.5-1-082	This item number not used by Turkey Point
3.5-1-083	Consistent with the GALL-SLR Report
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 Turkey Point
3.5-1-086	Not applicable to Turkey Point
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
3.5-1-089	Consistent with the GALL-SLR Report
3.5-1-090	Not applicable to Turkey Point
3.5-1-091	Consistent with the GALL-SLR Report
3.5-1-092	Consistent with the GALL-SLR Report
3.5-1-093	This item number not used by Turkey Point
3.5-1-094	Consistent with the GALL-SLR Report
3.5-1-095	Consistent with the GALL-SLR Report
3.5-1-096	Consistent with the GALL-SLR Report
3.5-1-097	Consistent with the GALL-SLR Report (see SER Section 3.5.2.2.2.6)
3.5-1-098	Consistent with the GALL-SLR Report
3.5-1-099	This item number not used by Turkey Point (see SER Section 3.5.2.2.2.4)
3.5-1-100	Consistent with the GALL-SLR Report (see SER Sections 3.5.2.1.3 and 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 Turkey Point 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 3.5.2-18 that the applicant determined to be consistent with the GALL-SLR Report. The staff audited and reviewed the information in the SLRA. The staff did not repeat its review of the matters described in the GALL-SLR Report; however, the staff did verify that the material presented in the SLRA was applicable and that the applicant identified the appropriate GALL-SLR Report AMRs.

Additionally, 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 3.5-1-036, 3.5-1-037, 3.5-1-040, 3.5-1-041, 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 these items only apply to BWRs, and finds that these items are not applicable to Turkey Point because it is a PWR.

For SLRA Table 3.5-1, items 3.5-1-020, 3.5-1-060, 3.5-1-062 through 3.5-1-064, 3.5-1-074, 3.5-1-079, 3.5-1-085, and 3.5-1-090, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to Turkey Point. 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 3.2-1, items 3.5-1-082 and 3.5-1-093, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not used because the component, material, environment, and aging effect combinations are addressed by other AMR items that are associated with different Table 1 items. The staff reviewed the SLRA and confirmed that the corresponding component, material, environment, and aging effect combinations are associated with different Table 1 items. The staff's determination of acceptability for the alternate Table 1 items is documented in the SER sections associated with those items.

SLRA Table 3.5-1, item 3.5-1-018 addresses loss of material (spalling, scaling) and cracking due to freeze-thaw in accessible areas of concrete components (e.g., dome, wall, basemat, ring girder, buttresses) of containment structures exposed to air-outdoor. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because based on Figure 1 of ASTM C33-90, "Standard Specification for Concrete Aggregates," Turkey Point is not located in a region with moderate to severe weathering conditions; therefore, the concrete components are not exposed to the environment required for this aging effect to occur.

SLRA Table 3.5-1, item 3.5-1-064 addresses loss of material (spalling, scaling) and cracking due to freeze-thaw in accessible areas of Groups 1-3, 5, and 7-9 structures concrete, exterior above-grade and below-grade, and foundation exposed to air-outdoor. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because based on Figure 1 of ASTM C33-90, "Standard Specification for Concrete Aggregates," Turkey Point is not located in a region with moderate to severe weathering conditions; therefore, the concrete components are not exposed to the environment required for this aging effect to occur.

SLRA Table 3.5-1, item 3.5-1-071 addresses masonry walls exposed to an outdoor air environment. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim and finds it acceptable because the walls are located in a "negligible" weathering region per Figure 1 of ASTM C33-90 and are not exposed to freezing temperatures for sufficient amounts of time to cause freeze-thaw aging effects. In addition, the masonry wall program conducts visual inspections on masonry walls and will identify and address degradation regardless of aging mechanism.

SLRA Table 3.5-1, item 3.5-1-027 addresses metal liner, metal plates, suppression pool steel shells (including welded joints), and penetrations (including personnel airlock, equipment hatch, control rod drive (CRD) hatch, penetration sleeves, dissimilar metal welds, and penetration bellows) exposed to air-indoor uncontrolled or air-outdoor, which will be managed for cracking due to cyclic loading if a CLB fatigue analysis does not exist. The applicant stated in the SLRA that this item is not applicable. However, in the applicant's response to RAIs 3.5.1.9-1 and 3.5.1.9-2, as documented in ADAMS Accession No. ML18352A885, the applicant revised Table 3.5-1, item 3.5-1-027 to state that the applicability of this item is limited to non-piping penetrations (e.g., hatches, electrical penetrations, etc.), dissimilar metal welds, and the fuel transfer tube (including penetration sleeves and expansion joints) for which a CLB fatigue analysis or fatigue waiver was not identified. The applicant also stated that this item is not applicable to the containment liner plate and piping penetrations because these components are evaluated as a TLAA in SLRA Section 4.6. The staff's evaluation of SLRA Table 3.5-1, item 3.5-1-027 is documented in SER Section 3.5.2.2.1.5 as part of its evaluation of responses to RAIs 3.5.1.9-1 and 3.5.1.9-2.

SLRA Table 3.5-1, item 3.5-1-063 addresses Groups 1-3, 5, and 7-9 concrete structures (exterior above and below grade) and foundation exposed to a fluid environment. The applicant stated that this item is not applicable because these structures are not exposed to a water-flowing environment at Turkey Point. However, the staff noted that the definition of water-flowing environment in the SLRA and the GALL-SLR Report Table IX.D includes rainwater and water flowing under a foundation. Since it is not clear how these structures are not exposed to or protected from a water-flowing environment, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI 3.5.1.47-1 and the applicant's response is documented in ADAMS Accession No. ML18334A182.

During its evaluation of the applicant's response to RAI 3.5.1.47-1, the staff noted that the applicant revised SLRA Table 3.5-1, item 3.5-1-063 to state that the Structures Monitoring program will be used to manage increase in porosity and permeability, and loss of strength for concrete structures exposed to a water-flowing environment. The staff also noted that the applicant revised SLRA Tables 3.5.2-2 and 3.5.2-18 to include the components associated with item 3.5-1-063. The staff finds the applicant's response and changes to item 3.5-1-063 from SLRA Table 3.5-1 and the associated Table 2 items acceptable because it ensures that applicable concrete structures exposed to a water-flowing environment are managed for increase in porosity and permeability, and loss of strength, using the Structures Monitoring program as recommended by the GALL-SLR Report.

3.5.2.1.2 Cracking, Loss of Bond, and Loss of Material (Spalling, Scaling) Due to Corrosion of Embedded Steel

SLRA Table 3.5-1, item 3.5-1-066 addresses accessible concrete and concrete foundations exposed to uncontrolled air-indoor or air-outdoor, which will be managed for cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel. During its review of components associated with item 3.5-1-066 for which the applicant cited generic notes B or D, the staff noted that the SLRA credits the Structures Monitoring program to manage the aging effect for several concrete structures and components. However, it is not clear how steel or concrete tanks and missile barriers (i.e., Groups 7 and 8 structures) were identified and reviewed for aging management requirements since they are not addressed in the SLRA, which resulted in the issuance of an RAI. RAI 3.5.1.66-1 and the applicant's response is documented in ADAMS Accession No. ML18311A299.

During its evaluation of the applicant's response to RAI 3.5.1.66-1, the staff noted that the applicant revised SLRA Tables 3.5.2-9 and 3.5.2-18 to include the associated AMR items for tank components that will be managed for the aging effects by the Structures Monitoring program. The staff also noted that the applicant's response stated that missile barrier components are already addressed within the SLRA under those Table 2 AMR components that are listed as having a missile barrier intended function. The staff finds the applicant's response and changes to the associated Table 2s acceptable because it clarifies that the effects of aging in tanks and missiles barriers will be managed consistent with the GALL-SLR Report recommendation to ensure that the intended functions for these components are maintained during the subsequent period of extended operation.

3.5.2.1.3 Loss of Material Due to Pitting and Crevice Corrosion; Cracking Due to SCC

SLRA Table 3.5-1, item 3.5-1-100 addresses aluminum, stainless steel support members, welds, bolted connections, and support anchorage exposed to uncontrolled indoor air, outdoor air, and water, which will be managed for loss of material and cracking. For the AMR item that cites generic note E, the SLRA credits the Fire Protection program to manage the aging effects for stainless steel drip shields exposed to outdoor air.

In its response to RAI 3.5.2.10-1, the applicant deleted the stainless steel drip shields AMR item from Table 3.5.2-10. The staff's evaluation of the applicant's response is documented in SER Section 3.0.3.2.17.

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, as recommended by 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 of 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.

3.5.2.2.1 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, items 3.5-1-001 and 3.5-1-002, addresses cracking and reduction of foundation strength in concrete exposed to soil or flowing water. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.1.1 and finds it acceptable because Turkey Point does not use a dewatering system to control settlement, the containment is not built on a porous concrete subfoundation, there has been no operating experience indicating significant settlement, and the Structures Monitoring program will continue to monitor structures for future evidence of settlement. Therefore, no additional plant-specific program is necessary to manage cracking or distortion due to settlement.

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, item 3.5-1-03, addresses reduction of strength and modulus of elasticity due to elevated temperature in concrete components (e.g., dome, wall, basemat, ring girders, buttresses, fill-in annulus) of containment structures exposed to an air-indoor uncontrolled or air-outdoor environment. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.1.2 and finds it acceptable because based on its review of the SLRA and UFSAR Sections 1.3.7 and 5.1.3.2, temperatures inside containment are kept below the GALL-SLR Report recommended threshold limits of 150 °F for general areas and

200 °F for local areas; therefore, concrete components are not exposed to the temperatures required for this aging effect to occur.

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

Item 1. SLRA Section 3.5.2.2.1.3, item 1, associated with SLRA Table 3.5-1, items 3.5-1-004, 3.5-1-005 and 3.5-1-035, addresses liner plate, liner anchors, integral attachments, and penetration sleeves of carbon steel material exposed to air-indoor uncontrolled and air-outdoor environments that will be managed for loss of material due to general, pitting, and crevice corrosion by the ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J AMPs. The staff reviewed the applicant's proposal against the further evaluation criteria in SRP-SLR Section 3.5.2.2.1.3, item 1.

The applicant stated that item 3.5-1-004 applies only to containment drywell components and is not applicable. The staff noted that item 3.5-1-004 only applies to BWR containment drywell shells and, therefore, is not applicable to the Turkey Point containments, which are PWR designs that do not incorporate drywell shells.

For items 3.5-1-005 and 3.5-1-035, the staff noted that a plant-specific program to manage this aging effect in accessible and inaccessible areas of the Turkey Point containments is not warranted based on the following: (1) concrete used in its construction met the requirements of ACI 318-63; (2) the containment liner including the moisture barrier at the junction where the liner is embedded in the concrete is subject to aging management under the scope of the ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J AMPs; (3) the concrete is monitored by the ASME Section XI, Subsection IWL AMP; and (4) the operating experience confirmed that borated water leaks or other water ponding on the liner are diverted to a sump. The staff also noted that the Turkey Point operating experience has not shown significant corrosion of the containment, noting that the IWE inspections in 2010 identified and corrected the Turkey Point Unit 3 containment liner that was corroded below minimum wall thickness at the floor to wall interface in the sump. The potential for degradation of the Unit 4 liner was also evaluated, and an acceptable wall thickness was confirmed, and degraded coatings at higher elevations was also addressed. The staff further noted that the root cause of the Unit 3 degradation was failure of the coating system, which was not designed for periodic immersion service. The corrective action to prevent recurrence included application of a coating system suitable for immersion service on the liner plate in the lower regions of Turkey Point Units 3 and 4 reactor pit areas. In its review of components associated with items 3.5-1-005 and 3.5-1-035, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J programs is acceptable because the containment concrete met ACI 318-63 requirements, the moisture barrier and containment concrete is subject to aging management using appropriate programs, borated water spills on containment are diverted to a sump, and past operating experience of localized corrosion degradation in the Unit 3 sump area was identified by IWE inspections, and subjected to appropriate corrective actions to prevent recurrence.

Based on the programs identified, the staff determined that the applicant's programs meet the criteria of SRP-SLR Section 3.5.2.2.1.3, item 1. For those items associated with SLRA Section 3.5.2.2.1.3, item 1, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB 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, associated with SLRA Table 3.5-1, item 3.5-1-006, addresses loss of material in steel elements of BWR torus shells exposed to uncontrolled indoor air or treated water. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.1.3, item 2, and finds that it is acceptable because Turkey Point containments are PWR designs that do not incorporate torus shells.

Item 3. SLRA Section 3.5.2.2.1.3, associated with SLRA Table 3.5-1, item 3.5-1-007, addresses loss of material in steel elements of BWR torus, downcomers, and suppression chambers exposed to uncontrolled indoor air or treated water. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.1.3, item 3, and finds it acceptable because Turkey Point 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, item 3.5-1-008, states that TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1) and that the evaluation of this TLAA is addressed in Section 4.5. This is consistent with SRP-SLR Section 3.5.2.2.1.4 and is, therefore, acceptable. The staff's evaluation of the TLAA for the prestressing system tendons is documented in SER Section 4.5.

3.5.2.2.1.5 Cumulative Fatigue Damage

SLRA Section 3.5.2.2.1.5, associated with SLRA Table 3.5-1, item 3.5-1-009, states that TLAAs are evaluated in accordance with 10 CFR 54.21(c)(1) and that the evaluation of this TLAA is addressed in SER Section 4.6. This is consistent with SRP-SLR Section 3.5.2.2.1.5 and is, therefore, acceptable. The staff's evaluation of the TLAA for containment liner, and piping penetration sleeves for the containment structures is documented in SER Section 4.6.

In its review of components associated with Table 3.5-1, item 3.5-1-009, the staff determined that it needed additional information, which resulted in the issuance of RAIs. RAI 3.5.1.9-1, RAI 3.5.1.9-2, and the applicant's responses are documented in ADAMS Accession No. ML18352A885.

During its evaluation of the applicant's responses to RAIs 3.5.1.9-1 and 3.5.1.9-2, the staff noted that no CLB fatigue analysis or fatigue waiver was identified by the applicant for non-piping containment penetrations (e.g., hatches, electrical penetrations), dissimilar metal welds associated with piping penetrations, and the fuel transfer tube expansion joints; thus, the TLAA evaluation only applies to the containment liner plate and piping penetrations. The staff also noted that the applicant proposed to manage the aging effect of cracking due to cyclic loading of non-piping containment penetrations (e.g., hatches, electrical penetrations), dissimilar metal welds associated with piping penetrations, and the fuel transfer tube (including penetrations sleeves and expansion joints) using the 10 CFR Part 50, Appendix J program and by performing periodic supplemental surface examination under the ASME Section XI, Subsection IWE program. The staff finds the applicant's response and changes to the ASME Section XI, Subsection IWE program, SLRA Section 3.5.2.2.1.5, SLRA Table 3.5-1, items 3.5-1-009 and 3.5-1-027, associated Table 2 items, and Commitment No. 34 in SLRA Table 17-3 acceptable for the following reasons: (a) these revisions clarify that the TLAA evaluation and further evaluation only apply to the containment liner plate and piping penetrations; (b) these revisions state that non-piping containment penetrations (e.g., hatches, electrical penetrations), dissimilar metal welds associated with piping penetrations, and fuel transfer tube (including penetrations sleeves and expansion joints) will be managed for cracking due to cyclic loading during the subsequent period of extended operation as recommended by the GALL-SLR Report when a CLB fatigue analysis does not exist; and (c) the proposed enhancement to the ASME Section XI, Subsection IWE program to use supplemental surface examinations is consistent with the GALL-SLR Report recommendation to adequately manage the aging effect of cracking in components subject to cyclic loading.

The staff finds that the applicant has met the further evaluation criteria of the SRP-SLR, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J programs for components where a CLB fatigue analysis does not exist is acceptable because it is consistent with the GALL-SLR Report recommendations, as described above.

Based on the programs identified, the staff determined that the applicant's programs meet the criteria of SRP-SLR Section 3.5.2.2.1.5. For those items associated with SLRA Table 3.5-1, item 3.5-1-027, 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). The staff's evaluation in accordance with 10 CFR 54.21(c)(1) of the TLAA for containment liner plate and piping penetrations is documented in SER Section 4.6.

3.5.2.2.1.6 Cracking Due to Stress Corrosion Cracking

SLRA Section 3.5.2.2.1.6, associated with SLRA Table 3.5-1, items 3.5-1-010, 3.5-1-038, and 3.5-1-039, addresses stainless steel (SS) penetration sleeves, penetration bellows, vent line bellows, suppression chamber shell (interior surface), and dissimilar metal welds exposed to air-indoor uncontrolled or air-outdoor environments, which will be managed for cracking by the ASME Section XI, Section IWE and 10 CFR Part 50, Appendix J programs. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.1.6.

The applicant stated that items 3.5-1-038 and 3.5-1-039 are not applicable to Turkey Point. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.1.6 and finds it acceptable because a review of the GALL-SLR Report and the Turkey Point UFSAR confirmed that the components associated with items 3.5-1-038 and 3.5-1-039 are only applicable to BWR Mark I/II or BWR Mark III containments, and not to Turkey Point's PWR containments.

The staff noted from the SLRA that containment penetration sleeves at Turkey Point are carbon steel and, as such, not susceptible to SCC. However, the staff further noted that sufficient technical justification was not provided to support the applicant's claim that the SCC aging effect is not applicable for dissimilar metal welds and SS fuel transfer tubes. In its review of components associated with item 3.5-1-010, the staff determined that it needed additional information, which resulted in the issuance of RAIs. RAIs 3.5.2.1.2-1 and 3.5.2.1.2-1a and the applicant's responses are documented in ADAMS Accession Nos. ML18292A642 and ML19050A420.

During its evaluation of the applicant's responses to RAIs 3.5.2.1.2-1 and 3.5.2.1.2-1a, the staff noted that the applicant revised SLRA Table 17-3, item 34, and SLRA Sections 3.5.2.2.1.6, 17.2.2.30, and B.2.3.30 to (a) state that a supplemental one-time surface examination and/or enhanced visual examination (e.g., EVT-1) of the SS fuel transfer tube from each unit and a representative sample of dissimilar metal welds from penetrations associated with high temperatures (i.e., greater than 140 ºF) will be performed under the ASME Section XI, Section IWE program to confirm that cracking due to SCC does not occur in components exposed to a potentially aggressive environment, and (b) provide a provision within the ASME Section XI, Subsection IWE program to ensure that a periodic inspection using enhanced visual and/or surface examination will be implemented to manage cracking due to SCC in the event that the one-time inspection is not able to confirm that the aging effect does not occur. The staff finds the applicant’s response and changes to SLRA Table 17-3, item 34, and SLRA Sections 3.5.2.2.1.6, 17.2.2.30, and B.2.3.30 acceptable because the proposed changes provide adequate bases to demonstrate that cracking due to SCC will be adequately managed for dissimilar metal welds in penetration sleeves and SS fuel transfer tubes.

The staff finds that the applicant has met the further evaluation criteria, and its proposal to manage the effects of aging using the ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J programs is acceptable. Considering that plant-specific operating experience has not revealed a history of cracking due to SCC, a supplemental one-time inspection using appropriate inspection methods will confirm prior to the subsequent period of extended operation that cracking due to SCC does not occur for these SS components and dissimilar metal welds. In the event that the one-time inspection is not able to confirm that the aging effect does not occur, the program includes provisions to implement additional appropriate examination methods within the ASME Section XI, Subsection IWE periodic inspection program to ensure that cracking due to SCC is detected and adequately managed during the subsequent period of extended operation.

Based on the programs identified, the staff determined that the applicant’s programs meet the criteria of SRP-SLR Section 3.5.2.2.1.6. For those items associated with SLRA Section 3.5.2.2.1.6, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.1.7 Loss of Material (Scaling, Spalling) and Cracking Due to Freeze-Thaw

SLRA Section 3.5.2.2.1.7, associated with SLRA Table 3.5-1, item 3.5-1-011, addresses loss of material (spalling, scaling) and cracking due to freeze-thaw in inaccessible areas of concrete components (e.g., dome, wall, basemat, ring girder, buttresses) of containment structures exposed to air-outdoor, groundwater/soil. The applicant stated that this item is not applicable. The staff evaluated the applicant’s claim against the criteria in SRP-SLR Section 3.5.2.2.1.7 and finds it acceptable because based on Figure 1 of ASTM C33-90, Turkey Point is not located in a region with moderate to severe weathering conditions; therefore, concrete components are not exposed to the environment required for this aging effect to occur.

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, item 3.5-1-012, addresses inaccessible areas of concrete components (e.g., dome, wall, basemat, ring girder, buttresses) of containment structures exposed to any environment that will be managed for cracking due to expansion from reaction with aggregates by the Structures Monitoring program. The staff reviewed the applicant’s proposal against the criteria in SRP-SLR Section 3.5.2.2.1.8.

The SLRA states that the concrete materials used at Turkey Point structures "were specifically investigated, tested, and examined in accordance with pertinent ASTM standards at the time of construction." The staff noted, based on its review of the SLRA, UFSAR Section 5.1, and UFSAR Appendix 5B, that the concrete for the containment structure was designed and constructed in accordance with ACI 318-63 (1963 edition), the concrete cement conforms to ASTM C-150-64, and the concrete mix aggregates were tested in accordance with ASTM C-33-64 for petrographic examinations and potential of alkali reactivity of the cement-aggregate combination. Based on its review of the SLRA and documents reviewed during the audit, the staff noted that there is no operating experience with occurrences of this aging effect at Turkey Point. The staff noted no indications of alkali-aggregate reaction during its onsite walkdown of accessible concrete structures. The staff also noted that the Structures Monitoring program performs visual inspections of inaccessible areas when these areas become accessible during excavation, and when an evaluation of inaccessible areas of concrete is required because periodic visual inspections of accessible areas of concrete, performed at least once every 5 years, indicate that degradation may be occurring in inaccessible areas. In its review of components associated with item 3.5-1-012, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable because: (1) Turkey Point has no operating experience related to this aging effect; (2) the visual inspections performed under the Structures Monitoring program will be capable of detecting and managing cracking due to expansion from reaction with aggregates; and (3) a plant-specific program is not needed.

Based on the program identified, the staff determined that the applicant's program meets the criteria of SRP-SLR Section 3.5.2.2.1.8. For those items associated with SLRA Section 3.5.2.2.1.8, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the 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, item 3.5-1-014, addresses increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of concrete components (e.g., dome, wall, basemat, ring girder, buttresses) of containment structures exposed to a water-flowing environment. The applicant stated that this item is not applicable because these structures are not exposed to a water-flowing environment at Turkey Point. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.1.9. In its review of components associated with item 3.5-1-014, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI 3.5.1.47-1 and the applicant's response is documented in ADAMS Accession No. ML18334A182. The staff's full evaluation of RAI 3.5.1.47-1 is documented in SER Section 3.5.2.2.2.1, item 4.

During its evaluation of the applicant's response to RAI 3.5.1.47-1, the staff noted that the applicant stated that there has been no operating experience of concrete leaching in accessible areas, including below-grade accessible areas, at Turkey Point for SCs associated with SLRA Table 3.5-1, item 3.5-1-014. The applicant revised SLRA Section 3.5.2.2.1.9 and SLRA Table 3.5-1, item 3.5-1-014 to state that containment structures are exposed to a water-flowing environment and, therefore, the aging effect of increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation is an applicable aging effect that will be managed by the Structures Monitoring program. The staff noted that under the Structures Monitoring program, accessible areas of concrete will be subject to visual inspections at least once every 5 years and inaccessible areas of concrete will be examined when made accessible during excavation for any reason and evaluated when conditions exist in accessible areas of concrete that could indicate degradation in inaccessible areas. The staff further noted that the applicant enhanced the Structures Monitoring program to (1) inspect and monitor the condition of accessible and inaccessible areas exposed to a water-flowing environment and (2) develop guidance for the evaluation of baseline inspection results related to concrete exposed to a water-flowing environment for evidence of leaching and carbonation. The staff also noted, based on SLRA Table 3.5-1, item 3.5-1-016 that accessible areas of concrete components of the containment structure will be inspected for this aging effect using the ASME Section XI, Subsection IWL program, which is consistent with the GALL-SLR Report recommendations. The staff's evaluation of the Structures Monitoring program and ASME Section XI, Subsection IWL program are documented in SER Sections 3.0.3.2.5 and 3.0.3.2.27, respectively. The staff finds the applicant's response and changes to the SLRA acceptable because: (1) the applicant clarified that there is no operating experience associated to this aging effect; (2) the applicant revised the SLRA to state that this aging effect is applicable because the associated concrete SC are exposed to a water-flowing environment that could cause this aging effect during the subsequent period of extended operation; and (3) the applicant clarified that the aging effect will be managed under the Structures Monitoring program, which is an AMP consistent (with exceptions and enhancements) with GALL-SLR Report AMP XI.S6.

The staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable because: (1) the AMP will manage this aging effect consistent with the GALL-SLR Report recommendations and the proposed enhancements to the AMP are able to detect and manage the related aging effect for inaccessible areas of concrete and (2) there is no operating experience at Turkey Point associated to this aging effect for SCs associated with item 3.5-1-014 and, therefore, a plant-specific AMP is not required.

Based on the program identified, the staff determined that the applicant's program meets the criteria of SRP-SLR Section 3.5.2.2.1.9. For those items associated with SLRA Section 3.5.2.2.1.9, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the 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

3.5.2.2.2.1 Aging Management of Inaccessible Areas

Item 1. SLRA Section 3.5.2.2.2.1, item 1, associated with SLRA Table 3.5-1, item 3.5-1-042, addresses loss of material (spalling, scaling) and cracking due to freeze-thaw in inaccessible areas of Groups 1-3, 5, and 7-9 structures concrete and foundation exposed to an air-outdoor, groundwater/soil environment. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 1 and finds it acceptable because based on Figure 1 of ASTM C33-90, Turkey Point is not located in a region with moderate to severe weathering conditions; therefore, concrete components are not exposed to the environment required for this aging effect to occur.

Item 2. SLRA Section 3.5.2.2.2.1, item 2, associated with SLRA Table 3.5-1, item 3.5-1-043, addresses inaccessible areas of all Group structures (except Group 6) concrete and foundation exposed to any environment that will be managed for cracking due to expansion from reaction with aggregates by the Structures Monitoring program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 2.

The SLRA states that the concrete materials used at Turkey Point structures "were specifically investigated, tested, and examined in accordance with pertinent ASTM standards at the time of construction." The staff noted, based on its review of the SLRA and UFSAR Sections 5.1, 5.2, and 6.1, that the concrete used at Turkey Point related Group structures was designed and constructed in accordance with ACI 318-63 (1963 edition), the concrete cement conforms to ASTM C-150-64, and the concrete mix aggregates were tested in accordance with ASTM C-33-64 for petrographic examinations and potential of alkali reactivity of the cement-aggregate combination. Based on its review of the SLRA and documents reviewed during the audit, the staff noted that there is no operating experience with occurrences of this aging effect at Turkey Point. The staff noted no indications of alkali-aggregate reaction during its onsite walkdown of accessible concrete structures. The staff also noted that the Structures Monitoring program performs visual inspections of inaccessible areas when these areas become accessible during excavation, and when an evaluation of inaccessible areas of concrete is required because periodic visual inspections of accessible areas of concrete, performed at least once every 5 years, indicate that degradation may be occurring in inaccessible areas. In its review of components associated with item 3.5-1-043, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable because: (1) Turkey Point has no operating experience related to this aging effect; (2) the visual inspections performed under the Structures Monitoring program will be capable of detecting and managing cracking due to expansion from reaction with aggregates; and (3) a plant-specific program is not needed.

Based on the program identified, the staff determined that the applicant's program meets the criteria of SRP-SLR Section 3.5.2.2.2.1, item 2. For those items associated with SLRA Section 3.5.2.2.2.1, item 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so 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 3.2.2.2.1, item 3, associated with SLRA Table 3.5-1, item 3.5-1-044, addresses cracking and distortion in all group structures concrete exposed to soil and item 3.5-1-046 addresses reduction of foundation strength and cracking in Groups 1-3, 5, and 7-9 structures and foundation and subfoundation concrete exposed to a water-flowing environment. The applicant stated that these items are not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 3, and finds it acceptable because Turkey Point does not use a dewatering system to control settlement, the applicable Groups structures are not built on a porous concrete subfoundation, there has been no operating experience indicating significant settlement, and the Structures Monitoring program will continue to monitor structures for indications of settlement. Therefore, no additional plant-specific program is necessary to manage cracking, distortion, and reduction of foundation strength due to settlement.

Item 4. SLRA Section 3.5.2.2.2.1, item 4, associated with SLRA Table 3.5-1, item 3.5-1-047, addresses increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of Groups 1-5 and 7-9 structures concrete, exterior above-grade and below-grade, and foundation exposed to a water-flowing environment. The applicant stated that this item is not applicable because these structures are not exposed to a water-flowing environment at Turkey Point. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.2.1, item 4. In its review of components associated with item 3.5-1-047, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI 3.5.1.47-1 and the applicant's response is documented in ADAMS Accession No. ML18334A182.

During its evaluation of the applicant's response to RAI 3.5.1.47-1, the staff noted that the applicant stated that "there has been no operating experience of leaching of concrete in accessible areas, including below-grade accessible areas, at Turkey Point for SCs associated with SLRA Table 3.5-1 items 014, 020, 047, and 063." The applicant clarified that the water infiltration at the tendon galleries observed in 1992 and the staining on Turkey Point Unit 4 auxiliary building east wall identified in 2012 were not attributed to leaching of calcium hydroxide or carbonation. The applicant stated that based on the GALL-SLR definition of a water-flowing environment, it does have operating experience associated with accessible areas of concrete exposed to a water-flowing environment. Therefore, the applicant stated that increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation is an applicable aging effect for accessible and inaccessible concrete SCs associated to SLRA Table 3.5-1, items 3.5-1-014, 3.5-1-020, 3.5-1-047, and 3.5-1-063, which will be managed by the Structures Monitoring program. The applicant also stated that "inspections will be focused on locations where water collects in accessible areas as a leading indicator of reinforced concrete conditions in inaccessible areas for leaching" and that "accessible areas can be used as an indicator of reinforced concrete conditions in inaccessible areas for carbonation as well." The staff noted, based on revised SLRA Table 3.5-1, item 3.5-1-063, that the associated accessible concrete SCs will be inspected for this aging effect using the Structures Monitoring program, which is consistent (with exceptions and enhancements) with the GALL-SLR Report recommendations. The staff also noted that under the Structures Monitoring program, accessible areas of concrete will be subject to visual inspections at least once every 5 years and inaccessible areas of concrete will be examined when made accessible during excavation for any reason and evaluated when conditions exist in accessible areas of concrete that could indicate degradation in inaccessible areas. The staff further noted that the applicant enhanced the Structures Monitoring program to (1) inspect and monitor the condition of accessible and inaccessible areas exposed to a water-flowing environment and (2) develop guidance for the evaluation of baseline inspection results related to concrete exposed to a water-flowing environment for evidence of leaching and carbonation. The staff's evaluation of the applicant's Structures Monitoring program and associated enhancements is documented in SER Section 3.0.3.2.5. The staff noted that the applicant revised SLRA Sections B.2.3.35, 17.2.2.35, 3.5.2.1.1, 3.5.2.2.1.9, and 3.5.2.2.2.1, item 4, Table 3.5-1 (items 3.5-1-014, 3.5-1-020, 3.5-1-047, and 3.5-1-063), and Tables 17-3, 3.5.2-1, 3.5.2-2, and 3.5.2-18. The staff noted that the revisions were made to indicate that increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation is an applicable aging effect that will be managed by the Structures Monitoring program in concrete SCs exposed to a water-flowing environment. The staff finds the applicant's response and changes to the SLRA acceptable because: (1) the applicant clarified that there is no operating experience associated with this aging effect; (2) the applicant revised the SLRA to state that this aging effect is applicable because the associated concrete SCs are exposed to a water-flowing environment that could cause this aging effect during the subsequent period of extended operation; and (3) the applicant clarified that the aging effect will be managed under the Structures Monitoring program, which is an AMP consistent (with exceptions and enhancements) with GALL-SLR report AMP XI.S6.

The staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable because: (1) the AMP will manage this aging effect consistent with the GALL-SLR Report recommendations, and the proposed enhancements to the AMP are able to detect and manage the related aging effect for inaccessible areas of concrete; and (2) there is no operating experience at Turkey Point associated with this aging effect for SCs associated with item 3.5-1-047 Therefore, a plant-specific AMP is not required.

Based on the program identified, the staff determined that the applicant's program meets the criteria of SRP-SLR Section 3.5.2.2.2.1, item 4. For those items associated with SLRA Section 3.5.2.2.2.1, item 4, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.2 Reduction of Strength and Modulus Due to Elevated Temperature

SLRA Section 3.5.2.2.2.2, associated with SLRA Table 3.5-1, item 3.5-1-048, addresses reduction of strength and modulus of elasticity due to elevated temperature in concrete of Groups 1-5 structures exposed to an air-indoor uncontrolled environment. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.2.2. In its review of components associated with item 3.5-1-048, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI 3.5.1.48-1 and the applicant's response is documented in ADAMS Accession No. ML18334A182.

During its evaluation of the applicant's response to RAI 3.5.1.48-1, the staff noted that the configuration of penetrations of the process piping for the associated non-containment structures include pipe sleeves and insulation whose function is to minimize the heat transfer from the process piping to the concrete surrounding it. The applicant stated that the pipe sleeves and insulation "ensure that local concrete temperatures remain below 200 °F." The staff noted that the applicant revised the SLRA to state that insulation of the process piping near penetrations is included within the scope of subsequent license renewal and that the aging effect of reduced thermal insulation resistance for insulation materials will be managed by the External Surfaces Monitoring of Mechanical Components program consistent with the GALL-SLR Report recommendations. The staff's evaluation of the External Surfaces Monitoring of Mechanical Components program, which is an AMP consistent, with enhancements, with GALL-SLR Report AMP XI.M36, is documented in SLRA Section 3.0.3.2.22. The staff finds the applicant's response and associated changes to the SLRA acceptable because the insulation of the process piping is in scope of subsequent license renewal and the aging effect of reduced thermal insulation resistance will be managed consistent with the GALL-SLR Report recommendations.

The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.2.2 and finds it acceptable because based on its review of the SLRA and UFSAR Section 5.1.3.2: (1) Turkey Point's structures are kept below the GALL-SLR Report recommended threshold limits of 150 °F for general areas and 200 °F for local areas and (2) the aging effect of reduced thermal insulation resistance is managed through the External Surfaces Monitoring program consistent with the GALL-SLR Report recommendations. Therefore, the staff finds that Turkey Point's Group 1-5 concrete structures are not exposed to the temperatures required for this aging effect to occur.

3.5.2.2.2.3 Aging Management of Inaccessible Areas for Group 6 Structures

Item 1. SLRA Section 3.5.2.2.2.3, item 1, associated with SLRA Table 3.5-1, item 3.5-1-049, addresses loss of material (spalling, scaling) and cracking due to freeze-thaw in inaccessible areas of Groups 6 structures concrete, exterior above-grade and below-grade, foundation, and interior slab exposed to air-outdoor, groundwater/soil. The applicant stated that this item is not applicable. The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.2.3, item 1, and finds it acceptable because based on Figure 1 of ASTM C33-90, Turkey Point is not located in a region with moderate to severe weathering conditions. Therefore, concrete components are not exposed to the environment required for this aging effect to occur.

Item 2. SLRA Section 3.5.2.2.2.3, item 2 (supplemented by letter dated November 28, 2018), associated with SLRA Table 3.5-1, item 3.5-1-050, addresses inaccessible areas of Group 6 structures concrete exposed to any environment that will be managed for cracking due to expansion from reaction with aggregates by the Structures Monitoring program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.3, item 2.

The SLRA states that the concrete materials used at Turkey Point structures "were specifically investigated, tested, and examined in accordance with pertinent ASTM standards at the time of construction." The staff noted, based on its review of the SLRA and UFSAR Section 5.1, that the concrete used at Turkey Point Group 6 structures was designed and constructed in accordance with ACI 318-63 (1963 edition), the concrete cement conforms to ASTM C-150-64, and the concrete mix aggregates were tested in accordance with ASTM C-33-64 for petrographic examinations and potential of alkali reactivity of the cement-aggregate combination. Based on its review of the SLRA and documents reviewed during the audit, the staff noted that there is no operating experience with occurrences of this aging effect at Turkey Point. The staff noted no indications of alkali-aggregate reaction during its onsite walkdown of accessible concrete structures. The staff also noted that the Structures Monitoring program performs visual inspections of inaccessible areas when these areas become accessible during excavation, and when an evaluation of inaccessible areas of concrete is required because periodic visual inspections of accessible areas of concrete, performed at least once every 5 years, indicate that degradation may be occurring in inaccessible areas. In its review of components associated with item 3.5-1-050, the staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable because: (1) Turkey Point has no operating experience related to this aging effect; (2) the visual inspections performed under the Structures Monitoring program will be capable of detecting and managing cracking due to expansion from reaction with aggregates; and (3) a plant-specific program is not needed.

Based on the program identified, the staff determined that the applicant's program meets the criteria of SRP-SLR Section 3.5.2.2.2.3, item 2. For those items associated with SLRA Section 3.5.2.2.2.3, item 2, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

Item 3. SLRA Section 3.5.2.2.2.3, item 3, associated with SLRA Table 3.5-1, item 3.5-1-051, addresses inaccessible areas of Group 6 structures concrete, exterior above-grade and below-grade, foundation, and interior slab exposed to a water-flowing environment that will be managed for increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation by the Inspection of Water-Control Structures Associated with Nuclear Power Plants program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.3, item 3. In its review of components associated with item 3.5-1-051, the staff determined that it needed additional information, which resulted in the issuance of an RAI. RAI 3.5.1-51 and the applicant's response is documented in ADAMS Accession No. ML18334A182.

During its evaluation of the applicant's response to RAI 3.5.1-51, the staff noted that the applicant stated that "[t]here is no known OE [operating experience] at Turkey Point of leaching or carbonation of accessible concrete of Group 6 structures." The staff noted that the applicant revised SLRA Section 3.5.2.2.2.3, items 2 and 3; Table 3.5-1, item 3.5-1-051; and Table 3.5.2-7 to state that the Structures Monitoring program will manage the aging effect of increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide and carbonation of Group 6 structures concrete. The staff noted that under the Structures Monitoring program, accessible areas of concrete will be subject to visual inspections at least once every 5 years and inaccessible areas of concrete will be examined when made accessible during excavation for any reason and evaluated when conditions exist in accessible areas of concrete that could indicate degradation in inaccessible areas. The staff also noted that the applicant enhanced the Structures Monitoring program to (1) inspect and monitor the condition of accessible and inaccessible areas (including Group 6 structures) exposed to a water-flowing environment and (2) develop guidance for the evaluation of baseline inspection results related to concrete exposed to a water-flowing environment for evidence of leaching and carbonation. The staff's evaluation of the applicant's Structures Monitoring program and associated enhancements is documented in SER Section 3.0.3.2.5. The staff also noted that consistent with the GALL-SLR Report recommendation, SLRA Table 3.5-1, item 3.5-1-061, manages this aging effect in accessible areas of Groups 6 structures concrete using the Inspection of Water-Control Structures Associated with Nuclear Power Plants program, which is a program, with enhancements, that will be consistent with GALL-SLR Report AMP XI.S7. The staff's evaluation of the applicant's Water-Control Structures Associated with Nuclear Power Plants program is documented in SER Section 3.0.3.2.18. The staff finds the applicant's response and changes to the SLRA acceptable because: (1) the applicant clarified that there is no operating experience associated to this aging effect and (2) the applicant revised the SLRA to consistently state that the aging effect will be managed under the Structures Monitoring program, which is an AMP consistent (with exceptions and enhancements) with GALL-SLR Report AMP XI.S6.

The staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the Structures Monitoring program is acceptable because: (1) the AMP will manage this aging effect consistent with the GALL-SLR Report recommendations and the proposed enhancements to the AMP are able to detect and manage the related aging effect for inaccessible areas of Group 6 structures concrete and (2) there is no operating experience at Turkey Point associated with this aging effect for Group 6 structures; therefore, a plant-specific AMP is not required.

Based on the program identified, the staff determined that the applicant's program meets the criteria of SRP-SLR Section 3.5.2.2.2.3, item 3. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.4 Cracking Due to Stress Corrosion Cracking, and Loss of Material Due to Pitting and Crevice Corrosion

SLRA Section 3.5.2.2.2.4, associated with SLRA Table 3.5-1, items 3.5-1-052, 3.5-1-099, and 3.5-1-100, addresses stainless steel tank liners exposed to standing water and aluminum and stainless steel support members, welds, bolted connections, and support anchorage to building structure exposed to air or condensation, which will be managed for loss of material due to pitting and crevice corrosion, and cracking due to SCC, by the Structures Monitoring program and the ASME Section XI, Subsection IWF program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.4.

For SLRA Table 3.5-1, item 3.5-1-052, the applicant stated that this item is not applicable because there are no stainless steel tank liners in the associated Groups 7 and 8 structures and component supports. The staff reviewed the UFSAR and SLRA and noted that the in-scope stainless steel tanks will be addressed as part of the mechanical system to which they belong. The staff also noted that the stainless steel liner in the spent fuel pool and transfer canal is addressed by SLRA Table 3.5-1, item 3.5-1-078, for the same aging effects. Therefore, the applicant's determination that item 3.5-1-052 is not applicable is acceptable.

For SLRA Table 3.5-1, item 3.5-1-099, the applicant claimed that the corresponding items in the GALL-SLR Report are not applicable because they are addressed by SLRA Table 3.5-1, item 3.5-1-100. However, in its review of components associated with items 3.5-1-099 and 3.5-1-100, the staff determined that it needed additional information, which resulted in the issuance of RAIs. RAI 3.5.1.100-1, followup RAI 3.5.1.100-1a, and the applicant's responses are documented in ADAMS Accession Nos. ML18311A299 and ML19050A420.

During its evaluation of the applicant's response to RAI 3.5.1.100-1, the staff noted that the applicant revised SLRA Tables 3.5.2-1, 3.5.2-2, 3.5.2-6, 3.5.2-9, 3.5.2-11, and 3.5.2-16 to clarify that cracking due to SCC will be managed for all Table 2 components associated with item 3.5-1-100. The staff also noted that the applicant revised SLRA Section B.2.3.35, "Structures Monitoring program," to include additional enhancements for the monitoring of cracking due to SCC, including the use of surface examination to detect this aging effect for the stainless steel and aluminum structural components. The applicant also revised Commitment No. 39 from SLRA Table 17-3 to ensure that these changes are implemented no later than 6 months prior to the subsequent period of extended operation. The staff finds the applicant's response and changes to the Structures Monitoring program, SLRA Commitment No. 39, and SLRA Table 2 items acceptable because when implemented it will be consistent with the SRP-SLR and GALL-SLR Report recommendations to credit an acceptable program that will be adequate to manage loss of material and cracking due to SCC for the stainless steel and aluminum structural components.

During its evaluation of the applicant's response to followup RAI 3.5.1.100-1a, the staff noted that the applicant revised SLRA Tables 3.5-1 and 3.5.2-1 to manage loss of material and cracking due to SCC for stainless steel ASME Class 1, Class 2, Class 3, and Class MC supports members using the ASME Section XI, Subsection IWF program, as recommended by the GALL-SLR Report. The staff also noted that the applicant stated that there are no aluminum supports members for ASME Class 1, Class 2, Class 3, or Class MC Components at Turkey Point. The applicant revised SLRA Sections 3.5.2.2.2.4, B.2.3.32, and B.2.3.35 to indicate that an augmented examination plan will be developed to manage the aging effects for these components, if necessary, based on the results from the evaluation performed under the Structures Monitoring program, and to provide the necessary revisions to the further evaluation section and the affected programs elements. The applicant also revised Commitment Nos. 36 and 39 from SLRA Table 17-3 to ensure that these changes are implemented no later than 6 months prior to the subsequent period of extended operation or the last RFO prior to the subsequent period of extended operation. The staff finds the applicant's response and changes to the SLRA Tables 3.5-1 and 3.5.2-2, SLRA Sections 3.5.2.2.2.4, B.2.3.32, and B.2.3.35, and Commitment Nos. 36 and 39 acceptable because (1) when implemented they will be consistent with the GALL-SLR Report recommendation to ensure that an acceptable program manages loss of material and cracking for the applicable stainless steel or aluminum structural components and (2) corrective actions will be in place to provide augmented examination for these components if cracking due to SCC is detected under the Structures Monitoring program.

The staff finds that the applicant has met the further evaluation criteria, and the applicant's proposal to manage the effects of aging using the ASME Section XI, Subsection IWF program and the Structures Monitoring program is acceptable because the use of visual inspection or surface examination for aluminum and stainless steel structural support components will ensure that loss of material and cracking due to SCC is detected and that degradation is evaluated prior to a loss of intended function.

Based on the programs identified, the staff determined that the applicant's programs meet the criteria of SRP-SLR Section 3.5.2.2.2.4. For those items associated with SLRA Section 3.5.2.2.2.4, the staff concludes that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2.5 Cumulative Fatigue Damage

SLRA Section 3.5.2.2.2.5, associated with SLRA Table 3.5-1, item 3.5-1-053, addresses time-dependent fatigue, cyclical loading, or cyclical displacement of support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 component supports, only if a CLB fatigue analysis exists. The applicant stated that this item is not applicable because CLB fatigue analysis for cumulative fatigue damage due to time-dependent fatigue, cyclic loading, or cyclical displacement of support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 component supports does not exist.

The staff evaluated the applicant's claim against the criteria in SRP-SLR Section 3.5.2.2.2.5 and finds it acceptable because the staff confirmed through a review of the UFSAR that the applicant's CLB does not contain fatigue analyses for component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 that are required to be identified as TLAAs in accordance with 10 CFR 54.21(c)(1).

The staff concludes that the applicant has demonstrated that the SRP-SLR Section 3.5.2.2.2.5 criteria are not applicable.

3.5.2.2.2.6 Reduction of Strength and Mechanical Properties of Concrete Due to Irradiation

SLRA Section 3.5.2.2.2.6, as revised by letters dated October 5, 2018, March 15, 2019, March 21, 2019, and May 6, 2019, associated with SLRA Table 3.5.1 item 3.5-1-97, addresses concrete exposed to irradiation that may need to be managed for reduction of strength, loss of mechanical properties, and cracking by a plant-specific program. The staff reviewed the applicant's proposal against the criteria in SRP-SLR Section 3.5.2.2.2.6, which states, in part:

> Reduction of strength, loss of mechanical properties, and cracking due to irradiation could occur in PWR and BWR Group 4 concrete structures that are exposed to high levels of neutron and gamma radiation…. [B]ased on literature review of existing research, radiation fluence limits of 1 x 10^{19} neutrons/cm^2 neutron radiation and 1 x 10^8 Gy (1 x 10^{10} rad) gamma dose are considered conservative radiation exposure levels beyond which concrete material properties may begin to degrade markedly.
>
> Further evaluation is recommended of a plant-specific program to manage aging effects of irradiation if the estimated (calculated) fluence levels or irradiation dose received by any portion of the concrete from neutron (fluence cutoff energy E > 0.1 MeV) or gamma radiation exceeds the respective threshold level during the subsequent period of extended operation or if plant-specific [operating experience] of concrete irradiation degradation exists that may impact intended functions. Higher fluence or dose levels may be allowed in the concrete if tests and/or calculations are provided to evaluate the reduction in strength and/or loss of mechanical properties of concrete from those fluence levels, at or above the operating temperature experienced by the concrete, and the effects are applied to the design calculations. Supporting calculations/analyses, test data, and other technical basis are provided to estimate and evaluate fluence levels and the plant-specific program.

Based on the applicant's projected neutron fluence and gamma dose on the Turkey Point primary shield wall (PSW), the thresholds beyond which concrete material properties may begin to degrade rapidly are expected to be exceeded over the 80-year life. The SLRA states that the neutron fluence and gamma dose incident on the PSW are 3.57 x 10^{19} neutrons/cm^2 and 1.9 x 10^{10} rads, respectively, at the end of the subsequent period of extended operation.

In addition to evaluating the concrete for the PSW, the effects of irradiation damage resulting in a loss of fracture toughness of reactor pressure vessel (RPV) structural steel supports are also assessed.

SLRA Section 3.5.2.2.2.6, as amended by SLRA Revision 1, dated April 10, 2018, discusses calculations, analyses, evaluations, and references to published papers in support of the applicant's (1) determination of projected fluence to 80 years of operation and (2) conclusion that a plant-specific program is unnecessary to manage reduction in strength and mechanical properties due to irradiation of concrete. The applicant determined that containment internal structures (i.e., PSW and RPV support steel) at Turkey Point would be capable of performing their intended functions through the subsequent period of extended operation without being managed for this aging effect. The staff conducted an audit that included site visits and in-office review to examine the applicant's supporting calculations and evaluations and interviewed applicant's representatives to obtain additional information related to the disposition of the irradiation effects on these structures. The staff initially performed its audit at the applicant's facility during the week of July 16, 2018. Further staff review of applicant documents occurred at a facility in Rockville, MD, from September 20, 2018, to October 17, 2018.

During the audit, the applicant amended basis documents related to SLRA Section 3.5.2.2.2.6, and by letter dated October 5, 2018, the applicant revised SLRA Section 3.5.2.2.2.6 in its entirety. This revision was based on audit activities as described in the staff's audit plan (ADAMS Accession No. ML18173A087) and audit report (ADAMS Accession No. ML18230B482). The staff subsequently issued RAIs 3.5.2.2.2.6-1 through 3.5.2.2.2.6-13 by letter dated January 15, 2019 (RAI Set 8, ADAMS Accession Nos. ML18341A003, ML18341A004, and ML18341A005), as revised by letter dated February 1, 2019 (ADAMS Accession Nos. ML19032A396 and ML19032A97). The applicant responded in part to RAI Set 8, specifically to RAIs 3.5.2.2.2.6-10, 3.5.2.2.2.6-12, and 3.5.2.2.2.6-13 by letter dated February 13, 2019 (ADAMS Accession No. ML19050A400). A public meeting was held at NRC headquarters on March 7, 2019 (ADAMS Accession Nos. ML19059A379 and ML19133A016), to discuss the applicant's draft responses to RAIs 3.5.2.2.2.6-1 through 3.5.2.2.2.6-9 and 3.5.2.2.2.6-11. The applicant finalized its responses to RAI Set 8 by submitting letters dated March 15, 2019, for RAIs 3.5.2.2.2.6-1 through 3.5.2.2.2.6-9 (ADAMS Accession No. ML19078A132), and March 21, 2019, for RAI 3.5.2.2.2.6-11 (ADAMS Accession No. ML19084A050). The applicant also revised SLRA Section B.2.3.32, Section A.17.2.2.32, Table 3.5-1, Table 3.5.2-1, and Table 17-3 Commitment No. 36, by letters dated March 15, 2019, and May 6, 2019. The applicant superseded its responses to RAIs 3.5.2.2.2.6-9 and 3.5.2.2.2.6-11, by letter dated May 6, 2019. The staff's review is documented below.

Fluence Calculation

The SLRA states that neutron fluence and gamma dose incident on the primary shield wall (PSW) were determined to the end of plant life (currently projected to 80 years) based on a Westinghouse Letter FPL-09-41 for the Turkey Point extended power uprate (EPU). The staff reviewed the document and noted that although the SLRA references peak neutron fluence, the values used in the analysis were based on an azimuthally averaged value instead of the peak azimuthal value. In addition, although the SLRA refers to fluence and gamma dose incident on the PSW, the analysis discusses values reported 8 centimeters (cm) into the PSW. Therefore, the staff issued RAI 3.5.2.2.2.6-1 requesting additional information to clarify the apparent discrepancies between the audit documents, which use the azimuthally averaged value of 8 cm into the shield wall concrete, and the peak values at the surface.

In its response to RAI 3.5.2.2.2.6-1, dated March 15, 2019, the applicant stated that the neutron flux values reported as incident on the PSW for the EPU were used to determine the end of subsequent period of extended operation fluence on the PSW. Westinghouse provided additional details regarding the fluence analysis performed for the EPU, indicating that the fluence values were: (1) based on an azimuthally averaged value instead of the peak azimuthal value and (2) reported at a location 8 cm into the PSW concrete instead of at the surface.

To ensure that the EPU neutron fluence value was representative of the fluence incident on the PSW at the end of the subsequent period of extended operation, Westinghouse performed additional Turkey Point-specific SLR calculations that satisfy the guidance set forth in RG 1.190. RG 1.190 is intended for use within the traditional beltline region for fluence up to the RPV boundary. As there is little attenuation between the RPV boundary and the PSW, much of the guidance captured in this regulatory guide can be used to ensure that the fluence incident on the PSW is modelled with reasonable accuracy. Westinghouse calculated the maximum neutron fluence at 72 EFPY (i.e., end of the subsequent period of extended operation) using a representative fuel cycle and included a 20 percent positive bias on the peripheral and re-entrant corner assemblies on this projection fuel cycle.

The result of the Westinghouse SLR analysis was bounded by the EPU neutron fluence value discussed in FPL 09-41. Because the EPU neutron fluence was used for the concrete degradation structural evaluation, the NRC staff finds this approach acceptable as it produces a more conservative result.

In its review of the methodology for determining fluence, the staff determined that the SLRA and audited documentation lacked sufficient technical basis to validate the fluence methods chosen to estimate neutron and gamma fluence. It was also not clear whether and how analytic uncertainty estimates were factored into the analyses for the staff to assess the accuracy of the methodology. Therefore, the staff issued RAI 3.5.2.2.2.6-2 requesting additional information to:

(a) Validate the fluence methods chosen to estimate neutron and gamma fluence incident on and through the PSW for the energy ranges of interest (i.e., E > 0.1 MeV for neutrons and for all gamma energies), including (1) comparisons with applicable measurement and calculational benchmarks and (2) additional margin for uncertainty as appropriate if no applicable measurement or calculational benchmarks are available.

(b) Quantify analytic uncertainty estimates for the reported fluence values of peak 80-year fluence, including all relevant sources of uncertainty, to demonstrate the accuracy of the methodology.

In its response to RAI 3.5.2.2.2.6-2, dated March 15, 2019, the applicant stated that Westinghouse has an ex-vessel neutron dosimetry (EVND) program, where neutron dosimeters are placed in the cavity region in front of the PSW for one or more fuel cycles for irradiation. The applicant stated that measurements from 11 three-loop neutron pad plants were compared to the utilized calculational methodology. The data comparisons show that the measurements and calculations agree within 11 percent, which is within the 20 percent criterion specified in RG 1.190.

For the gamma fluence validation, the applicant stated that the VENUS-1 benchmark has been used to compare calculated-to-measured gamma heating rates at the inner baffle, outer baffle, core barrel, and neutron pad. To model the heterogeneous regions of the VENUS-1 benchmark accurately, the TORT code was used in the analysis of VENUS-1. The zone-averaged (from the inner baffle, outer baffle, core barrel, and neutron pad zones) calculated-to-measured gamma heating rate is within 7.3 percent.

The applicant stated that no analytic uncertainty calculations were performed for the maximum neutron fluence and gamma fluences at the end of the subsequent period of extended operation. The applicant also stated that a comparison of the EVND location uncertainties associated with best-estimate neutron fluences from least squares evaluations for the H. B. Robinson Steam Electric Plant (H.B. Robinson) benchmark is 7 percent for the fast neutron fluence rate (E > 1.0 MeV) and 13 percent for the neutron fluence rate (E > 0.1 MeV). These differences suggest that there may be increased analytic uncertainty for neutron fluence values related to neutron energies E > 0.1 MeV. However, as stated in the applicant's response to RAI 3.5.2.2.2.6-1, the calculated SLR maximum neutron fluence included a 20 percent positive bias on the peripheral and re-entrant corner assembly relative powers on the projection fuel cycle.

For the maximum gamma fluence, Westinghouse performed a Turkey Point-specific calculation for the subsequent period of extended operation. To characterize the gamma dose, Westinghouse conservatively applied a Turkey Point gamma dose rate from a cycle that did not use a low leakage loading pattern over the entire 72 EFPY operating period. The result of this analysis (1.44×10^{10} rads) was bounded by the gamma dose that the applicant used in its concrete degradation analysis (1.9×10^{10} rads). The staff finds that a gamma fluence of

1.9×10^{10} rads is acceptable for use in the concrete degradation model as the additional margin reasonably accounts for the potential uncertainties that were not quantified by the applicant.

The staff finds that although the applicant did not provide an analytic uncertainty quantification, the fluence methods for the subsequent period of extended operation are acceptable based on available benchmark data and the inherent conservatism in the approach used to determine maximum neutron and gamma fluence values as explained above. Therefore, the staff's concerns discussed in RAI 3.5.2.2.2.6-2 are resolved.

The SLRA states that the relative radial neutron fluence profile used to determine the relative neutron fluence at the PSW was based on Figure 4-2 of EPRI Report 3002002676. It was not clear whether the model used to generate the data in Figure 4-2 is relevant to Turkey Point because it was not clear whether the applicant considered: (1) a detailed 3-D spatial source specification and (2) a fission spectrum specific to the highly burned peripheral fuel assemblies (as opposed to only considering a point source at the center). The SLRA and audited documents also did not provide justification for using what appeared to be a non-conservative attenuation profile. In addition, the staff determined that the analysis did not provide justification for the use of a simplified model (cited in EPRI Report 3002002676) to predict attenuation throughout the RPV. Therefore, the staff issued RAI 3.5.2.2.2.6-3 requesting additional information. This RAI requested that the applicant justify the use of the simplified model to determine the radial neutron fluence profile throughout the Turkey Point PSW. The RAI also requested that the applicant explain the basis for not using a concrete specific to Turkey Point as this may have an impact on the concrete attenuation characteristics.

In its response to RAI 3.5.2.2.2.6-3, the applicant stated that for neutron attenuation the fluence profile in the PSW was determined using the maximum neutron fluence incident on the PSW, and then applying Figure 2-3 of EPRI Report No. 3002011710. A comparison of the applicant's attenuation profile to Reference 6 cited in EPRI Report No. 3002002676 indicates that the curves are similar, with the neutron flux being reduced by one order of magnitude in the first 5 inches of the PSW. Reference 6 predicts the expected attenuation based on the REMEC-DORT methodology, which simulates a more accurate reactor-shield wall configuration. Independent NRC calculations were performed to estimate the radial neutron profile throughout the concrete PSW. Based on its independent confirmatory analysis, the staff found that the applicant's neutron attenuation profile was acceptable.

For the concrete characteristics, the applicant stated that the expected Turkey Point water/cement ratio is relatively high in relation to higher strength concretes used to establish the EPRI attenuation curve. Specific comparisons of these attributes including cement type, water to cement ratio, aggregate, and temperature are provided in the response to RAI 3.5.2.2.2.6-10. For the neutron energies of interest ($E > 0.1$ MeV), a higher water/cement ratio would increase the attenuation. Therefore, the attenuation characteristics of the utilized curves bound the higher Turkey Point water/cement ratio.

The NRC has not endorsed the use of EPRI Report 3002002676. However, based on the NRC's independent confirmatory analyses and because the EPRI attenuation curve is similar to the shape of the attenuation curve generated by the REMEC-DORT methodology, the NRC staff finds the use of EPRI Report 3002002676 acceptable in this instance. In addition, the NRC staff finds that the concrete composition utilized in the EPRI report is applicable, from a fluence attenuation model perspective because the attenuation characteristics bound the expected attenuation characteristics of the higher Turkey Point water/cement ratio. Therefore, the staff's concerns discussed in RAI 3.5.2.2.2.6-3 are resolved.

The staff also had questions concerning the applicant's calculation of displacements per atom (dpa). The staff needed additional information on the methodology used to calculate dpa. In addition, the analysis did not appear to be validated by comparison to a benchmark or standard, or to consider dpa uncertainty. Lastly, the SLRA assumed a 0.4 factor for neutron flux incident on the PSW as compared to the peak neutron flux without providing justification that the value was representative or bounding, considering the most influential peripheral fuel assemblies. Therefore, the staff issued RAI 3.5.2.2.2.6-4 requesting that the applicant provide justification of the method used to calculate dpa rate, validate the dpa calculation against existing benchmarks, and verify that the 0.4 axial peaking factor is bounding or sufficiently representative of past, actual, and future expected axial peaking factors.

Regarding the method used to calculate the dpa rate, the applicant simplified the calculation by using the total neutron flux for two energy groups, E = 0.1 MeV (for neutron energies of 5.53 KeV < E ≤ 1.0 MeV) and E = 1.0 MeV (for neutron energies E > 1.0 MeV), as representative of the total flux incident on the PSW for a best-estimate evaluation. The pre- and post-EPU neutron flux values for these average energies were used to separately estimate a corresponding dpa rate. These dpa rates were converted to dpa for average energies both before and after the EPU, then totaled.

The applicant stated that a comparison of the EVND location uncertainties associated with best-estimate neutron fluences from least squares evaluations for the H. B. Robinson benchmark is 7 percent for the fast neutron fluence rate (E > 1.0 MeV) and 11 percent for dpa per second (dpa/s). The staff notes that these differences suggest that there may be increased analytic uncertainty for neutron fluence values related to neutron energies E > 0.1 MeV. However, as stated in the applicant's response to RAI 3.5.2.2.2.6-1, the calculated maximum neutron fluence included a 20 percent positive bias on the peripheral and re-entrant corner assembly relative powers on the projection fuel cycle. When multiplying the Westinghouse-calculated dpa at the core midplane incident on the PSW by the 0.4 axial factor, the result is bounded by the dpa value used in the applicant's analysis.

The figure on page 13 of FPL Letter L-2018-187, dated October 5, 2018 (ADAMS Accession No. ML18283A308), presents the expected neutron flux variation relative to the active fuel region. Additional references, namely Remec, I., "Radiation Environment in Biological Shields of Nuclear Power Plants," Oak Ridge National Laboratory (ORNL), March 22, 2013, and TransWare Enterprises Report No. TWE-LPI1-001-R-001, Revision 0, "An Evaluation of Neutron, Gamma, and Temperature Profiles in a Three Loop PWR Biological Shield," February 2013, were reviewed by the applicant to verify that the use of 0.4 for the axial peaking factor is bounding (or sufficiently representative). This information indicates that the normalized neutron flux at the top of the active fuel region is approximately 40 percent of the maximum neutron flux at the belt-line region, which is consistent with the figure referenced above.

The NRC staff finds the applicant's dpa methodology acceptable (and the RAI 3.5.2.2.2.6-4 concerns resolved) for the following reasons:

(1) The simplification to the dpa methodology is reasonable as the total neutron flux and average neutron energies are still used.

(2) The conservative assumptions (as stated in the applicant's response to RAI 3.5.2.2.2.6-1) used in the dpa calculation are appropriate to account for increased analytical uncertainties related to neutron energies E > 0.1 MeV.

(3) Multiple references are presented that show an axial peaking factor of 0.4 is representative of past, actual, and future operation for the top of active fuel.

Impact of Irradiation on Concrete

SLRA Section 3.5.2.2.2.6 discusses a structural evaluation of the Turkey Point PSW concrete, which stated that the basis for the applicant's concrete analysis included, in part, information contained in several referenced studies. However, the staff could not verify that the studies referenced by the applicant were applicable to Turkey Point for the purposes of the SLRA review. Therefore, the staff did not use this information to make its safety finding and, instead, used information specific to Turkey Point, as discussed below.

The applicant's concrete evaluation states that the reduction in concrete strength due to neutron fluence and gamma dose would be up to 10 percent. However, the applicant did not provide plant-specific information supporting the selection of the 10 percent value for loss of compressive strength. The staff issued RAI 3.5.2.2.2.6-10, in part, to clarify the potential maximum strength loss. In its response to RAI 3.5.2.2.2.6-10, the applicant stated that the 10 percent reduction in strength was calculated using Equations 5-1 through 5-5 of EPRI Report 3002011710. While the NRC has not endorsed EPRI 3002011710, the staff noted that the applicant's consideration of the Radiation-Induced-Volumetric Expansion (RIVE) effects conservatively assumes a 100 percent loss of strength through a depth of 3.14 inches into the concrete. Therefore, the 10 percent reduction in strength due to neutron fluence considered for the calculated attenuation depth of 2.6 inches, is bounded by the RIVE consideration.

The SLRA includes a structural analysis which concluded that with a reduction in strength due to irradiation effects, the PSW structural function will continue to have a safety margin over the design basis through the subsequent period of extended operation. However, neither the SLRA nor the audited documentation provided a clear description of the CLB design basis with load combinations, governing load case(s), their respective maximum interaction ratios (IRs - i.e., the ratio of loading demands to structural capacity) and their locations for all stress conditions (tension, compression, and shear stresses) of the Turkey Point PSW concrete structure. The staff was unable to assess margins in available capacities considering the effects of concrete degradation due to irradiation (i.e., effects of neutron fluence, gamma dose, and RIVE effects) for the PSW concrete structure during the subsequent period of extended operation. In addition, the SLRA (as amended October 5, 2018) states that based on a referenced study by Maruyama, Kontani, Takizawa and Sawada, "Development of Soundness Assessment Procedure for Concrete Members," 2017, the threshold for concrete damage due to gamma dose is 2.3×10^{10} rads, and not the 1×10^{10} rads stated in the SRP-SLR Report. The applicant stated that although the projected gamma dose of 1.9×10^{10} exceeds the threshold for gamma dose in the SRP-SLR Report, the Turkey Point gamma dose is bounded by the Maruyama et al. study. As indicated above, the staff could not verify that the study's conclusions were applicable to Turkey Point for the purposes of the SLRA review and did not agree that there are no aging effects on concrete due to interactions of gamma rays with cement paste and aggregate used in Turkey Point concrete during the subsequent period of extended operation. The staff issued RAIs 3.5.2.2.2.6-11 and 3.5.2.2.2.6-12 to address these issues.

The staff has not endorsed any studies or conclusions that the threshold values in the SRP-SLR Report are inadequate and determined that damage due to gamma dose needed to be considered for Turkey Point. Subsequent to the March 7, 2019, public meeting, the applicant submitted a letter dated March 15, 2019, responding to RAI 3.5.2.2.2.6-11. The applicant stated that it is not crediting a comparison of the Turkey Point PSW concrete to that used by the

Maruyama et al. (2017) paper and provided a plant-specific analysis considering the combined effects of neutron fluence, gamma dose, and RIVE stresses. In its review of the responses to RAI 3.5.2.2.2.6-11 and 3.5.2.2.2.6-12, and the applicant's analyses and calculations, the staff noted that the combined effects of neutron fluence, gamma dose, and RIVE give a maximum IR of 0.89 which is less than the code allowable IR of 1.0. The staff finds that the applicant's assumptions of a 100 percent loss of strength to a depth of 3.14 inches (RIVE stress effect bounding neutron fluence effects) and thereafter a 10 percent loss of strength to a depth of 10.1 inches (due to gamma dose) is acceptable because:

(1) The SLRA states that the applicant performed an analysis demonstrating that although the effects of RIVE (the 100 percent loss of strength) are taken to 3.14 inches into the concrete for the calculation of damage over the subsequent period of extended operation, the structure could lose up to 7 inches and still perform its intended function. Extending beyond 7 inches to the 10.1-inch attenuation of gamma dose (3.1 remaining inches), it is noted that applying a uniform 10-percent loss of strength is conservative in that the reduction in strength actually will gradually diminish to zero, and the strength loss would be minimal (average to 5 percent).

(2) The staff noted in the audited calculations that the assumption that irradiation effects are considered equal for the full active length of fuel (above and below the reactor core mid-height) is conservative. The actual effects should follow a diminishing flux distribution; therefore, strength loss should decrease for concrete further from the core mid-height.

(3) The staff's approval of the applicant's leak-before-break analysis (LBB), as documented in SER Sections 4.7.3 and 4.7.4, significantly reduces the design loading. The loads in the PSW structural calculation do not account for this reduction and instead use the full design loading conditions; therefore, with the approval of the LBB the loads on the PSW are considerably lower.

(4) The value for gamma dose used in the calculation is 1.9×10^{10} rads. However, the applicant provided additional information in its response to RAI 3.5.2.2.2.6-2 that the Westinghouse calculated value for gamma dose is 1.44×10^{10} rads. As noted in the subsection above, the staff agrees with the Westinghouse value of 1.44×10^{10} rads; therefore, using a higher value of 1.9×10^{10} rads demonstrates additional margin in the analysis.

(5) As stated in the response to RAI 3.5.2.2.2.6-11, UFSAR Section 5.1.6.2, and noted during the staff's onsite audit, the 90-day concrete strength is specified as 7,500 psi. The evaluation for irradiation damage uses the design basis of 3,000 psi concrete strength, which is less than half of the expected strength, so there is conservatism with respect to the potential for loss of intended function.

The staff noted that the RPV steel support assemblies are partially embedded into the concrete of the PSW. As stated in the SLRA, this concrete is expected to have a loss of strength and change in mechanical properties due to the aging effects of radiation. The SLRA provides an evaluation of the RPV structural steel support assemblies for the aging effect of reduction in fracture toughness due to irradiation embrittlement. The staff noted, however, that the SLRA does not include a consideration of how the degradation of the PSW concrete due to irradiation would affect the CLB structural performance/integrity and intended function of the RPV supports – particularly the embedded portion into the concrete (e.g., degree of fixity of steel beams) – and the state of the local concrete (e.g., local crushing of concrete). The staff required additional information to assess, regarding the CLB design loads and intended function, the margin in structural capacity available under critical stress conditions for the RPV support structure, and the ability of the steel support structure to prevent excessive movement (per CLB design) of the RPV during the subsequent period of extended operation. Therefore, the staff issued RAI 3.5.2.2.2.6-13 requesting additional information regarding consideration of RPV support fixity and potential settlement given assumed concrete degradation.

In its response to RAI 3.5.2.2.2.6-13, the applicant stated that most of the horizontal cantilever beam section and both vertical columns, which are the main structural members transferring RPV support loading, are embedded into the concrete. The applicant stated that approximately 4.5 of the 6 feet of the horizontal beam is embedded into the concrete. Based on the span to depth ratio, the 1.5-feet cantilever 14WF342 beam with 1-inch stiffener plates is considered a deep beam that is governed by shear behavior. The applicant stated that with the effective length increasing by 3.14 inches (assuming the aforementioned 100 percent loss in concrete strength per the RIVE analysis), the span-to-depth ratio remains below two, so the beam is still considered a deep beam and shear demand will still be the limiting design stress. Additionally, the staff noted that there is a ¼-inch thick liner plate on the inside diameter of the PSW that will contribute to the axial confinement of the concrete structure. Finally, the applicant performed an analysis to determine the potential settlement of the steel and stated that considering a cracking depth of 3.14 inches, the corresponding maximum displacement is calculated to be less than 0.1 inch, which is negligible for this structural configuration.

In its review of the response to RAI 3.5.2.2.2.6-13 and its audit of associated documentation, the staff finds that assuming a 100 percent loss in strength to a 3.14-inch depth due to RIVE effects, and a 10 percent loss in strength to a depth of 10.1 inches due to gamma dose, the applicant's characterization of the behavior of the RPV support cantilever beam in response to assumed concrete degradation is acceptable because:

(1) Considering the steel as a 3.14-inch longer cantilever (assuming the concrete is not present) due to RIVE effects will not change the shear limit state of the horizontal deep beam RPV support. Additional conservatism is added based on the concrete actually being present through the depth of assumed loss in strength, since the concrete is confined by the liner plate. Loss of fixity is not likely to occur due to the triaxial compression resistance of the concrete. Also, calculations demonstrate the maximum postulated displacement of 0.1 inch would not affect the intended function of the RPV supports. Therefore, the assumed damage will have minimal impact on the ability of the beam to function as designed.

(2) As stated in the applicant's response to RAI 3.5.2.2.2.6-9 (and added enhancement to ASME Section XI, Subsection IWF AMP, as discussed above), the PSW liner plate near the supports and the relative position of the primary loop piping in the penetrations through the PSW will be inspected for evidence of deformation or movement. The staff notes that these inspections of the RPV supports will be conducted on a 5-year interval.

Therefore, the staff's concerns described in RAI 3.5.2.2.2.6-13 are resolved.

The staff finds that an additional plant-specific aging management program is not necessary to manage the effects of irradiation on the PSW concrete. The staff also notes that the applicant committed (Commitment No. 53) to follow ongoing industry efforts to characterize the effects of irradiation on concrete and recommendations for aging management in determining whether a plant-specific program is necessary in the future.

Loss of Fracture Toughness of Reactor Pressure Vessel Supports

SLRA Section 3.5.2.2.2.6, Revision 1, dated October 5, 2018, describes evaluations performed to determine loss of fracture toughness due to the effects of neutron irradiation on the RPV structural steel supports. The SLRA stated that the relevant portions of the support structures are columns and beams composed of ASTM A588 Type B steel, and bolting composed of ASTM A354, Grade BC alloy steel. This section discusses the staff's review of the applicant's use of the methodology in NUREG-1509, "Radiation Effects on Reactor Pressure Vessel Supports," dated May 1996 (ADAMS Accession No. ML073510018), which the applicant used in assessing the aging effects due to neutron embrittlement of the RPV support steel.

SLRA Section 3.5.2.2.2.6 states that, based on a review of NUREG-1509 and the design documentation of the RPV support bolting, no further evaluation for reduction in fracture toughness is required for bolting. However, the applicant did not provide the technical basis for this conclusion. Therefore, the staff issued RAI 3.5.2.2.2.6-5 requesting additional information. The applicant's response to RAI 3.5.2.2.2.6-5 described the transition temperature evaluation used in accordance with Figure 4-4 of NUREG-1509. The response provided the basis for the initial nil ductility transition temperature (NDTT) for the bolting (-15 °F) and the basis for the change in NDTT (ΔNDTT). The response also revised SLRA Section 3.5.2.2.2.6 to state "the evaluation for reduction in fracture toughness for the bolting is bounded by that of the beam material." The staff finds the applicant's statement that the evaluation for the bolting is bounded by that for the beam material acceptable. The staff evaluation of the beam material is provided below.

NUREG-1509 states that the radiation-induced ΔNDTT is estimated from the upper bound correlation curve of Figure 3-1. However, the applicant's analysis in SLRA Section 3.5.2.2.2.6 uses the [lower] fitted correlation curve from Figure 3-1. The application did not provide the basis for this deviation from the NUREG-1509 methodology. Therefore, the staff issued RAI 3.5.2.2.2.6-6 requesting a technical basis for the use of the fitted curve, including consideration of the uncertainty in the projection of ΔNDT to the end of the subsequent period of extended operation.

The applicant's response to RAI 3.5.2.2.2.6-6 provided several reasons for deviating from the NUREG-1509 methodology, including the preferential grain structure of the Turkey Point materials and segregation of data based on data from the high-flux isotope reactor (HFIR) from a high gamma radiation environment.

Neutron irradiation results in the embrittlement of ferritic steels. This neutron embrittlement causes changes in the mechanical properties of the material, with decreases in fracture toughness and ductility. The data that form the basis of the correlation between the change in transition temperature as a function of radiation in Figure 3-1 are primarily based on ASTM A212B materials. The Turkey Point cantilever beam materials are fabricated from ASTM A588 steel, with a copper content of 0.30 wt percent (from Turkey Point certified material test reports). ASTM A212B materials are generally more coarse-grained than ASTM A588 materials. The ASTM A354 bolting material was described as having a well-tempered martensitic microstructure in NUREG-0577, "Potential for Low Fracture Toughness and Lamellar Tearing on PWR Steam Generator and Reactor Coolant Pump Supports." The staff noted that correlations for projecting embrittlement in NUREG-1509 are based on the chemical composition or material specification of the material, not the grain size. The staff found the restriction of data to a small neutron fluence range and exclusion of HFIR data due to gamma flux to be inadequately supported. The non-HFIR data with dpa levels slightly higher than that for Turkey Point contributed significantly to defining the upper bound curve. Using Figure 3-1 requires consideration of the available data set as a whole because the curves were based on the entire data set. Therefore, the staff found that since adjustments to the transition temperature shift based on grain size could not be quantified, and restrictions of the data in Figure 3-1 of NUREG-1509 were not valid, and that the use of the fitted curve instead of the upper bound curve in Figure 3-1 of NUREG-1509 is not supported.

The staff notes as well that the data used to develop Figure 4-1 of NUREG-1509 are from non-copper bearing steel, and copper is a well-known contributor to neutron embrittlement through the formation of copper precipitates. To address the possibility of copper-bearing steels in the supports, Section 4.3.3.2 of NUREG-1509 identifies one reference that has an equation to calculate the maximum contribution of copper to the embrittlement, in addition to a separate equation to calculate the matrix damage (non-copper) embrittlement. With the 0.30 percent copper of the beam material, the reference identifies a copper-precipitation component of embrittlement of 119 °F, which must be added to the 99 °F identified in the response to the RAI. This provides an NDTT at the end of the subsequent period of extended operation of a minimum of 218 °F. The applicant identified normal operating temperatures of 120 °F (in cavity) and 150 °F (for the cantilever beams and bolting). Neither of these values is consistent with the definition of lowest service temperature (LST) in NUREG-1509, which states that the LST is “the minimum temperature of the most vulnerable part of the fracture-critical member when design-basis accident loads occur.” The staff concluded that a specific determination of LST for Turkey Point is not relevant to this evaluation, because the NDTT value of 218 °F at the end of the subsequent period of extended operation is much greater than any service temperature for the RPV supports at Turkey Point that could be characterized as LST as defined in NUREG-1509.

Section 4.3.4.2 of NUREG-1509 discusses that a margin of safety should be maintained between the LST and the NDT temperatures. It was not clear in the applicant’s analysis if and how margin was considered or calculated. Therefore, the staff issued RAI 3.5.2.2.2.6-7 requesting additional information to describe the margin analysis as described in Figure 4-4 of NUREG-1509. The staff noted that the 80-year NDTT was determined using the fitted curve of Figure 3-1, rather than the upper bound curve as described in the methodology of NUREG-1509. As discussed in the review of RAI 3.5.2.2.2.6-6, this deviation was not adequately supported. Following the methodology of NUREG-1509, the sum of the 80-year NDTT and the 30 °F margin exceeds the LST. Therefore, the staff found that the methodology of NUREG-1509 following Figure 4-4 indicates that further action is necessary.

Section 4.3.1.1 of NUREG-1509 states “[p]hysical examination of the RPV supports is essential to the reevaluation. As mentioned previously, the purpose of the examination is to detect visible signs of degradation of the supports, including, but not limited to, rust, corrosion, cracks or permanent deformation of the members.” The audited documents state that visual inspections have not identified dimensional shifts or changes in the RPV support steel, but they do not indicate inspection for rust, corrosion, cracks, or permanent deformation of the members. Therefore, the staff issued RAI 3.5.2.2.2.6-8 requesting additional information to identify examinations that have been performed to assess degradation of the reactor vessel support materials due to rust, corrosion, and cracks as described in NUREG-1509. The staff found the response provided sufficient detail of previously conducted inspections for consistency with the methodology of NUREG-1509.

In its review of SLRA Section 3, the staff noted that there is no AMR item addressing RPV supports in an irradiated environment. As such, it was not clear that the requirements of 10 CFR 54.21 to perform an integrated plant assessment were being met. Therefore, the staff issued RAI 3.5.2.2.2.6-9 requesting additional information to determine if an AMR item would be required, and to describe the AMR item. In its response to the RAI, the applicant added AMR items for the supports (beams) and the bolting to be age managed for loss of fracture toughness. The RAI response, as supplemented by letter dated May 6, 2019, also modified the SLRA to provide enhanced elements of the ASME Section XI, Subsection IWF AMP.

The staff noted that the application's enhancements to the IWF AMP "detection of aging effects" program element (modified by letter dated May 6, 2019) included a "visual inspection, enhanced to the extent possible in the location/configuration to manage applicable aging effects of all the RV supports (6 per unit) as part of the ASME Section XI, Subsection IWF program before or during the last scheduled refueling outage prior to entry into the [subsequent period of extended operation] for each unit." The applicant augmented Commitment No. 36 accordingly. The staff also noted that during the subsequent period of extended operation, visual inspections will be performed on a frequency not to exceed 5 years and will be further enhanced to the extent possible based on technology available at the time. The staff notes that performing inspections could be an effective method of detecting aging effects on structures and that the same would apply to the reactor vessel supports. An inspection methodology, however, must be demonstrated to be adequate to detect changes in the structural components due to the aging effects and the degradation mechanisms that may challenge the ability of the component to perform its intended function.

The staff notes that the ASME Section XI, Subsection IWF program uses VT-3 inspections and that the applicant proposes to further enhance the methodology used in such visual inspections to the extent possible for the purpose of identifying any applicable aging effects. The staff also notes that the loss of fracture toughness due to neutron irradiation in steel components does not provide a direct failure path for a component, unless the component has existing cracks. Therefore, loss of fracture toughness of the steel sections of the RPV supports can be managed indirectly through the applicant's proposed enhanced visual inspections of those steel components to demonstrate the absence of cracks.

While VT-3 examinations are not credited to detect small cracks, these enhanced visual inspections will be sufficient to manage these aging effects in the RPV supports because:

(1) The steel sections are deep, short cantilever 14WF342 beam sections and any cracking would more likely manifest as a shear crack at or near the exposed "fixed end" of the support that would be detectible by the enhanced visual examinations.

(2) Support conditions as noted above in "Impact of Irradiation on Concrete" are such that any potential degradation of concrete in the vicinity of a support would result in its partial fixity and a reduced crack driving force.

(3) The ability for the inspection to be able to detect small cracking is of low concern because of the robust structural configuration and lack of operating experience indicating misalignments or deformations of RPV components. Furthermore, any signs of cracking or deformation would be evaluated under the corrective action program.

(4) The applicant proposed to perform the inspections of all RPV supports (i.e., all six supports for both units). This is in lieu of the sample recommended by GALL Report AMP XI.S3 and will ensure that all surfaces of all of the supports will be examined.

(5) The applicant will perform the inspections every 5 years. This is more frequent than the once per 10-year frequency recommended by GALL Report AMP XI.S3 and is consistent with recommendations in WCAP-14422, Revision 2-A. The same

inspection frequencies are identified in Section 4.2.4.1 of NUREG/CR-6424. The staff finds the 5-year inspection interval to be acceptable to detect cracking and deformation that could impact the structure's ability to perform its intended function.

Since the basis for the applicant's visual inspection methodology will be established and documented to demonstrate its adequacy to detect changes in the structural components prior to its implementation, there is a reasonable assurance that the effects of loss of fracture toughness (cracking) of the RPV support structural steel due to exposure to neutron fluence will be adequately managed during the subsequent period of extended operation. This resolves the staff's concerns identified in RAIs 3.5.2.2.2.6-5 through 3.5.2.2.2.6-9.

Conclusion. The staff's review and evaluation of the ASME Section XI, Subsection IWF program, which the applicant proposed to manage loss of fracture toughness (cracking) of the RPV support structural steel, is documented in SER Section 3.0.3.2.28. The staff determined that the applicant's program, as amended by letter dated May 6, 2019, associated with SLRA Section 3.5.2.2.2.6, is acceptable. Further, the staff determined that the applicant's evaluation for PSW concrete meets SRP-SLR Section 3.5.2.2.6 criteria related to Table 3.5-1, item 3.5-1-097, and that the applicant has adequately assessed that a plant-specific program is not needed for the PSW. As such, the staff concludes that the SLRA is consistent with the GALL-SLR Report for the concrete bioshield and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.3 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 3.5.2-18 that are either not consistent with or not addressed in the GALL-SLR Report and are usually denoted with generic notes F through J. To efficiently capture and identify multiple applicable AMR items in each subsection, and because these AMR items often are not associated with 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 Control Building

<u>Stainless Steel Electrical and Instrument Panels and Enclosures Exposed to Air – Indoor Controlled</u>

The staff's evaluation for stainless steel electrical and instrument panels and enclosures exposed to controlled indoor air, with no identified aging effect and associated with generic note J, is documented in SER Section 3.5.2.3.9, Emergency Diesel Generator Buildings.

<u>Gypsum Board Acoustic Panel Ceiling Exposed to Controlled Indoor Air</u>.

In SLRA Table 3.5.2-4, the applicant stated that for gypsum board acoustic panels exposed to controlled indoor air, there is no aging effect and no AMP is proposed. The AMR item cites generic note J.

The staff reviewed the associated items in the SLRA to confirm that no credible aging effects are applicable for this component, material, and environment combination. The staff finds the applicant's proposal acceptable because gypsum (drywall) is an inorganic material with no feasible aging effect in a controlled indoor air environment. Additionally, this component is located in an area that is occupied continuously and is replaceable. If an unexpected indication of aging did occur, it would be identified and addressed.

<u>Control Room Raised Floor Exposed to Controlled Indoor Air</u>.

In SLRA Table 3.5.2-4, the applicant stated that for components of the control room raised floor (Tee Cor panels, Micarta cove base, and steel supports) exposed to controlled indoor air, there is no aging effect and no AMP is proposed. The AMR item cites generic note J.

The staff reviewed the associated items in the SLRA to confirm that no credible aging effects are applicable for this component, material, and environment combination. The staff notes that Tee Cor panels are prefabricated metal panels and Micarta cove base is of a composite plastic laminate material. The staff finds the applicant's proposal acceptable based on its review of the GALL-SLR Report, which lists no aging effect for steel or plastic materials in controlled indoor air environments. Additionally, this component is located in an area that is occupied continuously. If an unexpected indication of aging did occur, it would be identified and addressed.

3.5.2.3.2 Emergency Diesel Generator Buildings

<u>Stainless Steel Electrical and Instrument Panels and Enclosures, and Instrument Racks and Frames Exposed to Air – Indoor Controlled</u>

In SLRA Tables 3.5.2-4 and 3.5.2-9, the applicant stated that for stainless steel electrical panels and enclosures and instrument racks and frames exposed to controlled indoor air, there is no aging effect and no AMP is proposed. The AMR items cite generic note J.

The staff reviewed the associated items in the SLRA to confirm that no credible aging effects are applicable for these components, material, and environment combination. The staff finds the applicant's proposal acceptable based on its review of the SRP-SLR Report, which notes that further evaluation is necessary to address pitting and crevice corrosion or SCC for stainless steel components exposed to air with sufficient halides or moisture. However, the controlled indoor air environment ensures that these stainless steel components are not exposed to sufficient halides or moisture to cause these aging effects and, therefore, it is acceptable that no aging effect is identified for stainless steel components in this environment.

Carbon Steel Diesel Oil Storage Tank Exposed to Concrete

In SLRA Table 3.5.2-9, the applicant stated that for the carbon steel DOST liner exposed to concrete (i.e., the exterior side of the liner), there is no aging effect and no AMP is proposed. The AMR item cites generic note J and plant-specific note 4, which states that the external surface of the liner is embedded in concrete and not subject to age-related degradation.

The staff reviewed the associated items in the SLRA to confirm that no credible aging effects are applicable for this component, material, and environment combination. The staff noted that GALL-SLR item VII.J.AP-282, associated with SRP-SLR Table 3.3-1 ID 112, recommends further evaluation. The further evaluation section (SRP-SLR 3.3.2.2.9) lists no aging effect for steel embedded in concrete if the associated conditions in the SRP-SLR are met, most significantly, that the steel is not exposed to water via degraded concrete or penetrations. It was not clear to the staff how the conditions were being met for the carbon steel DOST liner or how the applicant was ensuring that water did not reach the liner. To address this, the staff issued RAI 3.5.2-9-1.

In its response, dated November 2, 2018 (ADAMS Accession No. ML18311A299), the applicant noted that the concrete was constructed in accordance with ACI 318-63, ensuring a low permeability concrete, that the concrete is inspected by the Structures Monitoring program to ensure that it remains free of cracks that could allow significant penetration of water to reach the steel tank, and that all piping penetrations are either indoors and protected from moisture or are sealed to ensure that water does not reach the steel tank liner. The penetration seals are managed for "loss of sealing" using the Structures Monitoring program.

The staff finds the applicant's proposal acceptable based on its review of the SRP-SLR, which states that there is no aging effect for steel embedded in concrete if it can be demonstrated that water will not reach the steel. Since the concrete and the penetration seals are being inspected by the Structures Monitoring program and since following the guidance of ACI 318-63 ensures low permeability concrete, it is reasonable to assume that the steel liner is not exposed to water and will not have an aging effect. In addition, the internal surface of the tank liner is being managed for aging by the Fuel Oil Chemistry program. If an unexpected indication of aging did occur based on conditions monitored by the above AMPs in accessible areas of the tank, it would be identified and addressed.

3.5.2.3.3 Fire Rated Assemblies

Cementitious Structural Steel Fireproofing Exposed to Indoor Air.

As amended (ADAMS Accession No. ML19035A195), SLRA Table 3.5.2-10 states that cementitious structural steel fireproofing exposed to indoor air will be managed for loss of material and cracking by the Fire Protection program. The amended AMR item lists loss of material and cracking as aging effects, and cites generic note J. The staff finds the applicant's revision acceptable because loss of material and cracking are applicable aging effects for cementitious materials, whereas the previously listed aging effects (hardening, loss of strength, and shrinkage) are those identified for elastomeric materials.

The staff reviewed the associated items in the SLRA, as amended, and considered whether the aging effects proposed by the applicant constitute all of the credible aging effects for this component, material, and environment combination. Based on its review of EPRI TR-1006756, which states that important parameters to maintain for structural steel fireproofing include thickness of material and continuity of material, the staff finds that the applicant has identified all credible aging effects for this component, material, and environment combination.

The staff finds the applicant's proposal to manage the effects of aging within the Fire Protection program acceptable because it includes periodic visual inspections that are capable of detecting cracking and loss of material (i.e., thickness and continuity of material) for the cementitious fireproofing material that are important for ensuring that the structural steel is able to retain sufficient strength to perform its intended function in the event of a building fire.

Fire Retardant Coating, Fire Sealed Isolation Joint, and Electrical Fireproofing Protection Exposed to Indoor Air and Outdoor Air.

As amended (ADAMS Accession No. ML19035A195), SLRA Table 3.5.2-10 states that fire retardant coatings (Flamemastic), fire sealed isolation joints (Cerafiber®), and electrical fireproofing (Thermo-lag) exposed to indoor air or outdoor air will be managed for cracking and loss of material by the Fire Protection program. The AMR items cite generic note J.

The staff reviewed the associated items in the SLRA and considered whether the aging effects proposed by the applicant constitute all of the credible aging effects for this component, material, and environment combination. Based on a review of official manufacturer websites, the staff identified that Flamemastic coatings are "compounded of water-based thermoplastic resins, flame-retardant chemicals, and inorganic, incombustible fibers"; Cerafiber® is a fiberization melt of alumina and silica; and Thermo-lag is a "thermally-activated, intumescent epoxy coating."

The staff noted that Flamemastic and Thermo-lag materials are similar to coatings and Cerafiber® is similar to a polymeric material as described in the GALL-SLR Report. The staff also noted that GALL-SLR item A-797, an AMR item for generic polymeric materials, cites loss of material and cracking as the applicable aging effects for an externally applied polymer that in its cured state does not remain flexible (i.e., hardening and loss of strength (as demonstrated by the material being too pliable) are not applicable). The staff further noted that GALL-SLR Report item A-416 cites loss of coating integrity as the applicable aging effect for coatings, for which the aging mechanisms are associated with loss of material and cracking. Based on its review of items A-416 and A-797, the staff determined that the applicant has identified all credible aging effects for these component, material, and environment combinations.

The staff finds the applicant's proposal to manage the effects of aging acceptable because periodic visual inspections of these fire-retardant coatings, fire sealed isolation joints, and electrical fireproofing can be capable of identifying loss of material and cracking.

3.5.2.3.4 Intake Structure

<u>*Stainless Steel Traveling Screen Cloth Exposed to Air-Outdoor, Water-Flowing, or Water-Standing*</u>

In SLRA Table 3.5.2-11, the applicant stated that stainless steel traveling screen cloth exposed to air-outdoor, water-flowing, or water-standing environment will be managed for loss of material and cracking by the Structures Monitoring program. The AMR item cites generic note J.

The staff reviewed the associated items in the SLRA and considered whether the aging effects proposed by the applicant constitute all of the credible aging effects for this component, material, and environment combination. Based on its review of the GALL-SLR Report, Section IX, the staff finds that the applicant has identified all credible aging effects for this component, material, and environment combination. The staff notes that minor loss of material or cracking that might not be detectable during a visual inspection should not prevent the traveling screen cloth from performing its filtering function.

The staff finds the applicant's proposal to manage the effects of aging acceptable because the use of visual inspection to detect cracking and loss of material using the Structures Monitoring program provides reasonable assurance 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.

3.5.2.3.5 Yard Structures

<u>*Earth Berm Exposed to Air-Outdoor*</u>

In SLRA Table 3.5.2-18, the applicant stated that an earth berm exposed to air-outdoor will be managed for loss of material and loss of form by the Structures Monitoring program. The AMR item cites generic note J.

The staff reviewed the associated items in the SLRA and considered whether the aging effects proposed by the applicant constitute all of the credible aging effects for this component, material, and environment combination. The staff noted that the applicant addressed loss of material and loss of form for this component, material, and environment combination in other AMR items. Based on its review of SRP-SLR Table 3.5-1, item 3.5-1-058, which identifies loss of material, and loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, or seepage as applicable aging effects for earthen structures, the staff finds that the applicant has identified all credible aging effects for this component, material, and environment combination.

The staff finds the applicant's proposal to manage the effects of aging acceptable because the use of visual inspection to manage loss of material and loss of form in earthen structures using the Structures Monitoring program is consistent with the GALL-SLR Report recommended inspection frequencies and methods for similar materials and environments (e.g., those addressed in SRP-SLR Table 3.5-1, item 3.5-1-058) and it provides reasonable assurance that the effects of aging will be adequately managed during the subsequent period of extended operation.

3.6 Aging Management of Electrical and Instrumentation and Controls Commodities

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 Controls," as being subject to an AMR. SLRA Table 3.6-1, "Summary of Aging Management Evaluations for Electrical Commodities," is a summary comparison of the applicant's AMRs with those evaluated 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 in the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.6-1-001	Consistent with the GALL-SLR Report (see SER Section 3.6.2.2.1)
3.6-1-002	Consistent with the GALL-SLR Report
3.6-1-003	Consistent with the GALL-SLR Report
3.6-1-004	Not applicable to Turkey Point (see SER Section 3.6.2.2.3)
3.6-1-005	Not applicable to Turkey Point (see SER Section 3.6.2.2.3)
3.6-1-006	Not applicable to Turkey Point (see SER Section 3.6.2.2.3)
3.6-1-007	Not applicable to Turkey Point (see SER Section 3.6.2.2.3)
3.6-1-008	Consistent with the GALL-SLR Report
3.6-1-009	Consistent with the GALL-SLR Report
3.6-1-010	Consistent with the GALL-SLR Report
3.6-1-011	Not applicable to Turkey Point
3.6-1-012	Not applicable to Turkey Point
3.6-1-013	Not applicable to Turkey Point
3.6-1-014	Not applicable to Turkey Point
3.6-1-015	Not applicable to Turkey Point
3.6-1-016	Not applicable to Turkey Point
3.6-1-017	Not applicable to Turkey Point
3.6-1-018	Not applicable to Turkey Point
3.6-1-019	Consistent with the GALL-SLR Report
3.6-1-020	Consistent with the GALL-SLR Report
3.6-1-021	Not applicable to Turkey Point (see SER Section 3.6.2.2.3)
3.6-1-022	Not applicable to Turkey Point
3.6-1-023	Not applicable to Turkey Point
3.6-1-024	Not applicable to Turkey Point
3.6-1-025	This item number is not used in the SRP-SLR no the GALL-SLR Report
3.6-1-026	This item number is not used in the SRP-SLR no the GALL-SLR Report
3.6-1-027	Not applicable to Turkey Point
3.6-1-028	This item number is not used in the SRP-SLR no the GALL-SLR Report

Component Group (SRP-SLR Item No.)	Staff Evaluation
3.6-1-029	Not applicable to Turkey Point (see SER Section 3.6.2.2.2)
3.6-1-030	Not applicable to Turkey Point (see SER Section 3.6.2.2.2)
3.6-1-031	Not applicable to Turkey Point (see SER Section 3.6.2.2.2)
3.6-1-032	Not applicable to Turkey Point

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 Turkey Point or are consistent with the GALL-SLR Report. Section 3.6.2.1.1 summarizes the staff's review of items that are not applicable or not used, and documents any RAIs issued and the staff conclusions. The remaining subsections in SER Section 3.6.2.1 document the review of components that required additional information or otherwise require explanation.

(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 Table 3.6.2-1 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.

Additionally, 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 3.6-1-011 through 3.6-1-018, 3.6-1-021 through 3.6-1-024, 3.6-1-027, and 3.6-1-029 through 3.6-1-032, the applicant claims that the corresponding AMR items in the GALL-SLR Report are not applicable to Turkey Point. 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, as recommended by the GALL-SLR Report, for the electrical and instrumentation and controls system components and provides information concerning how it will manage the applicable aging effects. The staff reviewed the applicant's evaluation of component groups of which the

GALL-SLR Report recommends further evaluation 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 TLAAs are evaluated in accordance with 10 CFR 54.21(c) and that the evaluation of this TLAA is addressed in Section 4.4. This is consistent with SRP-SLR Section 3.6.2.2.1 and is, therefore, acceptable. The staff's evaluation of the TLAA for environmental qualification (EQ) of electrical equipment is documented 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 3.2-1, items 3.2-1-029, 3.2-1-030, and 3.2-1-031, addresses reduced insulation resistance in cable bus components. The applicant stated that these items are not applicable because Turkey Point does not have any cable bus components. The staff evaluated the applicant's claim and finds it acceptable because, based on a review of the UFSAR and SLRA, there are no in-scope cable bus components used at Turkey Point.

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 (as amended by letter dated January 31, 2019), associated with SLRA Table 3.6-1, items 3.6-1-004, 3.6-1-005, 3.6-1-006, 3.6-1-007, and 3.6-1-021, addresses loss of conductor strength due to corrosion, increased resistance of connection due to oxidation or loss of preload, and loss of material due to wind-induced abrasion in transmission conductors and connections as well as switchyard buses and connections. The criteria in SRP-SLR Section 3.6.2.2.3 states 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.

Transmission Conductors Composed of Aluminum and Steel Exposed to Air-Outdoor

SLRA items 3.6-1-004 and 3.6-1-021 address the aging effect of loss of 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 loss of conductor strength is not an AERM for Turkey Point transmission conductors based on Turkey Point design and plant-specific and industry operating experience.

The applicant referenced an Ontario Hydroelectric study (IEEE C2 – 1997) that included the results of aluminum conductor steel reinforced (ACSR) transmission conductor laboratory and field tests, including the evaluation of conductor aging effects due to locations near pollution sources and major urban areas. The Ontario Hydroelectric study results indicate acceptable loss of strength due to corrosion in areas affected by industrial pollution of an 80-year-old ACSR conductor due to corrosion. The applicant stated that the high-sides of Turkey Point Units 3 and 4 startup transformers are connected to the 240-kV switchyard via overhead transmission lines.

The Turkey Point transmission conductors subject to an AMR are 1,431 thousands of circular mils (MCM) ACSR. This specific conductor construction type was included in the Ontario Hydroelectric test; therefore, the results of this test are representative of the Turkey Point 240-kV overhead transmission conductors.

There is a set percentage of composite conductor strength established at which a transmission conductor is replaced. The applicant stated that there is ample strength margin to maintain the intended function of these Turkey Point transmission conductors through the subsequent period of extended operation. The National Electrical Safety Code (NESC), requires that tension on installed conductors to be a maximum 60 percent of the ultimate conductor strength. The NESC also specifies the maximum tension to which a conductor must be designed to withstand heavy load requirements (consideration of ice, wind, and temperature). These requirements were reviewed for the specific transmission conductors included in the scope of subsequent license renewal for Turkey Point. Evaluation of the conductor type with the smallest ultimate strength margin (4/0 ACSR, 6/1) in the NESC illustrates the conservative nature of the design of transmission conductors.

The applicant also stated that the ultimate strength and the NESC heavy load tension requirements of 4/0 (212 MCM) ACSR, 6/1 are 8,350 lbs. and 2,761 lbs., respectively. The heavy load tension is 33 percent of the ultimate strength (2,761 lbs./8,350 lbs.), which is well within the NESC criterion of 60 percent. The actual margin between the NESC heavy load and the ultimate strength is 5,589 lbs (i.e., there is an ultimate strength margin of 67 percent). The Ontario Hydroelectric study showed a 30 percent loss of composite conductor strength in an 80-year-old conductor. In the case of the 4/0 ACSR transmission conductor, a 30 percent loss of ultimate strength would mean that the heavy load tension is 47 percent of the ultimate strength (2,761 lbs./5,845 lbs.), which is still within the NESC criterion of 60 percent. The actual margin for an 80-year 4/0 ACSR, 6/1 transmission conductor between the NESC heavy load and the aged ultimate strength would be 3,084 lbs. (i.e., there would still be an aged ultimate strength margin of 53 percent). The 4/0 ACSR conductor type has the lowest initial design margin of transmission conductors included in the review. Also, the ACSR transmission conductor in the Ontario Hydroelectric study was an 80-year-old specimen, which corresponds to the Turkey Point subsequent period of extended operation. The applicant also stated that a review of industry operating experience and NRC generic communications related to the aging of transmission conductors confirmed that no additional aging effects exist beyond those previously identified. A review of plant-specific operating experience did not identify any unique aging effects for transmission conductors.

The staff noted that the Ontario Hydroelectric study bounds the in-scope Turkey Point transmission conductors. With a 30 percent loss of conductor strength, there is still ample margin between the NESC requirements and the actual conductor strength. Furthermore, the applicant has confirmed that plant-specific operating experience did not identify any aging effects for transmission conductors at Turkey Point. Therefore, the staff finds that loss of conductor strength due to corrosion is not a significant AERM at Turkey Point.

In SLRA, Table 3.6-1, item 3.6-1-021, the applicant states that loss of conductor strength due to corrosion for transmission conductors composed of aluminum exposed to air outdoor is not applicable because Turkey Point does not have any aluminum conductor alloy reinforced or all aluminum conductor transmission conductors. The staff finds that the GALL-SLR Report aging effects are not applicable to Turkey Point because no aluminum conductor alloy reinforced or all aluminum conductor transmission conductors are used at Turkey Point.

Transmission Connectors Composed of Aluminum and Steel Exposed to Air-Outdoor

SLRA item 3.6-1-005 addresses the aging effect of increased resistance of connection due to oxidation or loss of preload in transmission connectors composed of aluminum or steel exposed to an air-outdoor environment. SLRA Section 3.6.2.2.3 states that oxidation and loss of preload are not applicable aging effects for Turkey Point transmission connectors based on the Turkey Point design and operating experience.

The applicant stated that transmission connectors can be susceptible to increased resistance due to corrosion. Minor corrosion can be expected due to exposure to precipitation that does not affect the ability of the connections to perform intended functions. At Turkey Point, transmission connector surfaces are coated with an antioxidant compound (grease type sealant) prior to tightening the connection to prevent the formation of oxides on the metal surface and to prevent moisture from entering the connections, thus minimizing the potential for corrosion and providing a corrosion-resistant low electrical resistance connection. The design of these connections and construction practices along with operating experience at Turkey Point indicate that increased resistance due to general corrosion and oxidation are not AERMs.

The applicant also stated that increased connection resistance due to loss of preload (torque relaxation) for transmission connections is not an aging effect requiring management. The design of the transmission conductor connection includes Bellville washers. The type of bolting plate and the use of Bellville washers is the industry standard to preclude torque relaxation. This design configuration, combined with proper sizing of the conductors, eliminates the need to consider this aging mechanism. Furthermore, the applicant's infrared inspection of the 240 kV switchyard connections verifies the effectiveness of the connection design and site installation practices. Therefore, increased connection resistance due to loss of preload on transmission connections is not an AERM.

The staff noted that bolted connections and washers at Turkey Point are coated with an antioxidant compound (electrical joint compound) prior to tightening the connection to prevent the formation of oxides on the metal surface and to prevent moisture from entering the connection, thus reducing the chances of corrosion. The staff finds that increased resistance of transmission conductor connection due to oxidation is not an AERM for transmission conductor connections at Turkey Point.

The staff also noted that the design of switchyard bolted connections precludes torque relaxation. The use of stainless steel Belleville washers is the industry standard to preclude torque relaxation. The Turkey Point design incorporates the use of stainless steel Belleville washers on bolted electrical connections to compensate for temperature changes, maintain the proper torque, and prevent loosening. This method of assembly is consistent with the good bolting practices recommended by industry guidelines (EPRI TR-104213, "Bolted Joint Maintenance & Application Guide"). Based on its review, the staff finds that loosening of the transmission conductor connections is not an AERM at Turkey Point.

The staff reviewed the associated items in the SLRA and confirmed that these aging effects are not applicable for this component, material, and environmental combination. The staff finds the applicant's further evaluation acceptable because the Turkey Point transmission connectors have not exhibited significant aging effects based on site-specific experience and the results of routine infrared inspections. In addition, the transmission connectors that are bolted connections employ corrosion inhibitors and bolting practices that prevent loss of preload and corrosion of the contact surfaces.

Switchyard Bus and Connections Composed of Aluminum, Copper, Bronze, Stainless Steel, and 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, copper, bronze, stainless steel, or galvanized steel exposed to an air-outdoor environment. SLRA Section 3.6.2.2.3 states that loss of material and increased resistance of connection are not applicable aging effects for Turkey Point switchyard bus and connections.

The applicant stated that switchyard bus and connections can be susceptible to increased resistance due to oxidation. At Turkey Point, switchyard connection surfaces are coated with an antioxidant compound (grease type sealant), providing a corrosion-resistant low electrical resistance connection. The absence of plant-specific operating experience problems with switchyard buses, as evidenced by routine infrared inspection, indicates that increased connection resistance due to general corrosion and oxidation is not an AERM at Turkey Point.

The applicant also stated that due to the design of the transmission switchyard conductors and bus bolted connections, torque relaxation (loss of preload) is precluded. The design calls for the use of Belleville washers to preclude connection degradation due to loss of preload. The operating experience at Turkey Point has not identified a loss of preload. Therefore, increased connection resistance due to loss of preload of switchyard connections and switchyard bus connections is not an AERM at Turkey Point.

The applicant stated that wind loading can cause transmission conductor vibration or sway. Wind loading that can cause transmission line and insulators to vibrate is considered in the design and installation of transmission conductors at Turkey Point such that they are not susceptible to vibration or excessive sway. Switchyard bus is connected to active equipment by short sections of flexible conductors. As a result, the rigid bus does not vibrate because it is supported by insulators and ultimately by static, structural components such as concrete footings and structural steel. The flexible conductors withstand the minor vibrations associated with the active switchyard components and are part of the switchyard bus commodity group. Accordingly, vibration is not applicable for switchyard bus because flexible conductors connecting switchyard bus to active components eliminate the potential for vibration. The applicant also stated that loss of material due to wind-induced abrasion and fatigue has not been experienced at Turkey Point and has not been observed in the review of industry operating experience.

The staff reviewed the associated items in the SLRA and confirmed that these aging effects are not applicable for this component, material, and environment combination. The staff finds the applicant’s evaluation acceptable because wind-borne particulates have not been shown to be a contributor to loss of material at Turkey Point. 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 Turkey Point. The staff also noted that the switchyard bus is connected to active components by short sections of flexible conductors, which dampen the vibration effects caused by wind and the operation of switchyard components.

Transmission Conductors Composed of Aluminum and 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 states that loss of material is not an applicable aging effect for Turkey Point transmission conductors.

The applicant stated that wind loading can cause transmission conductor vibration or sway. Wind loading that can cause transmission lines and insulators to vibrate and is considered in the design and installation of transmission conductors at Turkey Point such that they are not susceptible to vibration or excessive sway. The applicant reviewed plant-specific and industry operating experience concerning loss of material and concluded that they are not applicable AERMs. In addition, in a letter dated January 31, 2019, the applicant addressed loss of material due to wind-induced abrasion (sand blasting). It stated that loss of material of transmission conductors and connections due to wind-induced abrasion (sand blasting) could occur in desert areas, beaches, or in locations where agricultural farming is prevalent. There are no industries within a 5-mile radius of Turkey Point, with approximately one-half of this area being formed by the coastal waters in Biscayne Bay. The coastal waters can be characterized as a shallow-bay with no beaches. A substantial proportion of the land area in the 5-mile radius is vacant. A section of agricultural land is located in the northwestern quarter of the 5-mile arc and is mostly used for truck crop farming. A review of plant-specific operating experience did not identify wind-induced abrasion due to sand blasting or other contamination as an aging effect for transmission conductors and connections. Therefore, loss of material of transmission conductors and connections due to wind-induced abrasion (sand blasting) is not an AERM at Turkey Point.

The applicant further stated that hurricanes and other major wind events could cause foreign objects (such as siding and roofs) to get blown into transmission conductors and connections. Although these types of atmospheric disturbances are considered infrequent weather events rather than equipment aging effects, a review of plant-specific operating experience did not identify any instances in which these events caused damage to transmission conductors and connections. Additionally, the site performs a detailed inspection of the switchyard after a hurricane to look for transmission conductor and connection conductor damage. Therefore, loss of material due to wind-induced abrasion (sand blasting) of transmission conductors and connections due to hurricanes and other major wind events is not an AERM at Turkey Point.

The staff noted that wind-borne particulates have not been shown to be a contributor to loss of material at Turkey Point. Therefore, the staff finds that the loss of material (wear) of transmission conductors and connections due to wind-induced abrasion is not an AERM at Turkey Point.

Conclusion. On the basis of its review, the staff concludes that the applicant has met the SRP-SLR Section 3.6.2.2.3 criteria. For those items that apply to SLRA Section 3.6.2.2.3, the staff finds that the SLRA is consistent with the GALL-SLR Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2.4 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 Table 3.6.2-1 that are either not consistent with or not addressed in the GALL-SLR Report and are usually denoted with generic notes F through J. To efficiently capture and identify multiple applicable AMR items in each subsection, and because these AMR items often are not associated with a Table 1 item, the subsections are organized by applicable AMR section and then by material and environment combinations.

For component type, material, and environment combinations not evaluated in the GALL-SLR Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that it will adequately manage the effects of aging in a way that maintains the intended function(s) consistent with the CLB for the subsequent period of extended operation. The following sections document the staff's evaluation.

3.6.2.3.1 Electrical Commodities

<u>Fiberglass, Silicone Rubber, Aluminum and Aluminum Alloy, Steel, and Galvanized Metals, -High-Voltage Insulators - Polymer (for SBO Recovery) Exposed to Air-Outdoor</u>.

SLRA Section B.2.3.44 describes the new High-Voltage Insulators program as consistent with GALL-SLR Report AMP XI.E7, "High-Voltage Insulators." This section states that Turkey Point utilizes polymer insulators made of silicon rubber. However, SLRA Tables 3.6-1 and 3.6.2-1 describe Turkey Point high-voltage insulators as porcelain type rather than insulators made of polymers. The GALL-SLR evaluated porcelain type insulators, but polymer insulators have not been addressed in this document. The presence of material and component types not previously addressed in the GALL-SLR Report constitutes a site-specific material/environment combination that should be addressed in an SLRA. The applicant's SLRA does not include a discussion of a site-specific material/environment combination relating to polymer high-voltage insulators installed at Turkey Point for in-scope station blackout (SBO) recovery path transmission lines and switchyard components. Therefore, the staff determined that it needed more information, which resulted in the issuance of RAI B.2.3.40-1.

In its response, dated October 16, 2018, documented in ADAMS Accession No. ML18296A024, the applicant stated that porcelain high-voltage (H-V) insulators are used in the Turkey Point Unit 4 SBO recovery path. Polymer H-V insulators, installed in December 2012, are used in the Turkey Point Unit 3 SBO recovery path. The polymer H-V insulators are suspension-type insulators used in the string bus connecting the 240 kV transmission lines from the Unit 3 240 kV switchyard to the high side bushings of Start-up Transformer No. 3 The polymer H-V insulators used in the Turkey Point Unit 3 SBO recovery path are manufactured by NGK-Locke. Polymer insulators are not addressed in the GALL-SLR Report. The applicant stated that SLRA Table 3.6.2-1 will be revised to include a new item for polymer high-voltage insulators consisting of silicone rubber, fiber glass, aluminum, alloy, stainless steel, and galvanized materials. The applicant also provided discussions for operating experience, surface buildup of contamination, aging studies, loss of material, reduced insulation resistance due to polymer degradation, and the need for a site-specific AMP for polymer high-voltage insulators. The applicant also provided additional degradation effects resulting from deposits and surface contamination, specifically, swelling of silicone rubber layer due to chemical contamination, sheath wetting caused by chemicals absorbed by oil from silicone rubber compound, chalking and crazing of insulator surfaces resulting in contamination, arcing, and flashover, and aggressive environments due to excrements from birds and rodents. The applicant provided the following discussion.

- The applicant stated that the operating experience in transmission and distribution systems demonstrates that polymer insulators are a reliable replacement for porcelain insulators and consistently operate with a long service life with little or no maintenance.
- The applicant stated that contamination flashovers account for less than 5% of polymer insulator failures. Laboratory tests and field installation experience have shown that polymer insulators exhibit resistance to contamination flashovers that is superior to that of ceramic insulators.
- The applicant stated that the NGK-Locke polymer H-V insulators installed on the Turkey Point Unit 3 SBO recovery path are specifically designed and manufactured to minimize the likelihood of failure modes identified by aging studies and operating experience with polymer insulators.
- The applicant stated that hydrophobicity is a property of the housing that causes excellent insulator contamination performance. On silicone surfaces, contamination becomes encapsulated so that the insulator may accumulate some contamination. Periodic rainfall tends to wash away any chemical contamination from the polymer H-V insulator surfaces.
- The applicant stated that silicone rubbers are characterized by having a low surface energy that results in highly hydrophobic surfaces. This property prevents the insulator surface from becoming completely wet.
- The applicant stated that hydrophobicity is the surface property that causes a water drop to form a bead. The silicone rubbers used in the insulators are highly hydrophobic. This property limits contamination-caused flashovers by preventing the formation of a conductive water film on the insulator surface. Silicone insulators have more hydrophobicity than other types of insulators. They also keep their hydrophobic properties over a long period of time.
- The applicant stated that damage to polymer insulators from rodents could possibly occur during storage or transportation but not while in service. The Turkey Point Unit 3 polymer H-V insulators are located on take-off structures far away from rodents. Birds of many species frequently roost on transmission and distribution structures or in substations. Birds can contaminate insulators with their droppings. Usually, insulators can perform satisfactorily with a small amount of bird dropping contamination. If the bird species is the type that flock or if a few but very large birds roost, enough contaminate may be deposited on insulators to cause arcing and flashover. Because of their hydrophobicity, washing polymer insulators is not a routine practice. The only situation where washing would become necessary is when an enormous amount of bird excrement has accumulated on the insulators.
- The applicant stated that like other high-voltage insulators, a loss of metallic material can occur due to mechanical wear caused by oscillating movement of insulators due to wind. Surface corrosion in metallic parts may appear due to contamination or where galvanized or other protective coatings are worn. Additionally, air-borne contamination, such as salt,

can cause surface corrosion in metallic parts leading to a loss of material. Excessive loss of material can lead to insulator flashover and failure. Although polymer high-voltage insulator wear is not significant enough to cause a loss of intended function, Turkey Point will implement a Polymer High-Voltage Insulators program to manage mechanical wear of metallic parts.

From this evaluation, the applicant concluded that the polymer high-voltage insulators used in the Turkey Point Unit 3 SBO recovery path have aging effects requiring management. A site-specific Polymer High-Voltage Insulator AMP will be implemented prior to the subsequent period of extended operation.

During its evaluation of the applicant's response to RAI B.2.3.40-1, the staff noted that the applicant addressed pertinent aging effects and mechanisms, considered industry and site-specific operating experience, evaluated surface buildup of contamination and loss of material, and reduced insulation resistance due to polymer degradation, as well as contamination from animal excrement, and incorporated appropriate material in the new item for SLRA Table 3.6.2-1, and will include a site-specific Polymer High-Voltage Insulator AMP. The staff also noted that EPRI 1003057, "Plant Support Engineering License Renewal Handbook," states that mechanical wear in high-voltage insulators is an aging effect for strain and suspension insulators in that they are subject to movement. Movement of insulators can be caused by wind blowing on the supported transmission conductor, causing it to swing. If this swing is frequent enough, it could cause wear in the metal contact point of the insulator string and between an insulator and supporting hardware. EPRI 1003057 indicates that this mechanism is possible, but that industry operating experience has shown that transmission conductors are designed to normally not swing, and, when they do (e.g., due to a substantial wind), transmission conductors do not continue to swing for a long period of time once the wind has subsided. The staff also noted that similar to porcelain high-voltage insulators, various air-borne contaminates such as dust, salt, fog, or industrial effluent can contaminate the polymer high-voltage insulator surface leading to reduced insulation resistance. The buildup of surface contamination is gradual and, in most cases, removed by rainfall. The silicone rubber of the polymer high-voltage insulator is superior to porcelain due to its hydrophobic properties. Excessive surface contaminants can lead to insulator flashover and failure. Although the rate of contaminant buildup on the polymer high-voltage insulators is not significant, the applicant will implement a polymer high-voltage insulator program. The staff finds the applicant's response and changes to SLRA Table 3.6.2-1 acceptable because degradation and aging effects of polymer high-voltage insulators have been appropriately evaluated and considered for the site-specific environment and conditions at Turkey Point. Furthermore, aging effects requiring management (i.e., reduced insulation resistance), although not expected, will be monitored by the site-specific Polymer High-Voltage AMP. The staff's evaluation of this AMP is provided in SER Section 3.0.3.3.2 The staff's concerns pertaining to polymer insulators as described in RAI B.2.3.40-1 are resolved.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL-SLR Report. The staff finds that 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, as required by 10 CFR 54.21(a)(3).

3.7 Conclusion for Aging Management Review Results

The NRC staff reviewed SLRA Section 3, "Aging Management Review Results," and SLRA Appendix B, "Aging Management Programs," as supplemented. Based on its audit and its review of the applicant's aging management review results and aging management programs, 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 current licensing basis for the subsequent period of extended operation, as required by 10 CFR 54.21(a)(3), with the exception of those programs related to open items as listed in SER Section 1.5. 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 aging management programs and activities credited for managing aging at Turkey Point.

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 Turkey Point Units 3 and 4, if issued, will continue to be conducted in accordance with the current licensing basis, and that any changes made to the current licensing basis 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.

4 TIME-LIMITED AGING ANALYSES

4.1 Identification of Time-Limited Aging Analyses

This safety evaluation report (SER) section provides the staff's evaluation of the applicant's basis for identifying those plant-specific and generic analyses that must be listed and evaluated as time-limited aging analyses (TLAAs) in the subsequent license renewal application (SLRA). TLAAs are certain plant-specific safety analyses that involve time-limited assumptions defined by the current operating term. This SER section also provides the staff's evaluation of Florida Power & Light's (FPL's) basis for identifying those exemptions that must be identified in the SLRA as required by Title 10 of the *Code of Federal Regulations* (10 CFR) Section 54.21(c)(2).

Under the requirements in 10 CFR 54.21(c)(1), a license renewal applicant must list all evaluations, analyses, and calculations in the current licensing basis (CLB) that conform to the definition of a TLAA. TLAAs are defined in 10 CFR 54.3, "Definitions," 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 [subsequent] period of extended operation;

(ii) The analyses have been projected to the end of the [subsequent] period of extended operation; or

(iii) The effects of aging on the intended function(s) will be adequately managed for the [subsequent] period of extended operation.

In addition, 10 CFR 54.21(c)(2) requires applicants to list all plant-specific exemptions granted under 10 CFR 50.12, "Specific exemptions," and in effect that are based on TLAAs. For any such exemptions, the applicant must also provide an evaluation that justifies the continuation of the exemptions for the subsequent period of extended operation.

4.1.1 Summary of Technical Information in the Application

SLRA Section 4.1 describes the process used by FPL to identify the TLAAs within the applicant's CLB and design basis documentation. The applicant identified the CLB and design basis documentation that was reviewed and searched to identify potential TLAAs. The document search was performed consistent with the guidance provided in NEI 17-01, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 for Subsequent License Renewal," NUREG-2191, "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 addition, FPL stated that it reviewed the Turkey Point CLB as required by 10 CFR 54.21(c)(2) to identify all plant-specific exemptions granted under 10 CFR 50.12, "Specific exemptions," and in effect that are based on TLAAs. FPL stated that it did not identify any exemptions for the CLB that are based on a TLAA.

4.1.2 Staff Evaluation

The NRC staff reviewed SLRA Section 4.1 in accordance with the guidance provided in SRP-SLR Section 4.1, "Identification of Time-Limiting Aging Analyses and Exemptions." Specifically, SRP-SLR Section 4.1.1 summarizes the areas of review. In addition, SRP-SLR Section 4.1.2 summarizes the staff's acceptance criteria for performing TLAA and SLRA exemption identification reviews, and Section 4.1.3 summarizes the staff's review procedures for performing the TLAA and SLRA exemption identification reviews.

SRP-SLR Table 4.1-1 provides a sample process for identifying potential TLAAs. SRP-SLR Table 4.1-2 provides a list of those analyses or calculations that are normally part of an applicant's CLB and identified as TLAAs (i.e., generic TLAAs). SRP-SLR Table 4.7-1 provides examples of potential plant-specific TLAAs that have been identified by license renewal applicants. The staff used the guidance and information in these SRP-SLR tables to assist its review in determining whether the applicant identified all applicable calculations and analyses in its CLB as TLAAs in its SLRA.

The SLRA states that the applicant searched the CLB and design basis documentation to identify potential TLAAs. The documentation that was searched included the following: updated final safety analysis report (UFSAR), Technical Specifications (TS) and bases, Technical Requirements Manual, docketed licensing correspondence, NRC SERs, design basis documents, fire protection plan/hazards analyses, Westinghouse design analyses and reports, vendor design analyses and reports, environmental qualification documentation packages, design specifications, and 10 CFR 50.12 exemption requests.

During the onsite audit conducted August 27–31, 2018, the staff confirmed that the applicant performed a search of its CLB and design basis documentation to identify potential TLAAs. It was noted that a list of specific key words was used during this search to identify potential TLAAs. The staff also confirmed that each potential TLAA identified during the applicant's search was reviewed against the six criteria of 10 CFR 54.3(a) and that those potential TLAAs that met all six criteria were identified as TLAAs that require evaluation for the subsequent period of extended operation.

During its audit, the staff also confirmed that the applicant performed a search of docketed licensing correspondence, the operating license, and the UFSAR to identify exemptions granted pursuant to 10 CFR 50.12 that are currently in effect. The staff also confirmed that these exemptions were then reviewed to determine whether the exemption was based on a TLAA, and that no 10 CFR 50.12 exemptions involve a TLAA as defined in 10 CFR 54.3.

During its review, the staff performed an independent search of the UFSAR and a sample of docketed licensing correspondence and NRC SERs to identify potential TLAAs. Based on this independent search, the staff did not identify TLAAs that were not already identified in the SLRA by the applicant.

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 performed a systematic and comprehensive review of its CLB and that the applicant identified the applicable TLAAs in accordance with 10 CFR 54.21(c)(1). Further, on the basis of its review, the staff concludes that there are not any exemptions in the CLB that are based on a TLAA, in accordance with 10 CFR 54.21(c)(2).

4.2 Reactor Vessel Neutron Embrittlement Analysis

4.2.1 Neutron Fluence Projections

4.2.1.1 Summary of Technical Information in the Application

SLRA Section 4.2.1 describes the applicant’s TLAA for neutron fluence projections.

The applicant dispositioned this TLAA for the reactor pressure vessel (RPV) beltline and extended beltline materials in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of aging due to fluence on the intended functions will be adequately managed by the Reactor Vessel Material Surveillance aging management program (AMP) (described in SLRA Section B.2.3.19) for the subsequent period of extended operation.

The applicant projected the expected neutron fluence values for the RPV to 80 years. FPL’s projected fluence values are for 72 effective full-power years (EFPY) based on the assumption of a 100 percent capacity factor from the present until the end of the subsequent period of extended operation. The applicant stated that these projections were performed using the methods described in Westinghouse Licensing Topical Report WCAP-14040-A, Revision 4, “Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves” (Agencywide Documents Access and Management System (ADAMS) Accession No. ML050120209), and in WCAP-16083-NP-A, “Benchmark Testing of the FERRET Code for Least Squares Evaluation of Light Water Reactor Dosimetry” (ADAMS Accession No. ML061600256). The applicant also stated that fluence projections using the same methods had been reviewed and approved by the staff in concert with the Turkey Point Units 3 and 4 extended power uprate (EPU) license amendment. The applicant indicated it will use the test results from the in-vessel surveillance capsules of the Reactor Vessel Material Surveillance AMP to periodically verify and update the neutron fluence projections.

4.2.1.2 Staff Evaluation

The staff reviewed the applicant’s TLAA for the RPV beltline and extended beltline materials and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.2.3.1.1.3.

The NRC provides guidance for acceptable fluence calculations in Regulatory Guide (RG) 1.190, “Calculational and Dosimetry Methods for Determining Reactor Pressure Vessel Neutron Fluence.” The staff has generically approved methods described in WCAP-14040-A and WCAP-16083-NP-A, based on their adherence to the guidance contained in RG 1.190. Specific examples include using a cross-section library that was derived from the Evaluated Nuclear Data File/Brookhaven, Version VI (ENDF/B-VI) nuclear data file, use of greater than S8 angular quadrature, and extensive qualification to experimental data, including the Pool Critical Assembly at Oak Ridge National Laboratory.

Furthermore, the staff notes that the same methods were used to perform fluence projections to the end of the renewed, 60-year operating license in concert with an EPU that the NRC approved in 2012. Therefore, the staff has previously determined that fluence projections obtained using the same methods as those described in the SLRA were acceptable for use at Turkey Point Units 3 and 4. In its present review, the staff verified that Section 2.1.1 of the safety evaluation (SE) approving the EPU determined that these fluence projections were acceptable, as described in Section 2.1.1 of that SE (ADAMS Package Accession No. ML11293A359).

Because the applicant performed its fluence calculations using NRC-approved methods that adhere to RG 1.190, the staff determined that the fluence projections are acceptable. In addition, the staff noted that the applicant based the remaining TLAAs in SLRA Section 4.2 on a 72-year projection, which assumes a 100-percent capacity factor for the duration of the subsequent period of extended operation. The staff finds this assumption conservative because the plant cannot realistically achieve a 100-percent capacity factor, which means this assumed 72-year neutron fluence period overestimates the actual neutron fluence that would be expected at the end of the subsequent period of extended operation.

SRP-SLR Section 4.2.2.1.1.3 states that in the GALL-SLR Report AMP X.M2, “Neutron Fluence Monitoring,” the staff has evaluated an AMP for projecting and monitoring neutron fluence for the subsequent period of extended operation. It also states that the staff has determined that this program is acceptable to project and monitor neutron fluence as a basis for managing loss of fracture toughness due to neutron irradiation embrittlement of RPVs in accordance with 10 CFR 54.21(c)(1)(iii).

Because the staff determined that the applicant will monitor the neutron fluence of the RPV beltline and extended beltline components in accordance with its Neutron Fluence Monitoring AMP, which the staff found to be consistent with GALL-SLR Report AMP X.M2, “Neutron Fluence Monitoring” (documented in SER Section 3.0.3.2.2), the staff finds that the applicant’s Neutron Fluence Projections TLAA is consistent with the acceptance criteria in SRP-SLR Section 4.2.2.1.1.3, and is therefore acceptable in accordance with 10 CFR 54.21(c)(1)(iii).

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of aging due to neutron fluence on the intended functions of the RPV beltline and extended beltline materials will be adequately managed for the subsequent period of extended operation.

4.2.1.3 UFSAR Supplement

SLRA Section A.17.3.2.1 provides the UFSAR supplement summarizing the Neutron Fluence Projections TLAA. The staff reviewed SLRA Section A.17.3.2.1 consistent with the review procedures in SRP-SLR Section 4.2.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is therefore acceptable.

4.2.1.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of aging due to neutron fluence on the intended functions of the RPV beltline and extended beltline materials will be adequately managed for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the neutron fluence projection TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.2.2 Pressurized Thermal Shock

4.2.2.1 Summary of Technical Information in the Application

SLRA Section 4.2.2 describes the applicant’s TLAA for pressurized thermal shock (PTS). The applicant stated that the PTS analysis has been determined to be a TLAA.

The applicant dispositioned the PTS TLAA for the RPV beltline and extended beltline materials in accordance with 10 CFR 54.21(c)(1)(ii) to demonstrate that the analysis has been projected to the end of the subsequent period of extended operation.

The applicant provided the input values and results of the PTS evaluation for Turkey Point Units 3 and 4 in SLRA Tables 4.2.2-1 and 4.2.2-2, respectively.

The applicant noted that it received an exemption from 10 CFR Part 50, Appendix H and 10 CFR 50.61, to use the methodology of BAW-2308, Revision 1-A and Revision 2-A to determine the initial RT_{NDT} ($RT_{NDT(u)}$) values for certain welds. The NRC authorized this exemption by letter dated March 11, 2010 (ADAMS Accession No. ML100150599), and it is only applicable to certain Linde 80 welds.

4.2.2.2 Staff Evaluation

The staff reviewed the applicant’s TLAA for the RPV beltline and extended beltline materials and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.2.3.1.3.2.

SRP-SLR Section 4.2.2.1.3 states:

> For PWRs, 10 CFR 50.61 requires that the reference temperature for RPV beltline materials evaluated at the neutron fluence corresponding to the end of the subsequent period of extended operation [i.e., reference temperature for pressurized thermal shock (RT_{PTS})] be less than the PTS screening criteria at the expiration date of the operating license, unless otherwise approved by the NRC. The PTS screening criteria are 132 °C (Celsius) [270 °F (Fahrenheit)] for plates, forgings, and axial weld materials, and 149 °C (300 °F) for circumferential weld materials.

The staff reviewed the applicant's PTS evaluation against the acceptance criteria in SRP-SLR Section 4.2.2.1.3.2, which states that (for a disposition in accordance with 10 CFR 54.21(c)(1)(ii)) the PTS analysis is re-evaluated to consider the subsequent period of extended operation in accordance with 10 CFR 50.61 or 10 CFR 50.61a. The SRP-SLR further states that if the analyses result in RT_{PTS} values that exceed the PTS screening criteria at the end of the subsequent period of extended operation, the applicant is required to implement additional corrective actions as described in 10 CFR 50.61 or 10 CFR 50.61a. If the existing PTS analysis is based on 10 CFR 50.61a, the applicant updates the submittal to reflect the subsequent period of extended operation.

During its review of the applicant's PTS TLAA, the staff needed additional information and issued an RAI. RAI 4.2-1 and the applicant's response are documented in ADAMS Accession No. ML18299A214.

During its evaluation of the applicant's response to RAI 4.2-1, the staff noted that the applicant provided the requested information clarifying how the $RT_{NDT(u)}$ values and the associated σ_u values were determined for certain RPV materials. The applicant indicated that revised values were determined from a larger generic database for U.S. supplied forgings or Linde 80 welds as applicable and are therefore considered more representative than the previous licensing basis values. In addition, the applicant indicated that for the Turkey Point Units 3 and 4 inlet and outlet nozzle welds, three weld heats were previously assigned to all three welds because it was not known which specific heats applied to which welds. However, the applicant conducted additional fabrication records research and was able to identify the specific weld wire heats applicable to each weld. In addition, for both units, the lower shell to transition ring circumferential weld was not identified as an extended beltline material for the EPU; therefore, no values were reported. For the SLRA, this weld is now identified as an extended beltline component requiring evaluation for PTS; therefore, the generic database values of $RT_{NDT(u)}$ and σ_u for Linde 80 welds were used. The applicant cited a proprietary Framatome report as the source of this data. The staff finds that the applicant has provided an acceptable explanation for the changes in the values because generic values derived from a larger database of the appropriate material type should generally be more representative of the materials of concern. RAI 4.2-1 is thus resolved.

FPL provided RT_{PTS} calculations for several RPV materials based on surveillance data. The chemistry factor (CF) values for these materials are slightly different than the CFs in the previous analysis of record (Turkey Point Units 3 and 4 EPU Licensing Report, ADAMS Accession No. ML103560177). During the audit, the staff reviewed the calculations of the revised CFs, and found them acceptable. The staff notes that the final SE of BAW-2308, Revision 1-A (ADAMS Accession No. ML052070408) requires as a condition the use of a minimum CF of 167 °F. The RPV shell welds for which the applicant used the BAW-2308, Revision 1-A and 2-A method all used CFs greater than or equal to 167 °F without surveillance data. The CF calculated using surveillance data is lower than 167 °F for the intermediate shell (IS) to lower shell (LS) weld for Turkey Point Units 3 and 4. However, because of the SE condition, the CF from surveillance data cannot be used. The staff also notes that the surveillance data for this weld is non-credible (ADAMS Accession No. ML110700068), which would prevent the use of a lower CF value regardless of the condition from the BAW-2308, Revision 1-A (ADAMS Accession No. ML052070408) and 2-A SE (ADAMS Accession No. ML080770349). The other material for which the CF changed is the Turkey Point Unit 4 LS forging. The staff noted that the change is small, and the LS forging RT_{PTS} value is far below the screening criterion. Therefore, because there is significant margin between the LS forging RT_{PTS} value and the screening criterion, the staff finds that the change in CF to the LS forging is acceptable. The staff finds that the minor differences in the CFs calculated from the surveillance data from the CLB values either do not affect the calculation of the RT_{PTS} values or have only a minor effect that would not challenge the screening criteria and are therefore acceptable.

For the upper shell (US)-to-IS and IS-to-LS circumferential welds, the staff verified that the $RT_{NDT(u)}$ and σ_u values were the same as those approved in the exemption (ADAMS Accession No. ML100150599). These values are from BAW-2308, Revision 2-A in the column headed "With Proposed ASTM E1921 Loading Rate Adjustment," in Table 3-1 of the request for exemption dated March 18, 2009 (ADAMS Accession No. ML090920408).

The staff performed confirmatory calculations of the applicant's RT_{PTS} values at the end of the subsequent period of extended operation and duplicated the applicant's results. The staff determined the applicant's RT_{PTS} values have been determined in accordance with 10 CFR 50.61, using neutron fluence values for 80 years (72 EFPY) determined in accordance with methods acceptable to the staff (see SER Section 4.2.1) and are therefore acceptable.

The staff finds that the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(ii), that the PTS analyses for the RPV beltline and extended beltline materials have been projected to the end of the subsequent period of extended operation.

Additionally, the PTS analyses meets the acceptance criteria in SRP-SLR Section 4.2.2.1.3.2 because the applicant re-evaluated the RT_{PTS} values for the Turkey Point Units 3 and 4 RPV beltline and extended beltline materials in accordance with 10 CFR 50.61, and all the RT_{PTS} values are less than the PTS screening criteria at end-of-license. Therefore, the staff finds that the applicant's TLAA for PTS is in accordance with 10 CFR 54.21(c)(1)(ii).

4.2.2.3 UFSAR Supplement

SLRA Section A.17.3.2.2 provides the UFSAR supplement summarizing the Pressurized Thermal Shock TLAA. The staff reviewed SLRA Section A.17.3.2.2 consistent with the review procedures in SRP-SLR Section 4.2.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is therefore acceptable.

4.2.2.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the RT_{PTS} values of the RPV beltline and extended beltline materials have been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the PTS TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.2.3 Upper-Shelf Energy

4.2.3.1 Summary of Technical Information in the Application

SLRA Section 4.2.3 describes the applicant's TLAA for upper-shelf energy (USE).

The applicant dispositioned the USE evaluation for the RPV beltline and extended beltline materials in accordance with 10 CFR 54.21(c)(1)(ii) to demonstrate that the effects of loss of fracture toughness have been projected to the end of the subsequent period of extended operation.

The applicant's description of the USE TLAA indicates that the USE values of the RPV beltline and extended beltline materials have been projected to the end of the subsequent period of extended operation using the methodology of RG 1.99, Revision 2, and demonstrated to remain equal to or greater than 50 ft-lbs, or an equivalent margins analysis (EMA) has been performed. The applicant indicated that the USE of several RPV beltline materials fell below 50 ft-lbs early in plant life, so an EMA was submitted to the NRC and approved for 32 EFPY (corresponding to the initial 40-year license). The EMA was subsequently revised for initial license renewal to extend the applicability to 48 EFPY. The SLRA states that "As part of the EPU analyses, an additional USE fracture mechanics evaluation was performed in accordance with Appendix K of ASME Section XI to demonstrate continued acceptable equivalent margins of safety against fracture through 48 EFPY using the EPU fluence values." As described in SLRA Section 4.2.3, the applicant again revised the EMA to support 72 EFPY of operation for subsequent license renewal.

A detailed description of the EMA is provided in SLRA Section 4.2.3. The applicant stated that the American Society of Mechanical Engineers(ASME) Code Section XI, acceptance criteria for Levels A through D Service Loadings for all Turkey Point Units 3 and 4 reactor vessel beltline and extended beltline Linde 80 welds are satisfied and are reported in AREVA reports ANP-3646NP/P-000, Revision 0, "Low Upper-Shelf Toughness Fracture Mechanics Analysis of Turkey Point Units 3 and 4 Reactor Vessels for Levels A & B Service Loads at 80 Years," and ANP-3647NP/P-000, Revision 0, "Low Upper-Shelf Toughness Fracture Mechanics Analysis of Turkey Point Units 3 and 4 Reactor Vessels for Levels C & D Service Loads at 80 Years." The applicant provided the summary of the results of the EMA for Turkey Point Unit 3, which indicates that the EMA results meet the acceptance criteria of the ASME Code, Section XI, Nonmandatory Appendix K. The applicant also provided a description of the fracture toughness models used in the EMAs, including how its use was validated for 80 years. The model is described in detail in Attachments 2 and 3 of Enclosure 4 to the SLRA, Revision 1, transmittal letter (Public Version, ADAMS Accession No. ML18037A837).

4.2.3.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the USE of the RPV beltline and extended beltline materials and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.2.3.1.2.2.

The acceptance criteria section in SRP-SLR Section 4.2.2.1.2.2 states:

> The RPV components evaluated in the existing USE analysis or NRC-approved EMA are re-evaluated to consider the subsequent period of extended operation in accordance with10 CFR Part 50, Appendix G.
>
> 10 CFR Part 50, Appendix G, Section IV.A.1, requires applicants to take further corrective actions where the 68 Joule (J) (50 ft-lb) end-of-life (EOL) USE criterion cannot be met. When this occurs, a licensee is required to submit a supplemental analysis for NRC approval. The applicant will need to submit a plant-specific engineering analysis (usually an EMA) for NRC approval as supplemental information for subsequent license renewal (SLR).

Note 2 to Tables 4.2.3-1 and 4.2.3-2 states that the minimum fluence value on Figure 2 of RG 1.99, Revision 2 is 1 x 10^{18} n/cm^2 (E > 1.0 MeV) and the maximum value is 6 x 10^{19} n/cm^2 (E > 1.0 MeV). Note 2 further states that for projections with fluence less than 1 x 10^{18} n/cm^2, the decrease at 1 x 10^{18} n/cm^2 will be used, and that for projections with the fluence greater than 6 x 10^{19} n/cm^2 the decrease will be estimated at the lesser of the next higher copper value line or the maximum predicted decrease of 60 percent. The staff finds this to be conservative. The staff verified the applicant's USE values using Figure 2 of RG 1.99, Revision 2, and applying the provisions of Note 2. The staff confirmed the applicant's results with respect to the USE at the end of the subsequent period of extended operation. Therefore, the staff finds that the applicant has acceptably projected the USE values.

The staff's review of the EMA analyses is detailed below.

<u>EMA Analysis for Turkey Point Units 3 and 4</u>

The plant-specific EMA reports for Turkey Point Units 3 and 4 both state in the introduction that the EMA reported therein is technically identical to the EMA reported in the corresponding topical reports (TRs), BAW-2192P, Supplement 1, Revision 0, and BAW-2178, Supplement 1, Revision 0, which the Pressurized Water Reactor Owner's Group (PWROG) submitted to the NRC on December 15, 2017. The TRs were approved by SE dated December 7, 2018 (ADAMS Accession No. ML18333A124). Therefore, the staff's review of the EMA consisted of verification that the content of the Turkey Point plant-specific reports is technically identical to the Turkey Point portions of the two TRs.

Service Level A & B EMA Analysis

ANP-3646NP states that the analysis in the report is technically identical to the analysis for Turkey Point Units 3 and 4 in TR BAW-2192 Supplement 1, Revision 0, which was submitted to the NRC on December 15, 2017. The staff verified that the input values for material properties, RPV geometry, and neutron fluence in ANP-3646NP are identical to those for Turkey Point Units 3 and 4 in BAW-2192 Supplement 1, Revision 0. The staff also verified that the methodology and results for Turkey Point Units 3 and 4 are identical between the TR and the plant-specific EMA report.

In its final SE of BAW-2192 Supplement 1, Revision 0, the staff concluded that BAW-2192, Supplement 1, Revision 0 demonstrates, for the seven plants within the scope of the TR, that there is adequate margin of safety against ductile fracture in the RPV welds for Service Level A and B loads, through 80 calendar years of operation. The staff also concluded that the TR may be referenced in SLRAs for the plants within scope of the report, as a basis for demonstrating that the USE TLAA has been projected in accordance with 10 CFR 54.21(c)(1)(ii), for Linde 80 welds in those plants.

The staff compared the neutron fluence values used in the ANP-3646NP to those listed in SLRA Tables 4.2.3-1 and 4.2.3-2. The 1/4T neutron fluence values calculated from the inner diameter (ID) fluence values listed in Table 3-1 of ANP-3646NP/P-000 are larger than those listed in SLRA Tables 4.2.3-1 and 4.2.3-2, which is conservative. Therefore, the staff finds that the neutron fluence values used for the Service Level A & B EMA analysis are acceptable.

In summary, the staff finds that the applicant's EMA analysis for Service Level A and B loadings was performed using a methodology acceptable to the staff, consistent with the staff's SE for BAW-2192P.

The staff finds that the applicant has demonstrated that the Linde 80 weld materials for Turkey Point Units 3 and 4 have equivalent margins against ductile fracture at the end of the subsequent period of extended operation under Service Level A and B loadings to those required by Appendix G of Section XI of the ASME Code; therefore, the applicant's EMA analysis satisfies the requirements of 10 CFR Part 50, Appendix G.

Service Level C & D EMA Analyses

ANP-3647NP states that the Turkey Point EMA reported therein is technically identical to the Turkey Point EMA reported in BAW-2178P, Supplement 1, Revision 0, which the PWROG submitted to the NRC on December 15, 2017. The staff verified that the input values for material properties, RPV geometry, and neutron fluence in ANP-3646NP are identical to those for Turkey Point Units 3 and 4 in BAW-2192 Supplement 1, Revision 0. The staff also verified that the methodology and results for Turkey Point Units 3 and 4 are identical between the TR and the plant-specific EMA report.

In its SE of BAW-2178, Supplement 1, Revision 0, the staff concludes that the TR demonstrates, for the seven plants within the scope of the TR, that there is an adequate margin of safety against ductile fracture in the RPV welds for Service Level C and D loads, through 80 calendar years of operation. The staff also concludes that the TR may be referenced in SLRAs for the plants within scope of the report, as a basis for demonstrating that the USE TLAA has been projected in accordance with 10 CFR 54.21(c)(1)(ii), for Linde 80 welds in those plants.

The staff compared the neutron fluence values used in ANP-3647NP to those listed in SLRA Tables 4.2.3-1 and 4.2.3-2. The 1/4T neutron fluence values calculated from the ID fluence values listed in Table 3-1 of ANP-3647NP/P-000 are larger than those listed in SLRA Tables 4.2.3-1 and 4.2.3-2, which is conservative. Therefore, the staff finds that the neutron fluence values used for the Service Level C & D EMA analysis is acceptable.

In summary, because the applicant's EMA for Service Level C & D loads is identical to the EMA analysis in an approved TR, the staff finds that the applicant's EMA analysis for Service Level C and D loadings is acceptable, consistent with the staff's SE for BAW-2178P.

The staff finds that the applicant has demonstrated that the Linde 80 weld materials for Turkey Point Units 3 and 4 have equivalent margins against ductile fracture at EOL under Service

Level C and D loadings to those required by Appendix G of Section XI of the ASME Code, and thus the applicant's EMA analysis satisfies the requirements of 10 CFR Part 50, Appendix G.

The staff also finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(ii), that the USE analysis for the RPV beltline and extended beltline materials have been projected to the end of the subsequent period of extended operation.

Additionally, the applicant's evaluation of the USE TLAA meets the acceptance criteria in SRP-SLR Section 4.2.2.1.2.2 because the applicant has re-evaluated the USE values for the RPV beltline and extended beltline materials for 80 years, and for those materials with USE values predicted to fall below 50 ft-lbs, the applicant performed an EMA, which was found acceptable by the staff. Therefore, the staff finds that the applicant has acceptably projected the USE TLAA through the end of the subsequent period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.2.3.3 UFSAR Supplement

SLRA Section A.17.3.2.3 provides the UFSAR supplement summarizing the USE TLAA. The staff reviewed SLRA Section A.17.3.2.3 consistent with the review procedures in SRP-SLR Section 4.2.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is therefore acceptable.

4.2.3.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the USE evaluation for the RPV beltline and extended beltline materials has been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the USE TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.2.4 Adjusted Reference Temperature

4.2.4.1 Summary of Technical Information in the Application

SLRA Section 4.2.4 describes the applicant's TLAA for adjusted reference temperature (ART). The ART of the limiting beltline material is used to adjust the beltline pressure-temperature (P-T) limit curves to account for irradiation effects. RG 1.99, Revision 2, provides the methodology for determining the ART of the limiting material. The ART values are used as input to the P-T limits but are not independently used to make a safety determination.

The applicant indicated it used fluence values for 72 EFPY to determine the ART at the one-quarter RPV thickness (1/4T) and three-quarter RPV thickness (3/4T) locations in accordance with RG 1.99, Revision 2. The applicant stated that the ART values of the limiting beltline materials at 72 EFPY correspond to the intermediate shell to lower shell circumferential weld for Turkey Point Unit 3, and the intermediate shell to lower shell circumferential weld for Turkey Point Unit 4.

The applicant dispositioned the TLAA for the RPV beltline and extended beltline materials in accordance with 10 CFR 54.21(c)(1)(ii) to demonstrate that the analysis has been projected to the end of the subsequent period of extended operation. The applicant provided its calculations of the ART of all RPV beltline and extended beltline materials in Tables 4.2.4-1 (Turkey Point Unit 3) and 4.2.4-2 (Turkey Point Unit 4).

4.2.4.2 Staff Evaluation

The staff reviewed the applicant's TLAA for ART and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii), consistent with the review procedures in SRP-SLR Section 4.7.3.1.2.

The staff performed confirmatory calculations of the applicant's 72 EFPY ART values using the methodology of RG 1.99, Revision 2. The staff used the ID neutron fluence values provided in the PTS analysis in SLRA Tables 4.2.2-1 and 4.2.2-2, along with the attenuation formula from RG 1.99, Revision 2, to independently verify the 1/4T and 3/4T neutron fluence values. Because the RPV shell thickness is needed to calculate the fluence at the 1/4T and 3/4T locations, but was not provided in SLRA Section 4.2.4, the staff obtained RPV thickness values from Attachment 2 to Enclosure 5 of the SLRA, Areva Topical Report ANP-3646P, Revision 0, "Low Upper-Shelf Toughness Fracture Mechanics Analysis of Turkey Point Units 3 and 4 Reactor Vessels for Levels A & B Service Loads at 80 Years," dated January 5, 2018. The ART values determined by the staff closely matched the applicant's ART values. Therefore, the staff determined that the applicant appropriately projected the ART values for 72 EFPY using the methodology of RG 1.99, Revision 2.

RAI 4.2-1, pertaining to changes in certain $RT_{NDT(u)}$ and σ_u values from the previous licensing basis values, is described in detail in Section 4.2.2, and is also applicable to the ART analyses. In its response to RAI 4.2-1 documented in ADAMS Accession No. ML18299A214, the applicant provided the requested information. As detailed in SER Section 4.2.2, the staff finds that the applicant has provided an acceptable explanation for the changes in the values. RAI 4.2-1 is thus resolved.

Therefore, the staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(ii), that the ART values for the RPV beltline and extended beltline materials have been projected to the end of the subsequent period of extended operation.

4.2.4.3 UFSAR Supplement

SLRA Section A.17.3.2.4 provides the UFSAR supplement summarizing the ART TLAA. The staff reviewed SLRA Section A.17.3.2.4 consistent with the review procedures in SRP-SLR Section 4.2.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is therefore acceptable.

4.2.4.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the ART values for the RPV beltline and extended beltline materials have been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the ART TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.2.5 Pressure-Temperature Limits and LTOP Setpoints

4.2.5.1 Summary of Technical Information in the Application

SLRA Section 4.2.5 contains a description of the applicant's TLAA for pressure-temperature (P-T) limits and low-temperature overpressure protection (LTOP) setpoints. The applicant dispositioned the P-T limits and LTOP TLAA in accordance with 10 CFR 54.21(c)(1)(iii). The applicant stated that the effects of aging on the intended function(s) of the reactor vessels will be adequately managed for the subsequent period of extended operation. The Reactor Vessel Material Surveillance AMP (Section B.2.3.19) will ensure that updated P-T limits based upon updated ART values will be submitted to the NRC for approval prior to exceeding the current terms of applicability in the TS for Turkey Point Units 3 and 4.

The applicant stated that the current P-T limits are based upon fluence projections that were considered to represent the amount of power to be generated over 60 years of plant operation, assuming a 60-year average capacity factor of 80 percent. Since they are currently based upon a 60-year assumption regarding capacity factor, the P-T limits satisfy the criteria of 10 CFR 54.3(a) and have been identified as TLAAs.

The applicant stated that the current Turkey Point Units 3 and 4 heatup and cooldown curves were calculated using the most limiting value of RT_{NDT} corresponding to the limiting material in the beltline region of the reactor vessel for 48 EFPY based on EPU fluences. Turkey Point Units 3 and 4 reactor vessel P-T limit curves are contained in plant Technical Specification 3/4.4.9. The applicant stated that prior to exceeding 48 EFPY, new P-T limit curves will be generated to cover plant operation beyond 48 EFPY, using NRC-approved analytical methods. The applicant stated that the analysis of the P-T curves will consider locations outside of the beltline, such as nozzles, penetrations and other discontinuities to determine if more restrictive P-T limits are required than would be determined by considering only the reactor vessel beltline materials. The UFSAR supplement also includes the previous statement regarding consideration of nozzles and discontinuities.

The applicant additionally stated that Turkey Point Technical Specification 3/4.4.9.3 specifies the power-operated relief valve (PORV) lift settings to mitigate the consequences of LTOP events, and that, each time the P-T limit curves are revised, the LTOP PORV setpoints must be re-evaluated. The applicant stated that therefore, LTOP protection limits are considered part of the calculation of P-T curves. Finally, the applicant stated that the P-T limit curves and LTOP PORV setpoints will be updated (if required) and a TS change request will be submitted for approval prior to exceeding the current 48 EFPY limits.

4.2.5.2 Staff Evaluation

The staff reviewed the applicant's TLAA for P-T Limits and LTOP, and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.2.3.1.4.3.

SRP-SLR Section 4.2.2.1.4.3 states that updated P-T limits for the subsequent period of extended operation must be established and completed using the applicable TS change process for updating the P-T limit curves prior to the plant's entry into the subsequent period of extended operation. The SRP-SLR further states that the 10 CFR 50.90 process for P-T limits located in the limiting conditions for operation (LCOs) or the administrative controls process for P-T limits that are administratively amended through a PTLR process can be considered adequate AMPs or aging management activities within the scope of 10 CFR 54.21(c)(1)(iii), such that P-T limits will be maintained through the subsequent period of extended operation.

The applicant stated that the analysis of the P-T curves will consider locations outside of the beltline, such as nozzles, penetrations and other discontinuities to determine if more restrictive P-T limits are required than would be determined by considering only the reactor vessel beltline materials. This information is included in the UFSAR supplement for the P-T Limits and LTOP setpoint TLAA. Therefore, the staff finds it acceptable that these non-beltline areas will be considered in the development of the P-T limits, consistent with the clarification discussed in Regulatory Information Summary (RIS) 2014-11.

The applicant stated that the P-T limits and LTOP TLAA will be managed by the Reactor Vessel Materials Surveillance AMP, rather than the 10 CFR 50.90 process. The staff finds that the use of the Reactor Vessel Materials Surveillance AMP is appropriate to manage the P-T limits and LTOP TLAA because it provides data on neutron embrittlement and neutron fluence of the RPV materials. The staff's evaluation of the Reactor Vessel Materials Surveillance program is documented in SER Section 3.0.3.1.3, which determined that the AMP will be adequate to manage the applicable aging effects. Also, since the P-T limits and LTOP setpoints are in the LCOs of the TS for Turkey Point Units 3 and 4, changes to these limits must be submitted to the NRC via a license amendment request under the 10 CFR 50.90 process.

Therefore, the staff finds that the P-T limits and LTOP setpoints TLAA will be adequately managed during the subsequent period of extended operation by the Reactor Vessel Material Surveillance AMP and the 10 CFR 50.90 process.

4.2.5.3 UFSAR Supplement

SLRA Section A.17.3.2.5 provides the UFSAR supplement summarizing the P-T Limits and LTOP Setpoints TLAA. The staff reviewed SLRA Section A.17.3.2.5 consistent with the review procedures in SRP-SLR Section 4.2.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.2.2.2 and is therefore acceptable.

4.2.5.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the P-T limits and LTOP setpoints TLAA will be adequately managed during the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the PTS TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.3 Metal Fatigue

SLRA Section 4.3 provides the TLAAs associated with the thermal and mechanical fatigue analyses of plant mechanical components. Fatigue is an age-related degradation mechanism caused by cyclic stressing of a component by either mechanical or thermal stresses. Evaluation of fatigue analyses of Class 1 components is provided in SLRA Section 4.3.1. Fatigue analysis of piping components is discussed in SLRA Section 4.3.2. Evaluation of environmentally assisted fatigue (EAF) is documented in SLRA Section 4.3.3. In addition, reactor vessel underclad cracking and RCP flywheel evaluations are documented in SLRA Sections 4.3.4 and 4.3.5, respectively.

4.3.1 Metal Fatigue of Class 1 Components

4.3.1.1 Summary of Technical Information in the Application

SLRA Section 4.3.1, as amended by letter dated October 24, 2018, describes the applicant's metal fatigue TLAA for the reactor vessels, reactor vessel internals, pressurizers, steam generators (SGs), reactor coolant pumps (RCPs), and pressurizer surge lines that were designed in accordance with the ASME Boiler and Pressure Vessel Code, Section III, Class 1. The applicant dispositioned these metal fatigue TLAAs, as amended by letter dated October 24, 2018, in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of fatigue of these components on the intended functions will be adequately managed by the Fatigue Monitoring program for the subsequent period of extended operation.

4.3.1.2 Staff Evaluation

The staff reviewed the applicant's metal fatigue TLAA, as amended by letter dated October 24, 2018, for the reactor vessels, reactor vessel internals, pressurizers, SGs, RCPs, and pressurizer surge lines, which were designed in accordance with the ASME Code, Section III, Class 1, 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.

Based on its review of SLRA Section 4.3.1, the staff needed additional information and issued an RAI. RAI 4.3.1-1 and the applicant's response are documented in ADAMS Accession No. ML18299A214.

During its evaluation of the applicant's response to RAI 4.3.1-1, the staff noted that the applicant clarified the inconsistency about the disposition of its TLAA for metal fatigue of Class 1 components and revised the disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), so that the effects of aging on the intended function will be adequately managed by the Fatigue Monitoring program for the subsequent period of extended operation. The staff finds the applicant's response and changes to the disposition of the metal fatigue of Class 1 component TLAAs acceptable, because the Fatigue Monitoring program will continue to monitor and ensure the validity of these TLAAs and trigger corrective actions prior to analyses becoming invalid during the subsequent period of extended operation.

Additionally, the metal fatigue TLAA for the reactor vessels, reactor vessel internals, pressurizers, SGs, RCPs, and pressurizer surge lines meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3 because the use of the Fatigue Monitoring program is consistent with the SRP-SLR and the program continually monitors and ensures the validity of these TLAAs and trigger corrective actions prior to analyses becoming invalid during the subsequent period of extended operation. The staff's evaluation of the Fatigue Monitoring program is documented in SER Section 3.0.3.2.1, which determined that the AMP, with enhancements, will be adequate to manage the applicable aging effects.

4.3.1.3 UFSAR Supplement

SLRA Section A.17.3.3.1, as amended by letter dated October 24, 2018, provides the UFSAR supplement summarizing the Metal Fatigue TLAA for ASME Boiler and Pressure Vessel Code, Section III, Class 1 Components. The staff reviewed SLRA Section A.17.3.3.1 consistent with the review procedures in SRP-SLR Section 4.3.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA, as amended, meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is therefore acceptable.

4.3.1.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the Class 1 components designed in accordance with the ASME Code, Section III, will be adequately managed by the Fatigue Monitoring program for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the metal fatigue of Class 1 components TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.3.2 Metal Fatigue of Piping Components

4.3.2.1 Summary of Technical Information in the Application

SLRA Section 4.3.2 describes the applicant's metal fatigue TLAA for the reactor coolant system (RCS) primary loop piping and balance-of-plant piping systems designed to American National Standards Institute (ANSI) B31.1, Power Piping, and the Turkey Point Unit 4 emergency diesel generator safety-related piping. The applicant dispositioned these metal fatigue TLAAs in accordance with 10 CFR 54.21(c)(1)(i) to demonstrate that the analyses remain valid for the subsequent period of extended operation. By letter dated October 24, 2018, the applicant amended SLRA Section 4.3.2 and SLRA Table 4.1-2 to revise the disposition of the TLAA for the RCS B hot leg tubing to be in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of fatigue of this component on the intended functions will be adequately managed by the Fatigue Monitoring program for the subsequent period of extended operation.

4.3.2.2 Staff Evaluation

The staff reviewed the applicant's metal fatigue TLAA for the RCS primary loop piping and balance-of-plant piping systems designed to ANSI B31.1, Power Piping, and the Turkey Point Unit 4 emergency diesel generator safety-related piping, 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.

During its review of the applicant's Metal Fatigue of Piping Components TLAA, the staff needed additional information and issued RAIs. RAIs 4.3.2-1, 4.3.2-2, and 4.3.2-3, and the applicant's response are documented in ADAMS Accession No. ML18299A214.

In RAI 4.3.2-1, the staff needed to determine whether the applicant used the methodology in Electric Power Research Institute (EPRI) Report TR-104534 to exclude systems or portions of systems from consideration in the SLRA as a TLAA. In its response to RAI 4.3.2-1, the applicant revised SLRA Section 4.3.2 to confirm "[a]ll non-Class 1 mechanical systems within the scope of the [Turkey Point] SLRA were initially screened for the TLAA associated with metal fatigue." The staff noted from the applicant's revisions to SLRA Section 4.3.2 that the methodology in EPRI Report TR-104534 was conservatively used after this initial screening of its fatigue analyses as TLAAs. The staff finds the RAI response and revisions to SLRA Section 4.3.2 acceptable because the applicant confirmed that it initially screened its fatigue analyses for TLAAs, in accordance with 10 CFR Part 54, and then conservatively screened for additional non-Class 1 components and systems that may be subject to fatigue during the subsequent period of extended operation.

In RAI 4.3.2-2, the staff needed to understand how the applicant determined the number of projected cycles presented in SLRA Table 4.3.2 2 that are used to support the disposition of these metal fatigue TLAAs in accordance with 10 CFR 54.21(c)(1)(i). During its evaluation of the applicant's response to RAI 4.3.2-2, the staff noted that the applicant provided a detailed discussion of how it determined the number of expected cycles for each of the systems in SLRA Table 4.3.2-2. Furthermore, the staff noted that the applicant provided a detailed justification that the number of projected full temperature cycles for 80 years of plant operation for the piping, tubing and in-line components. The staff finds the applicant's response acceptable because (1) the number of projected full temperature cycles through the subsequent period of extended operation for these components was conservative and (2) the margin between these projections and the assumed thermal cycles in the fatigue calculations is sufficient.

In RAI 4.3.2-3, the staff needed more information regarding the applicant's disposition of the RCS B hot leg tubing TLAA in accordance with 10 CFR 54.21(c)(1)(i). During its evaluation of the applicant's response to RAI 4.3.2-3, the staff noted that the applicant revised the disposition of the RCS B hot leg tubing TLAA to be in accordance with 10 CFR 54.21(c)(1)(iii), such that the Fatigue Monitoring program will manage the effects of fatigue through the subsequent period of extended operation. The staff finds the applicant's response and changes to the disposition of the RCS B hot leg tubing TLAA acceptable because the Fatigue Monitoring program will continue to monitor and ensure the validity of the RCS B hot leg tubing TLAA and trigger corrective actions prior to analyses becoming invalid during the subsequent period of extended operation.

The staff finds that the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i), that the RCS primary loop piping and balance-of-plant piping systems designed to ANSI B31.1, Power Piping, and the Turkey Point Unit 4 emergency diesel generator safety-related piping, with the exception of the RCS B hot leg tubing, remains valid for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.1 because the number of full temperature cycles, including transient severity, expected to occur through the subsequent period of extended operation for these components, are not projected to exceed the limits evaluated in the TLAA and there is significant margin between these projections and the assumed thermal cycles.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the RCS B hot leg tubing will be adequately managed by the Fatigue Monitoring program during the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3 because the use of the Fatigue Monitoring program is consistent with the SRP-SLR and the program continually monitors and ensures the validity of these TLAAs and trigger corrective actions prior to analyses becoming invalid during the subsequent period of extended operation. The staff's evaluation of the Fatigue Monitoring program is documented in SER Section 3.0.3.2.1, which determined that the AMP, with enhancements, will be adequate to manage the applicable aging effects.

4.3.2.3 UFSAR Supplement

SLRA Section A.17.3.3.2, as amended by letter dated October 24, 2018, provides the UFSAR supplement summarizing the metal fatigue TLAA for ANSI B31.1 and ASME Boiler and Pressure Vessel Code, Section III, Class 3 Piping. The staff reviewed SLRA Section A.17.3.3.2 consistent with the review procedures in SRP-SLR Section 4.3.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA, as amended, meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is therefore acceptable.

4.3.2.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the fatigue analyses for non-Class 1 piping, tubing, and in-line components remain valid for the subsequent period of extended operation. Additionally, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of fatigue on the intended functions of the RCS B hot leg tubing will be adequately managed by the Fatigue Monitoring program for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.3.3 Environmentally Assisted Fatigue

4.3.3.1 Summary of Technical Information in the Application

SLRA Section 4.3.3 describes the applicant’s TLAA for EAF. The applicant dispositioned the EAF TLAA for the reactor coolant pressure boundary (RCBP) components, except the pressurizer surge line, in accordance with 10 CFR 54.21(c)(1)(iii). The applicant stated that the effects of EAF on Class 1 pressure boundary components with ASME Section III CUFs and NUREG/CR-6260 locations, with the exception of the pressurizer surge line, on the intended functions will be adequately managed by the Fatigue Monitoring program for the subsequent period of extended operation. The applicant dispositioned the EAF TLAA for the pressurizer surge line in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of EAF on the intended functions of this component will be adequately managed by the Pressurizer Surge Line Fatigue program for the subsequent period of extended operation.

4.3.3.2 Staff Evaluation

The staff reviewed the applicant’s TLAA for EAF on Class 1 pressure boundary components with ASME Section III CUFs and NUREG/CR-6260 locations, and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.3.3.1.2.3.

The staff reviewed the applicant’s TLAA for EAF on the pressurizer surge line and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), as managed by the Pressurizer Surge Line Fatigue program, consistent with the review procedures in SRP-SLR Section 4.3.3.1.1.3.

Per NUREG-2192, Revision 0, the EAF assessment for SLR should include the NUREG/CR-6260 locations and other plant-specific locations that may be more limiting than those locations evaluated in NUREG/CR-6260 for the appropriate vintage and design.

Consistent with NUREG-2192, Revision 0, the applicant performed an assessment of plant-specific locations corresponding to those identified in NUREG/CR-6260, and all of the RCPB components with existing ASME Code fatigue analyses CUFs. This assessment was performed to identify any locations that may be more limiting than those in NUREG/CR-6260 to address EAF for SLR. The initial step involved a review of the NUREG/CR-6260 locations and the components with ASME Section III CUF values calculated as part of the design basis to determine if they were (1) part of the RCPB, and (2) exposed to the reactor coolant water environment.

The staff finds that the applicant's assessment of only components with ASME 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 exposed to the reactor coolant water environment are appropriate and consistent with the guidance identified in NUREG-2192, Revision 0 (Section 4.3.2.1.2).

Once the applicant determined the scope of components in its CLB that should be addressed for EAF, the applicant explained that the next step was to apply the applicable material-based bounding EAF multipliers (F_{en}) to the existing ASME Code fatigue analyses CUFs to determine if the Code design limit of 1.0 would be exceeded.

During its review of the applicant's EAF TLAA, the staff needed additional information and issued RAIs. RAIs 4.3.3-1, 4.3.3-2, 4.3.3-3, 4.3.3-4, and 4.3.3-5, and the applicant's responses, are documented in ADAMS Accession No. ML18299A214.

In RAI 4.3.3-1, the staff noted that the applicant used the methodology in Draft Report for Comment version of NUREG/CR-6909, Revision 1, dated March 2014, and the GALL-SLR Report recommends using the final version of NUREG/CR-6909, Revision 1, dated May 2018. The staff requested that the applicant justify its use of the Draft Report version, and explain the impacts, if any, of the newer version on the applicant's refined calculations and methods to determine the F_{en} factors that address EAF. In its response to RAI 4.3.3-1, the applicant stated that the two reports only differ in the application of strain rate for wrought and cast stainless steel materials when calculating F_{en} values. The staff compared the methods to calculate the Environmental Fatigue Factor in Appendix A of both reports and confirmed that the only difference is the application of strain rate for wrought and cast stainless steel materials. The applicant also performed an assessment between the two NUREG/CR-6909 reports to demonstrate the impact, if any, to its CUF_{en} calculations performed for the SLRA.

Based on this assessment, the applicant determined that the use of the strain rate threshold in the Draft Report for Comment version of NUREG/CR-6909, Revision 1 (March 2014), is conservative when compared to the final version of NUREG/CR-6909, Revision 1 (May 2018). The staff noted in Appendix F to NUREG/CR-6909 (May 2018) that the revision to the strain rate threshold was based on the limited data, and that the revised threshold better represents the existing data. The staff finds the applicant's response acceptable because the applicant demonstrated the F_{en} equations it used in the SLRA produce equivalent or more conservative results when compared to the final version of NUREG/CR-6909, Revision 1, which is recommended for use in the GALL-SLR Report and SRP-SLR.

In RAI 4.3.3-2, the staff requested information regarding the applicant's EAF screening evaluation results for the RPV Head Flange and S/G Primary Chamber and Tubesheet and Stub Barrel Complex. During its evaluation of the applicant's response to RAI 4.3.3-2, the staff noted that the applicant confirmed that there was an error in Structural Integrity Associates (SIA) Report No 1700109.401P.R5 and accordingly, the report has been revised (SIA Report No. 1700109.401P, Revision 7, ADAMS Accession No. ML18299A116) to be consistent with information in SLRA section 4.3.3 and the text that discusses locations where CUF_{en} screening was greater than 1. The staff finds the applicant's response and changes to its supporting calculation acceptable because the inconsistency between the SLRA and calculation was corrected, and the results are consistent with this step of the applicant's EAF screening methodology (e.g., applicable material-based bounding F_{en} factors applied to the existing ASME Code fatigue analyses CUFs). The staff's evaluation of the applicant's EAF screening methodology is discussed above.

In RAI 4.3.3-3, the staff needed to understand the applicant's refined EAF analyses for the Reactor Vessel Shell at Core Support Pads and Pressurizer Upper Head. During its review, the staff noted that the licensee's EAF screening evaluation identified the SG Tube to Tubesheet weld as being subject to further EAF assessment. However, the staff noted that the SG Tube to Tubesheet weld is no longer part of the RCPB because the applicant has a permanently approved H* alternate repair criteria for both the hot- and cold-leg side of the SG (see ADAMS Accession No. ML12292A342); therefore, the staff finds it appropriate that this component is not subject to the EAF assessment described in the SRP-SLR.

During its evaluation of the applicant's response to RAI 4.3.3-3, the staff noted that the applicant confirmed that where 80-year projected cycles were used for the transients in the refined CUF_{en} analyses of the reactor vessel shell at the core support pads and the pressurizer upper head, the larger number of cycles between the two units was used. The applicant stated that text has been added to Revision 4 of the "Environmentally Assisted Fatigue Evaluation of the Turkey Point Unit 3 and Unit 4 Pressurizer Upper Head and Shell and Reactor Vessel Core Support Blocks," (Document Number LTR-SDA-II-17-13-P) for clarification. The staff finds the applicant's response acceptable because the larger number of 80-year projected cycles between the two units was used in the refined CUF_{en} analyses of the reactor vessel shell at the core support pads and the pressurizer upper head, which is conservative and yields a bounding CUF_{en} for which the Fatigue Monitoring program manages for Units 3 and 4.

In RAI 4.3.3-4, the staff needed to understand the applicant's refined EAF evaluation for the Pressurizer Spray Nozzle. During its evaluation of the applicant's response to RAI 4.3.3-4, the staff noted that SLRA Section 4.3.3 omitted the use of 80-year projected cycles for the inadvertent auxiliary spray (IAS) transient fin calculation 1700804.315P. The applicant explained that one IAS cycle was used consistent with the projected number of IAS cycles from SLRA Table 4.3-2 and 4.3-3. Although the Fatigue Monitoring program monitors an assumed number of IAS cycles (i.e., one), the staff noted that the applicant conservatively evaluated the impact of additional IAS cycles. It was determined that up to four additional IAS cycles can be experienced without exceeding a CUF_{en} of 1.0. The staff finds the applicant's response acceptable because the applicant confirmed the number of IAS cycles used in the CUF_{en} calculation for the Pressurizer Spray Nozzle, which will be monitored by the Fatigue Monitoring program to ensure the validity of this analysis and trigger corrective actions prior to analyses becoming invalid during the subsequent period of extended operation.

In RAI 4.3.3-5, the staff needed to understand the applicant's refined EAF evaluation for the control rod drive mechanism (CRDM) lower joint. During its evaluation of the applicant's response to RAI 4.3.3-5, the staff noted that the applicant indicated the difference in CUF_{en} values between Turkey Point Unit 3 and Unit 4 is due solely to the number of cycles used in the calculation, and it is not associated with design loading, material fabrication, and geometry differences. The staff reviewed Revision 003 of the CRDM Lower Joint calculation (Framatome Calculation No. 32-9280202 – Proprietary) and verified the applicant's statement. In addition, the applicant provided in its response a detailed discussion describing the pairing of transient cycles that were used to determine the CUF_{en} values for Unit 3 (0.415), the CUF_{en} values for Unit 4 (0.539), as well as the bounding CUF_{en} value for both units (0.597). The staff reviewed Revision 003 of the CRDM Lower Joint calculation (Framatome Calculation No. 32-9280202 – Proprietary) and verified the pairing of transient cycles used to determine the CUF_{en} values for Turkey Point Units 3 and 4, as well as the bounding CUF_{en} value for both units. The staff finds the applicant's response acceptable because the Fatigue Monitoring program will manage the bounding CUF_{en} value (0.597), ensure the validity of this analysis, and trigger corrective actions prior to it becoming invalid during the subsequent period of extended operation.

SLRA Section 4.3.3 indicates that the applicant credited 80-year projections for select transients in order to meet the Code design limit of 1.0 when considering EAF for the following components:

- Reactor Vessel Flange
- Reactor Vessel Shell at Core Support Pads
- CRDM Housing J-Weld
- CRDM Housing Bi-metallic Weld
- CRDM Latch Housing
- CRDM Lower Joint
- Steam Generator Divider Plate
- Steam Generator Tubes
- Pressurizer Spray Nozzle
- Pressurizer Upper Head
- Pressurizer Heater Wells

The staff reviewed the refined EAF analyses, including revisions made in response to RAI 4.3.3-5, for these components and noted that use of the 80-year projected cycles is acceptable to reduce CUF_{en} values because the Fatigue Monitoring program will continue to monitor and ensure the validity of these fatigue analyses and trigger corrective actions prior to analyses becoming invalid.

SLRA Section 4.3.3 indicates that for the reactor vessel vent nozzle 40-year design cycles were used in the refined CUF_{en} analysis; however, a finite element fatigue calculation using the methodology of Subarticle NB-3200 of Section III of the ASME Code was used to meet the Code design limit of 1.0 when considering EAF. The staff noted that for all design transients, the 40-year design cycles bound 80-year projections. The staff finds the applicant's approach to address EAF for the reactor vent nozzle during the subsequent period of extended operation acceptable because the use of 40-year cycle limits for all design transients bounds the expected number of cycles for 80 years of operation and the method used to calculate CUF (i.e., the methodology of Subarticle NB-3200 of Section III of the ASME Code) is in accordance with 10 CFR 50.55a.

SLRA Section 4.3.3 states that the EAF analyses for the Class 1 RCPB components associated with the reactor vessels, pressurizers, SGs, and RCPs with calculated ASME Section III CUFs, and NUREG/CR-6260 locations (except the pressurizer surge line) will be managed using the Fatigue Monitoring program. The staff noted that the Fatigue Monitoring program verifies the continued acceptability of existing analyses through manual cycle counting and relies on the

Water Chemistry program to provide monitoring of appropriate environmental parameters used in calculating F_{en} values. Corrective actions are initiated when any applicable transient cycle count comes within 80 percent of the design or projected cycle limit, as applicable. These conditions are entered into the corrective action program and, as necessary, component re-evaluation, enhanced inspection, repair or replacement is required to demonstrate that the fatigue design limit will not be exceeded during the subsequent period of extended operation. The staff's evaluation of the Fatigue Monitoring program is documented in SER Section 3.0.3.2.1.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of EAF on the intended functions of the Class 1 pressure boundary components with ASME Code, Section III CUFs, and NUREG/CR-6260 locations (except the pressurizer surge line), will be adequately managed for the subsequent period of extended operation with the Fatigue Monitoring program. Additionally, the applicant's use of the Fatigue Monitoring program, which also relies on the Water Chemistry program, is consistent with the acceptance criteria in SRP-SLR Section 4.3.2.1.2.3.

SLRA Section 4.3.3 states that, in lieu of additional analyses to refine the CUF_{en} for the pressurizer surge lines, the applicant manages the potential for crack initiation and growth, including reactor water environmental effects, for the pressurizer surge line during the subsequent period of extended operation with its plant-specific Pressurizer Surge Line Fatigue program. This program assesses fatigue based on the approach documented in the ASME Boiler and Pressure Vessel Code, Section XI, "Rules for In-service Inspection of Nuclear Power Plant Components, Non-Mandatory Appendix L Operating Plant Fatigue Assessment." This program incorporates a flaw tolerance evaluation that was performed specifically for this component to assess its operability and to determine the successive inspection schedule for the surge line welds with a postulated surface flaw. Once the inspection frequency is established by the flaw tolerance analysis of the pressurizer surge lines, periodic surface and volumetric examination of the welds will be performed during the subsequent period of extended operation to manage EAF. The staff's evaluation of the Pressurizer Surge Line Fatigue program is documented in SER Section 3.0.3.3.1.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of EAF on the intended functions of the pressurizer surge line will be adequately managed for the subsequent period of extended operation with the Pressurizer Surge Line Fatigue program. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.3.2.1.1.3 because the applicant credits the Pressurizer Surge Line Fatigue program that performs surface or volumetric examinations explicitly for the pressurizer surge line on an inspection frequency established by a component-specific flaw tolerance analysis.

4.3.3.3 UFSAR Supplement

SLRA Section A.17.3.3.3 provides the UFSAR supplement summarizing the EAF TLAA. The staff reviewed SLRA Section A.17.3.3.3 consistent with the review procedures in SRP-SLR Section 4.3.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.3.2.2 and is therefore acceptable.

4.3.3.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of EAF on the intended functions of the Class 1 RCPB components associated with the reactor vessels, pressurizers, SGs, and RCPs with calculated ASME Section III CUFs, and NUREG/CR-6260 locations (except the pressurizer surge line) will be adequately managed by the Fatigue Monitoring program for the subsequent period of extended operation. Additionally, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of EAF on the intended functions of the pressurizer surge line will be adequately managed by the Pressurizer Surge Line Fatigue program for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the EAF TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.3.4 Reactor Vessel Underclad Cracking

4.3.4.1 Summary of Technical Information in the Application

SLRA Section 4.3.4 describes the applicant's TLAA for postulated cracks in RPV base metal beneath the austenitic stainless steel interior cladding. The applicant stated that no RPV underclad cracking has been detected at Turkey Point. Therefore, the applicant's TLAA considers a postulated underclad crack based on the bounding underclad crack size from industry operating experience reported in the PWR Owners Group (PWROG) SLR technical report, PWROG-17031-NP, "Update for Subsequent License Renewal: WCAP-15338-A, 'Review of Cracking Associated with Weld Deposited Cladding in Operating PWR Plants,'" Revision 0, August 2017. PWROG-17031-NP, Revision 0 is included in Enclosure 4 of the SLRA and provides a generic 80-year analysis of RPV structural integrity based on generic 80-year projections of RPV underclad crack growth and implementation of the ASME Code, Section XI, IWB-3610 acceptance standards for analytical evaluation of flaws in ferritic RPV materials. The applicant's TLAA invokes the generic 80-year analysis in PWROG-17031-NP, Revision 0 to demonstrate that the bounding postulated underclad crack with projected 80-year crack growth will satisfy the analytical flaw evaluation acceptance standards in the ASME Code, Section XI, IWB-3610. Therefore, the applicant dispositioned the TLAA for RPV underclad cracking in accordance with 10 CFR 54.21(c)(1)(ii) to demonstrate that the analysis has been projected to the end of the subsequent period of extended operation.

4.3.4.2 Staff Evaluation

The staff reviewed the applicant's TLAA for RPV underclad cracking and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(ii) consistent with the review procedures in SRP-SLR Section 4.7.3.1.2. The staff reviewed the applicant's TLAA to determine whether its implementation of the generic underclad crack evaluation in PWROG-17031-NP, Revision 0 is acceptable for demonstrating that the projected RPV underclad crack size meets the acceptance standards for analytical evaluation of RPV flaws in the ASME Code, Section XI, IWB-3610 for the subsequent period of extended operation.

The staff noted that the PWROG-17031-NP, Revision 0 SLR methodology for analyzing RPV underclad cracks is not approved by the NRC for generic use in SLR applications. However, the staff verified that the PWROG-17031-NP, Revision 0 SLR methodology is consistent with the NRC-approved 60-year generic methodology for RPV underclad crack evaluation provided in WCAP-15338-A, dated October 2002 (ADAMS Accession No. ML083530289). With the exception of the generic cumulative fatigue crack growth (FCG) projection for the applicability term of the reports (80 years for PWROG-17031-NP, Revision 0 versus 60 years for WCAP-15338-A) and some qualitative updates to operating experience information, both reports provide identical generic analyses. The analytical techniques used in both reports for evaluating postulated underclad cracks are based on the linear elastic fracture mechanics (LEFM) acceptance standards of the ASME Code, Section XI, IWB-3610 and the LEFM procedures, including FCG rate curves, established in the ASME Code, Section XI, Appendix A. The analytical evaluation procedures of Appendix A are specifically recommended by IWB-3610 for LEFM and FCG analysis of ferritic RPV components. The staff noted that these acceptance criteria and methods are well established for conservative analytical evaluation of actual RPV flaws that are detected during plant inservice inspections, as required by the ASME Code, Section XI and 10 CFR 50.55a. The staff's evaluation of the time-dependent aspects of this methodology for implementation as the 80-year basis for the applicant's TLAA for RPV underclad cracks is addressed below.

RPV Underclad Cracking – Nuclear Power Industry Experience and 80-Year Flaw Growth Projections

RPV underclad cracking was initially detected in 1970, and it has been extensively investigated by industry over a 30-year period. Underclad cracking is a fabrication defect that has occurred in SA508, Class 2 and Class 3 RPV forgings. Underclad cracks originally formed in the low alloy steel base metal heat affected zone beneath the austenitic stainless steel cladding, following deposition of cladding by weld overlay on the RPV forging interior. The fabrication processes and mechanisms that led to the formation of underclad cracks are described in detail in WCAP-15338-A and PWORG-17031-NP, Revision 0.

PWROG-17031-NP, Revision 0 cites the evaluation in WCAP-15338-A of the now-historic industry operating experience for RPV flaws that are located in and underneath the RPV cladding, and it provides a summary of additional industry operating experience since 2002 concerning flaws that involve degraded or missing cladding. The staff's review of the industry operating experience with detected RPV flaws located in and below cladding generally confirms that these types of flaws have not yet been shown to be a structural integrity concern for RPVs in operating U.S. plants. All detected flaws continue to satisfy the ASME Code, Section XI acceptance standards, and there have been no detected underclad cracks with dimensions that exceed a maximum flaw depth of 0.295 inch and a maximum flaw length of 2.0 inches based on measurements obtained from destructive evaluation of clad SA508, Class 3 nozzle forging drop-out specimens.

The 60-year WCAP-15338-A and 80-year PWROG-17031-NP, Revision 0 reports contain a generic FCG evaluation for a series of postulated RPV cracks, which consider various flaw depths and aspect ratios, axial and circumferential crack orientations, as well as crack locations in both the RPV beltline shell region and the inlet nozzle-to-shell weld. The initial crack sizes used for the generic FCG evaluation are bounding for the largest underclad cracks that were detected in actual RPV forgings based on the industry operating experience described in the 60-year WCAP and 80-year PWROG reports. Specifically, prior to FCG, the bounding initial crack depth through the RPV low alloy steel is 0.30 inch, which slightly exceeds the maximum underclad crack depth from destructive evaluation of SA508, Class 3 forgings. The initial crack lengths are established based on consideration of three flaw aspect ratios (length-to-depth ratios) of 2, 6, and 100. The aspect ratio of 100 is referred to as the "continuous" flaw shape, and it always provides the most bounding FCG result for any given initial flaw depth. Therefore, the most bounding initial crack size considered for the FCG analysis has a depth of 0.30 inch and an effectively continuous length of 30 inches, which exceeds the length of any flaw ever detected.

Although the applicant has not detected any underclad cracks in its RPV forgings for Turkey Point Units 3 and 4, the SLRA Section 4.3.4 TLAA appropriately considers the potential for their existence, based on the industry experience with this issue for SA508 forgings. The applicant's TLAA directly cites the PWROG-17031-NP, Revision 0 cumulative FCG analysis for the bounding projection of its postulated underclad crack growth for the subsequent period of extended operation. This PWROG cumulative FCG analysis projects that the bounding axial crack in the RPV beltline shell region, with initial depth of 0.30 inch and continuous crack length, will grow to about 0.43 inch in depth after 80 years of operation, based on the ASME Code, Section XI, Appendix A FCG rate curves for low allow steel exposed to RCS water environments. This is the most bounding crack growth result for all crack shapes and crack orientations considering both RPV beltline shell and inlet nozzle locations. The use of FCG rate curves for a water environment is conservative for FCG rate calculations because, realistically, underclad cracks are most likely not directly exposed to RCS water. However, as established in the staff's review of this FCG rate method for 60-year applications in WCAP-15338-A, the water environment assumption is necessary to ensure that the analysis is bounding if an underclad crack were to become a surface flaw. Therefore, the applicant's use of this FCG rate method for its projection of underclad crack growth for the subsequent period of extended operation is acceptable.

With respect to the generic number of transient cycles used for determining the 80-year cumulative FCG result, PWROG-17031-NP, Revision 0 applied the full set of design transients for normal, upset, and test conditions over an 80-year period by multiplying the 40-year design basis transient cycles by a factor of two to conservatively account for an 80-year operating period. Based on its review of the 80-year projected transient cycles for the subsequent period of extended operation at Turkey Point Units 3 and 4, as provided in SLRA Tables 4.3-2 and 4.3-3, the staff verified that this generic assumption of twice the design cycles is very conservative and bounding for both Turkey Point Units 3 and 4. Therefore, the staff determined that the applicant's use of this method to project the cumulative FCG for the subsequent period of extended operation is acceptable for meeting the requirements of 10 CFR 54.21(c)(1)(ii).

ASME Code, Section XI, IWB-3610 Allowable Flaw Sizes for 80-Year Operating Periods

PWROG-17031-NP, Revision 0 documents the results of LEFM analyses for a representative 3-Loop plant to determine the allowable flaw sizes based on the ASME Code, Section XI IWB-3610 acceptance criteria. In accordance with IWB-3610, the Code-allowable flaw sizes are calculated based on the evaluation of transient loadings for normal, upset, and test conditions (Service Levels A and B), and emergency and faulted conditions (Service Levels C and D). The Code-allowable flaw sizes reported in PWROG-17031-NP, Revision 0 for 80-year applications are the same as those reported in WCAP-15338-A for 60-year applications for all transient analyses. Consistent with WCAP-15338-A, the most limiting allowable flaw depth for Service Levels A and B is 0.67 inch through a 7.75-inch thick RPV beltline shell forging based on LEFM analysis of a continuous axial flaw for the Excessive Feedwater Flow Transient. Consistent with WCAP-15338-A, the most limiting allowable flaw depth for Service Levels C and D is 1.25 inch (7.75-inch thick RPV beltline shell forging) based on LEFM analysis of a continuous axial flaw for the Large Steamline Break Transient. The applicant's TLAA compared the bounding projected crack depth of 0.43 inch for the continuous axial flaw based on the 80-year FCG analysis to the most limiting of all the allowable continuous axial flaw depths from the PWROG and WCAP reports, which is 0.67 inch for Service Levels A and B. Because the bounding projected crack depth of 0.43 inch for 80 years is less than the most limiting allowable flaw depth of 0.67 inch for all transient conditions, the applicant determined that Turkey Point's underclad crack growth analysis has been projected to the end of the subsequent period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii). However, because the Code-allowable flaw sizes have not changed between the 60-year and 80-year versions of the methodology, the staff evaluated the time-dependent inputs and assumptions for determining allowable flaw sizes based on LEFM methods in IWB-3610 and Appendix A of the ASME Code, Section XI to determine whether they could be considered to remain the same for 60-year and 80-year operating periods.

The PWROG report indicates that the governing transient characteristics for determining Code-allowable flaw sizes for 80-year applications are the same as those in WCAP-15338-A for 60-year applications. As established in WCAP-15338-A, RPV flaw loadings for applied stress intensity factor (K_I) calculations under Service Levels A, B, C, and D were determined based on analysis of the governing transients for a representative Westinghouse 3-Loop plant. Since Turkey Point Units 3 and 4 are both 3-loop plants, this evaluation is directly applicable, provided that transient loadings have not changed since the WCAP-15338-A was approved in 2002. Further, the staff's 2002 approval SE for WCAP-15338-A determined that the transient loadings for determining K_I values and Code-allowable flaw sizes are acceptable for generic application to underclad crack analysis for all Westinghouse Plants, including the 2-Loop and 4-Loop designs.

With respect to transient loadings on RPV underclad cracks, the staff noted that there are no time-dependent aging effects. However, after the 2002 publication of WCAP-15338-A, any changes at the facility that affect transient intensities may potentially warrant evaluation to determine whether the WCAP-15338-A transient loadings remain applicable. The staff noted that the applicant's statement in SLRA Section 4.3.4 indicating that the representative set of design transients addressed in WCAP-15338-A for the LEFM evaluation would remain applicable to Turkey Point considering its EPU conditions is reasonable for addressing this issue. The staff verified that the transient loadings on RPV underclad cracks would not change with the implementation of the 2012 EPU based on the fact that this EPU is a constant pressure uprate and transient temperatures are not significantly impacted. Therefore, the staff found that the applicant's continued use of the same governing transient characteristics for the LEFM analysis is acceptable to support its determination that the projected FCG of the bounding underclad crack will continue to satisfy IWB-3610 acceptance standards for the subsequent period of extended operation.

With respect to RPV beltline material fracture toughness (K_{IC}), PWROG-17031-NP, Revision 0 indicates that the Code-allowable flaw sizes for all transients were determined based on the following assumptions:

(1) The RPV beltline material is in the upper shelf temperature regime for all transients evaluated in the PWROG report for Service Levels A, B, C, and D;

(2) The KIC value used for all transient analyses is two-hundred thousand pounds per square inch times the square root of an inch (200 ksi*√in); and

(3) Any increase in the adjusted reference temperature (RTNDT) caused by RPV beltline material embrittlement for subsequent periods of extended operation (60-to-80 year extended license terms) would be insignificant, relative to the impact on this KIC value and the determination of allowable flaw size.

The staff noted that the use of a K_{IC} value of 200 ksi*√in is, by convention, considered to be a conservative representation of the upper-shelf fracture toughness for the RPV material for LEFM analyses in accordance with IWB-3610. However, this presupposes that the material is in the upper-shelf temperature regime throughout the transient. For LEFM analysis of transient conditions per the ASME Code, Section XI, IWB-3610 and Appendix A, the K_{IC} value should be determined based on the lower bound K_{IC} curve specified in Paragraph A-4200 of Appendix A. The lower bound K_{IC} curve in Code Paragraph A-4200 shows that the K_{IC} value increases as an exponential function of the metal temperature at the analyzed flaw depth minus the adjusted RT_{NDT} at the analyzed flaw depth. Per IWB-3610, K_{IC} must be determined based on the crack tip temperature for the analyzed transient conditions. For RPV beltline materials, the value of RT_{NDT} used to determine K_{IC} must account for the effects of neutron embrittlement, as specified in Paragraph A-4400. Based on the equation for K_{IC} specified in Paragraph A-4200, the RPV material temperature must exceed the adjusted RT_{NDT} value for the limiting RPV beltline material by at least 104.25 °F for the analyzed flaw depths in order for the K_{IC} value to be greater than or equal to 200 ksi*√in for the analyzed transient conditions.

Considering the above ASME Code criteria for K_{IC}, and the projected state of RPV beltline neutron embrittlement for the subsequent period of extended operation, the staff needed additional information and issued an RAI. RAI 4.3.4-1 and the applicant's response are documented in ADAMS Accession No. ML18311A299. The staff requested that the applicant justify the continued use 200 ksi*√in as the RPV material fracture toughness for determining the allowable flaw sizes for the transients evaluated in PWROG-17031-NP, Revision 0. During its evaluation of the applicant's response to RAI 4.3.4-1, the staff noted that the governing transients for Service Levels A and B have high fluid temperatures; therefore, the calculated K_{IC} value based on Code Paragraph A-4200 exceeds 200 ksi*√in even if the 10 CFR 50.61 PTS screening criterion of 270 °F is used for the adjusted RT_{NDT} value. Based on its review of the applicant's RPV PTS data for subsequent period of extended operation in SLRA Section 4.2.2, the staff verified that the projected RT_{PTS} values for all Turkey Point Units 3 and 4 RPV forgings are significantly less than 270 °F for 72 EFPY, which corresponds to 80 calendar years of operation. It should also be noted that for a given flaw depth through the RPV forging, the K_{IC} value is calculated based on material temperature and RT_{NDT} at the crack tip, and because the RT_{NDT} at the crack tip is lower than RT_{PTS}, the K_{IC} value would be even higher than if the limiting RT_{PTS} values were used. Therefore, the staff found that 200 ksi*√in would remain bounding as the K_{IC} value for determining the limiting allowable flaw depth of 0.67 inch for the RPV beltline forgings at Turkey Point Units 3 and 4 based on the Service Level A and B transient analyses. This finding is limited to the applicant's implementation of PWROG-17031-NP, Revision 0, as described in SLRA Section 4.3.4.

During its evaluation of the applicant's response to RAI 4.3.4-1 for the Service Levels C and D transient analyses, the staff found that there is no basis to assume that 200 ksi*√in is a bounding K_{IC} value for Level C and D and transients in PWROG-17031-NP, Revision 0. The staff also noted that the RAI response did not address how the K_{IC} value for determining the allowable flaw size for Service Levels C and D accounted for the projected increase in RT_{NDT} due to RPV beltline neutron embrittlement for the subsequent period of extended operation. Therefore, because the Large Steamline Break Transient determines the limiting allowable flaw size (1.25-inch flaw depth for the continuous axial flaw) for Service Levels C and D in the RPV beltline shell region, the staff requested in a follow up to RAI 4.3.4-1 (designated RAI 4.3.4-1a) that the applicant (1) provide the temperature profile for the Large Steamline Break Transient, (2) address whether or not a K_{IC} value of 200 ksi*√in is bounding for the duration of this transient, and (3) provide the K_{IC} and RT_{NDT} data used for determining the allowable flaw size for the Large Steamline Break Transient. RAI 4.3.4-1a and the applicant's response are documented in ADAMS Accession No. ML19050A420.

During its evaluation of the applicant's RAI 4.3.4-1a response, the staff reviewed the transient temperature data and confirmed that 200 ksi*√in is not a bounding K_{IC} value for the duration of the Large Steamline Break Transient. The staff noted that K_{IC} is generically calculated based on Code Paragraph A-4200 for the representative 3-loop plant in order to determine the generic allowable flaw depth of 1.25 inch for the Large Steamline Break Transient. However, the K_{IC} calculation for determining allowable flaw depth for this transient was not updated to generically account for the increase in adjusted RT_{NDT} for RPV beltline materials for the 60-to-80-year subsequent period of extended operation. Therefore, the staff determined that the PWROG report does not provide a sufficient basis to conclude that the allowable flaw depth for Service Levels C and D is valid for generic application to 80-year operating periods.

The applicant also stated in its RAI 4.3.4-1a response that the increase in the adjusted RT_{NDT} resulting from additional neutron embrittlement for the subsequent period of extended operation can be accommodated given that the maximum projected underclad crack growth for 80 years results in a bounding continuous axial flaw depth of 0.43 inch, and the limiting allowable flaw depth for Service Levels A and B is 0.67 inch. Since the applicant determined that the maximum projected underclad crack depth of 0.43 inch is acceptable for the subsequent period of extended operation, based on the most limiting allowable flaw depth of 0.67 inch for Service Levels A and B, the staff considered the plant-specific impact of the increase in RT_{NDT} on K_{IC} for determining the allowable flaw depth for the Large Steamline Break Transient. Based on its review of the transient temperature data provided in response to RAI 4.3.4-1a for the Large Steamline Break, the staff determined a bounding value for the decrease in K_{IC} considering a conservative increase from the 60-year to the 80-year RT_{NDT} for the limiting RPV beltline forgings at Turkey Point Units 3 and 4. The staff identified that the bounding decrease in K_{IC} for the subsequent period of extended operation would result in a small decrease in the allowable flaw depth for the limiting RPV beltline forgings at Turkey Point Units 3 and 4 for the Large Steamline Break Transient. However, the staff verified that the percentage reduction in the allowable flaw depth for this transient would be less than 40 percent based on surface flaw stress intensity factor (K_I) equations in Appendix A of the Code; and a decrease of 46.4 percent would be needed in order for the allowable flaw depth for this transient to be reduced from 1.25 inch to 0.67 inch, which is the limiting allowable flaw depth for Service Levels A and B. Therefore, for the Turkey Point Units 3 and 4 RPV beltline forgings, the staff verified that the 0.67-inch flaw depth remains the most limiting allowable flaw depth for all analyzed transients (Levels A, B, C, D) per IWB-3610, considering the 60- to 80-year increase in adjusted RT_{NDT} for the limiting forgings.

The staff finds the applicant's responses to RAI 4.3.4-1 and RAI 4.3.4-1a acceptable because the increase in adjusted RT_{NDT} for the limiting RPV beltline forgings at Turkey Point does not invalidate the applicant's determination that the projected underclad crack depth (0.43 inch) is less than the most limiting allowable flaw depth (0.67 inch) for all analyzed transients for the subsequent period of extended operation. Therefore, considering the changes in RT_{NDT} and K_{IC} for the RPV beltline materials for the subsequent period of extended operation, the staff finds that the applicant's analysis for projecting the underclad crack growth is acceptable. However, it should be noted that the staff's finding on this issue is applicable only to Turkey Point Units 3 and 4 RPV underclad cracking TLAA, as described in SLRA Section 4.3.4, and it is not applicable to generic LEFM analysis of underclad cracks in PWROG-17031-NP, Revision 0.

During its review of the critical flaw depths for the Large Steamline Break Transient, the staff noted that Section 5.7 of PWROG-17031-NP, Revision 0 and Appendix A-5 of WCAP-15338-A show that the critical flaw depth for the continuous circumferential flaw (2.21 inches) is more limiting than the critical flaw depth for the continuous axial flaw (2.50 inches). The staff identified that these critical flaw depths are inconsistent with the expected LEFM results for the RPV shell region because the RPV shell hoop stress on axial flaws is approximately twice the RPV shell axial stress on circumferential flaws for pressure loading. Therefore, in RAI 4.3.4-2, the staff requested that the applicant explain how the analysis of the Large Steamline Break Transient can result in a more limiting critical flaw depth for the continuous circumferential flaw compared to the critical flaw depth for the continuous axial flaw. RAI 4.3.4-2 and the applicant's response are documented in ADAMS Accession No. ML18311A299.

In its response to RAI 4.3.4-2, the applicant confirmed that the RPV shell hoop stress for axial flaws is higher than the RPV shell axial stress for circumferential flaws. The applicant identified that the circumferential flaw depth of 2.21 inches is a typographical error in the PWROG and WCAP reports. The applicant reported that the Large Steamline Break Transient actually results in a critical flaw depth of 2.64 inches for the continuous circumferential flaw rather than 2.21 inches, and an errata letter was submitted to the NRC by letter dated October 31, 2018 (ML18306A493) to make this correction. The staff finds the response acceptable because the applicant identified the error regarding the critical circumferential flaw depth in the PWROG and WCAP reports and provided the corrected value for this flaw depth. The staff determined that the revised circumferential flaw depth of 2.64 inches is consistent with expected LEFM results for critical flaw sizes in the RPV shell region based on RPV axial and hoop stresses due to pressure loading. Therefore, the staff finds that the revised flaw depth is acceptable.

As stated above, the staff finds that the applicant has demonstrated that the 80-year projected FCG of the bounding postulated underclad crack meets the ASME Code, Section XI, IWB-3610 flaw evaluation acceptance criteria for the RPV beltline forgings at Turkey Point Units 3 and 4. Therefore, the staff finds that the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(ii) that the analysis for RPV underclad cracking has been projected to the end of the subsequent period of extended operation. Additionally, the staff finds that it meets the acceptance criteria in SRP-SLR Section 4.7.2.1.2 because the applicant has demonstrated that the analysis of RPV underclad cracking has been projected to the end of the subsequent period of extended operation.

4.3.4.3 UFSAR Supplement

SLRA Section A.17.3.3.4 provides the UFSAR supplement summarizing the Reactor Vessel Underclad Cracking TLAA. The staff reviewed SLRA Section A.17.3.3.4 consistent with the review procedures in SRP-SLR Section 4.7.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is therefore acceptable.

4.3.4.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis for RPV underclad cracking has been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.3.5 Reactor Coolant Pump Motor Flywheel

4.3.5.1 Summary of Technical Information in the Application

SLRA Section 4.3.5 describes the applicant's TLAA related to deterministic and risk-informed evaluations of RCP motor flywheel integrity. The applicant dispositioned the TLAA for the RCP motor flywheel in accordance with 10 CFR 54.21(c)(1)(i) to demonstrate that the CLB analyses remain valid for the subsequent period of extended operation. To support its disposition of this TLAA in accordance with 10 CFR 54.21(c)(1)(i), the applicant provided PWROG Technical Report, PWROG-17011-NP, "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 0, November 2017. PWROG-17011-NP, Revision 0 was included in Enclosure 4 (ADAMS Accession No. ML18037A837) of the SLRA and provides the 80-year methodology for deterministic and risk-informed analyses related to the integrity of Westinghouse RCP motor flywheels.

4.3.5.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the RCP motor flywheels and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i) consistent with the review procedures in SRP-SLR Section 4.7.3.1.1. The staff reviewed the applicant's analysis by verifying that its implementation of the PWROG-17011-NP, Revision 0 methodology is acceptable for demonstrating that the CLB analyses of the Turkey Point Units 3 and 4 motor flywheels will remain valid for the subsequent period of extended operation.

The PWROG-17011-NP, Revision 0 report included in the SLRA provides generic deterministic and risk-informed analyses for Westinghouse RCP motor flywheels that are applicable to 80-year operating periods. PWROG-17011-NP extends the applicability of NRC-approved methodologies in WCAP14535A (ADAMS Accession No. ML18312A175) and WCAP-15666-A (ADAMS Accession No. ML18303A413) to the subsequent period of extended operation. These analyses form the basis for implementation of 20-year inspection intervals for the RCP flywheels.

The original inspection interval for RCP flywheels was 40 months, as specified in RG 1.14, Revision 1, "Reactor Coolant Pump Flywheel Integrity," dated August 1975 (ADAMS Accession No. ML003739936). Before 1996, plants gathered more than 20 years of operating experience and inspection results, and there were no service-induced flaws identified that would affect RCP flywheel integrity. Considering the inspection history and reduction in personnel radiation exposure, the Westinghouse Owners Group (WOG) submitted a deterministic and probabilistic fracture mechanics (PFM) methodology in WCAP-14535A to the NRC in January 1996 for elimination of RCP flywheel inspections. As indicated in the staff's SE in WCAP-14535A, the staff only evaluated the stress and deterministic fracture mechanics part of the methodology and approved the extension of the RCP flywheel inspection interval from 40 months specified in RG 1.14, Revision 1 to 10 years.

Subsequently, WOG submitted and the staff approved Topical Report WCAP-15666-A, dated October 2003. WCAP-15666-A provided the generic PFM and risk-informed methodology that formed the basis for plant-specific applications to extend the RCP flywheel inspection intervals from 10 years to 20 years for 60-year operating periods (initial period of extended operation).

Plant-specific requirements to have an RCP flywheel inspection program consistent with RG 1.14, Revision 1, or the above relaxations from the RG, are included in the Administrative Controls Section of the TS. The staff noted that Section 6.8, "Procedures and Programs" of Turkey Point Units 3 and 4 TS provide the RCP flywheel inspection program requirements, which includes the 20-year inspection interval based on plant-specific application of the WCAP-15666-A methodology for the 60-year license. The 10- to 20-year interval extension was authorized based on TS changes issued on February 23, 2010 in Amendment Nos. 242 and 238 for Turkey Point Units 3 and 4, respectively (ADAMS Accession No. ML100210321).

NRC Staff Review of Topical Report PWROG-17011-NP, Revision 1

By letter dated May 15, 2018 (ADAMS Accession No. ML18143B465), the PWROG submitted Revision 1 to the PWROG-17011-NP report for NRC review and approval. This revision was submitted under the NRC's TR review program to provide the generic 80-year methodology for continuation of the 20-year RCP flywheel inspection intervals for the subsequent period of extended operations. The staff reviewed the PWROG-17011-NP, Revision 1 methodology as a generic TR and found it acceptable for generic implementation in SLR TLAAs to support continuation of 20-year RCP flywheel inspection intervals for 80-year operating periods. The basis for the staff's acceptance of this methodology is documented in its March 19, 2019 SE (ADAMS Accession No. ML19072A095).

The staff confirmed that the analytical methods in Topical Report PWROG-17011-NP, Revision 1 are consistent with the "Revision 0" version that was included in Enclosure 4 of the Turkey Point Units 3 and 4 SLRA. Although the final results (core damage frequency and large early release frequency) in PWROG-17011-NP, Revision 1 were revised in the staff's SER for the TR to correct an error in the PFM analysis and to restore configuration control of the computer code, the changes are small and will not affect the conclusions of either Revision 0 or Revision 1 of PWROG-17011-NP. Because the staff has found PWROG-17011-NP, Revision 1 acceptable for generic implementation, and the analytical methods in Revision 1 are consistent with those in the Revision 0 version provided in the SLRA, the staff finds that the applicant's implementation of PWROG-17011-NP, Revision 0 is acceptable to support its disposition of this TLAA in accordance with 10 CFR 54.21(c)(1)(i).

As discussed in Section 4.0, "Conditions and Limitations," of the staff's SE for Topical Report PWROG-17011-NP, Revision 1, there is no condition or limitation for continuation of the 20-year inspection interval for Westinghouse RCP flywheels. However, as indicated in SE Section 4.0, PWROG-17011-NP, Revision 1 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 FCG calculation supporting WCAP-15666-A, remains bounding on a plant-specific basis for 80 years of operation. Further, this confirmation shall be made in all SLRAs to fulfill this TR criterion. The staff verified that SLRA Section 4.3.5 affirmatively states that the 6,000 RCP start and stop cycles assumed in the FCG calculation remain bounding and applicable for the subsequent period of extended operation at Turkey Point Units 3 and 4. The staff also reviewed the applicant's projected and analyzed transient cycles provided in SLRA Tables 4.3-2 and 4.3-3 for Turkey Point Units 3 and 4, respectively, and confirmed that the cumulative number of transients that involve RCP starts and stops is expected to remain significantly less than the 6,000 cycles that were analyzed for the generic FCG calculation. It should be noted that the cumulative FCG result of 0.08 inch is the same for WCAP-15666-A and PWROG-17011-NP, since both reports use a total cycle assumption of 6,000 RCP starts and stops for 60-year and 80-year license terms, respectively. Therefore, the staff finds that the assumed 6,000 start and stop cycles remains bounding for the subsequent period of extended operation at Turkey Point Units 3 and 4, and this supports the applicant's disposition of this TLAA in accordance with 10 CFR 54.21(c)(1)(i).

The applicant also addressed the generic maximum flywheel overspeed of 1,500 rpm assumed in the deterministic stress and fracture analysis for PWROG-17011-NP. The staff noted that the 1,500 rpm overspeed is applicable to Turkey Point because WCAP-14535A demonstrated that 1,500 rpm is generically bounding for Westinghouse design basis loss-of-coolant accidents in Class 1 branch lines, which assumes that the plant will continue to have a valid leak-before-break (LBB) analysis for primary loop piping for the duration of the operating license. The staff's review and acceptance of the applicant's LBB analysis of the primary loop piping for the subsequent period of extended operation is documented in SER Section 4.7.3. Therefore, the staff finds that the maximum flywheel overspeed condition of 1,500 rpm remains valid for the subsequent period of extended operation at Turkey Point Units 3 and 4.

As stated above, the staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for the RCP motor flywheels at Turkey Point Units 3 and 4 remain valid for the subsequent period of extended operation. Additionally, the staff finds that it meets the acceptance criteria in SRP-SLR Section 4.7.2.1.1 because the applicant has demonstrated that the existing analyses for the RCP motor flywheels remain valid for the subsequent period of extended operation.

4.3.5.3 UFSAR Supplement

SLRA Section A.17.3.3.5 provides the UFSAR supplement summarizing the TLAA related to deterministic and risk-informed evaluations for RCP motor flywheel integrity. The staff reviewed SLRA Section A.17.3.3.5 consistent with the review procedures in SRP-SLR Section 4.7.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is therefore acceptable.

4.3.5.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for the RCP motor flywheels remain valid for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.4 Environmental Qualification (EQ) of Electrical Equipment

4.4.1 Summary of Technical Information in the Application

SLRA Section 4.4 describes the applicant's TLAA for evaluation of environmental qualification (EQ) of electric equipment for the subsequent period of extended operation. Thermal, radiation, and cyclical aging analyses of plant electrical and instrumentation components located in harsh environments, developed to meet 10 CFR 50.49 requirements, have been identified as TLAAs. The applicant dispositioned the TLAA for the EQ of electric equipment in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of aging and accident conditions on the intended functions of EQ equipment will be adequately managed by the "Environmental Qualification of Electric Equipment" AMP described in SLRA section B.2.2.4 for the subsequent period of extended operation.

4.4.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the EQ of electric equipment and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.4.3.1.3.

The EQ requirements established by 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 EOL condition, will meet its performance specifications during and following design basis accidents. An EQ program that satisfies the requirements of 10 CFR 50.49 is considered an adequate AMP for the purposes of license renewal. Electric components in the applicant's EQ program identified as having a qualified life equal to, or greater than, the current operating term (i.e., 60 years) are considered a TLAA for subsequent incense renewal.

The staff reviewed SLRA Section 4.4 and the associated program basis documents to determine if the applicant's EQ program meets the requirement of 10 CFR 54.21(c)(1). The applicant's EQ program is implemented per the requirements of 10 CFR 54.21(c)(1)(iii) to show that components evaluated under the applicant's TLAA evaluation are adequately managed during the subsequent period of extended operation. The staff reviewed the applicant's EQ program, including the management of aging effects, to confirm that electric equipment requiring environmental qualification 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 B.2.2.4 and the program basis documents, including reports provided to the staff during the audit. Based on the staff review of SLRA Section B.2.2.4 and the audit results, the staff concludes that the applicant's EQ program elements are consistent with the GALL-SLR Report AMP X.E1. The staff's evaluation of the applicant's Environmental Qualification of Electric Equipment AMP is documented in SER Section 3.0.3.2.4, which determined that the AMP will be adequate to manage the applicable aging effects.

The staff also reviewed the applicant's EQ program reanalysis attributes evaluation and concludes that it is consistent with SRP-SLR Section 4.4.4.1.3 and SRP-SLR Table 4.4-1. Reanalysis of an aging evaluation addresses attributes of analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, corrective actions, and ongoing qualification. The applicant stated that ongoing qualification is not considered a viable option and Turkey Point has no plans to implement this option. No exemptions were identified based on a TLAA.

The staff finds that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of thermal, radiation, and cyclical aging of plant electrical and instrumentation components located in harsh environments and qualified to meet 10 CFR 50.49 requirements, on the intended functions of the EQ electric equipment will be adequately managed for the subsequent period of extended operation. The applicant's EQ program manages the effects of thermal, radiation, and cyclic aging through the use of aging evaluation based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49(e)(5), EQ components are refurbished, replaced, or their qualification is extended before reaching the aging limit established in the evaluation.

Additionally, the staff finds that the applicant'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 program for license renewal. The staff also finds that the continued implementation of the EQ program provides assurance that the aging effects will be managed and 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 Section A.17.3.4 provides the UFSAR supplement summarizing the EQ of electric equipment TLAA. The staff reviewed SLRA Section A.17.3.4 consistent with the review procedures in SRP-SLR Section 4.4.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.4.2.2 and is therefore acceptable.

4.4.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of thermal, radiation, and cyclic aging on the intended functions of the EQ electric equipment will be adequately managed by the Environmental Qualification (EQ) of Electric Equipment program for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation for the subsequent period of extended operation, 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, as amended by letters dated October 17, 2018, December 14, 2018, March 1, 2019, and May 6, 2019 (ADAMS Accession Nos. ML18292A641, ML18352A885, ML19064A824, and ML19128A149, respectively), describes the applicant's TLAA for post-tensioned containment tendon prestress forces for the subsequent period of extended operation.

Predicted Lower Limit (PLL) and Base Line Predicted Force (BPF). The amended SLRA Section 4.5 states that for each selected tendon for lift-off force measurement, its calculated PLL force value establishes the PLL lines in accordance with RG 1.35.1, "Determining Prestressing Forces for Inspection of Prestressed Concrete Containments." It also states that BPF as an alternative to the PLL, and consistent with RG 1.35.1, has been used for the 40th and 45th surveillance years for tendon acceptance and "will be used in constructing the lower bound of all tendon prestress forces for tendon lift-off force evaluation during the [subsequent period of extended operation]."

Regression Analysis. The amended SLRA Section 4.5 states that regression analyses are developed for each of the three tendon groups (horizontal "H," vertical "V," and dome "D" tendons) to determine the trend over time of the prestress values of individual tendons, measured during successive surveillances consistent with information notice (IN) 99-10, Attachment 3. The amended SLRA Section 4.5 also states that trend lines are "periodically updated with new tendon prestressing force data following each surveillance [… to] demonstrate that the average group prestressing forces will remain above the group minimum required value (MRV) until the next scheduled surveillance, and potentially for the life of the plant." It further states that "[i]ndividual measured tendon prestressing forces will be compared to predicted force values and trend lines developed for the [subsequent period of extended operation]."

The applicant dispositioned the TLAA for the containment tendon prestress system in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of prestress tendon force losses on the intended functions will be adequately managed by SLRA Sections B.2.2.3, "Concrete Containment Unbonded Tendon Prestress," and B.2.3.31, "ASME Section XI, Subsection IWL" AMPs for the subsequent period of extended operation.

4.5.2 Staff Evaluation

The staff reviewed the applicant's TLAA for Turkey Point Units 3 and 4 concrete containment unbonded tendon prestress and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.5.3.1.3.

The review procedures state that the applicant may reference the GALL-SLR Report in its SLRA for a TLAA AMP that is consistent with GALL-SLR Report AMP X.S1 to manage the effects of aging (i.e., loss of tendon prestress) for the period of extended operation.

The staff reviewed the amended SLRA Section 4.5 and noted that it credits the TLAA AMP "Concrete Containment Unbonded Tendon Prestress AMP," described in the amended SLRA Section B.2.2.3 (evaluated by the staff in SER Section 3.0.3.2.3), to manage the loss of tendon prestress aging effect for the subsequent period of extended operation. The amended SLRA states that the program will confirm that the average lift-off forces of the prestressed tendons remain above their MRVs through the period of extended operation. The staff confirmed that the applicant identified the appropriate TLAA AMP consistent with the GALL-SLR Report TLAA AMP X.S1, in accordance with the review procedures of SRP-LR Section 4.5.3.1.3. The staff also noted that the applicant appropriately designated SLRA Section B.2.3.31, "ASME Section XI, Subsection IWL," for tendon selection and examinations performed in accordance with ASME Code Section XI, Subsection IWL, 2007 Edition through 2008 Addenda.

The staff reviewed the applicant's AMP to verify that the applicant has adequately addressed plant-specific operating experience. During the review of the Turkey Point's UFSAR, audited documents, and the applicant's SLRA supplements of October 17, 2018, and December 14, 2018, the staff noted the following concerns:

(1) discrepancies as to when replacement and retensioning of tendons associated with the reactor vessel closure head (RVCH) replacement project for the two units occurred and measures taken to ensure replaced/retensioned tendon adequacy;

(2) whether non-normalized actual lift-off forces were used for trending;

(3) justification of upward trending lift-off force values and trend lines.

Based on these concerns, the staff needed additional information and issued RAIs. RAIs 4.5-2, 4.5-3, and 4.5-4, and the applicant's responses, are documented in ADAMS Accession No. ML19064A824.

The applicant amended SLRA Section 4.5 in response to RAIs 4.5-2, 4.5-3, and 4.5-4. During its review and evaluation of the amended SLRA Section 4.5 dated March 1, 2019, and the applicant's response to RAI 4.5-2 in conjunction with responses to RAIs 4.5-3, 4.5-4, and B.2.2.3-1 (RAI B.2.2.3-1 is evaluated by the staff in SER Section 3.0.3.2.3), the staff noted that the RVCH replacement for the two units was completed a year apart with replaced/retensioned tendons monitored in accordance with augmented examination requirements of IWL-2521.2 and Table IWL-2521.2. The staff also noted that all RVCH replacement tendon lift-off forces are presented in SLRA Tables 4.5-6 through 4.5-10 and plotted in amended SLRA Figures 4.5-6 through 4.5-10. The staff further noted that the applicant justified an upward trending of the regression analysis trend line for some of the RVCH replacement group tendon lift-off forces based on the low number of randomly selected tendons in the required followup 35th, 40th, and 45th year surveillances. The staff finds the applicant's response to RAI 4.5-2 acceptable because RVCH lift-off forces were measured beginning with the 35th year surveillance even though the code of record for that surveillance year (ASME Code Section XI, Subsection IWL, 1992 Edition with 1992 Addenda) did not require augmented examinations; and because Turkey Point followed later ASME Code Section XI, Subsection IWL requirements mandated by 10 CFR 50.55a.

Predicted Lower Limit (PLL) and Base Line Predicted Force (BPF). The staff reviewed SLRA Section 4.5 and noted that Section 4.5 of the SLRA did not clearly indicate how the applicant plans to disposition the PLL and/or the alternate acceptable BPF TLAAs in accordance with 10 CFR 54.21(c)(1) during the subsequent period of extended operation. The staff needed more information and issued an RAI. RAI 4.5-1 and the applicant's response are documented in ADAMS Accession No. ML19064A824.

In RAI 4.5-1, the staff requested that the applicant clarify and identify how it would disposition the PLL and/or BPF TLAA per 10 CFR 54.21(c)(1). In its response, the applicant stated that "[t]he Concrete Containment Unbonded Tendon Prestress AMP and ASME Section XI, Subsection IWL AMP will manage the effects of aging," and therefore "the Concrete Containment Tendon Prestress TLAA (which includes the predicted forces, either PLL or BPF, shown in SLRA Figures 4.5-1 through 4.5-10) is dispositioned in accordance with 10 CFR 54.21(c)(1) and 10 CFR 54.21(d), as 10 CFR 54.21(c)(1)(iii)." The staff finds the applicant's response acceptable because it clearly states that it would disposition the PLL and or BPF TLAAs in accordance with 10 CFR 54.21(c)(1)(iii), and that the predicted tendon prestress forces on the intended functions of the tendon prestress will be adequately managed during the subsequent period of extended operation.

The staff also noted that TLAA 4.5, as amended by letters dated October 17, 2018, December 14, 2018, and March 1, 2019, plotted the PLL in Figures 4.5-1 through 4.5-6 of the SLRA to predict the lower bound prestress tendon lift-off forces during the CLB and also projected the PLL to the end of the subsequent period of extended operation. In its letter dated December 14, 2018, the applicant, however, stated that it would predict the tendon RVCH replacement activity tendon prestress forces prior to each surveillance by using the BPF methodology. In addition, the staff noted that during the review and evaluation of RAI 4.5-3 in conjunction with RAIs 4.5-2, 4.5-4, and B.2.2.3-1, that the applicant proposed to follow the BPF alternate approach of RG 1.35.1 to estimate tendon prestress forces for all tendon groups prior to each tendon lift-off force surveillance measurement during the subsequent period of extended operation. The staff's evaluation and basis for acceptability of the applicant's response to RAI 4.5-3 is documented in Section 3.0.3.2.3.

The staff finds the applicant's approach to determine tendon's lift-off force effectiveness and performance within the sampled tendon group based on the BPF acceptable, because the BPF TLAA dispositioned as 10 CFR 54.21(c)(1)(iii) provides the predicted tendon prestress forces subject to specific time-dependent losses based on design values of creep and shrinkage of concrete and relaxation of steel over the plant life as discussed in SER Section 3.0.3.2.3.

The staff then reviewed the applicant's BPF TLAA and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.7.3.1.3. The review procedures state that the applicant may reference the GALL-SLR Report in its subsequent license renewal application and propose to manage the aging effects associated with the TLAA by an AMP or aging management activities in the same manner as described in the integrated plant assessment (IPA) in 10 CFR 54.21(a)(3).

The staff noted that the amended SLRA Section 4.5 credits the Concrete Containment Unbonded Tendon Prestress program to manage predicted (estimated) tendon prestress forces based on BPF, which considers for estimates of loss of tendon prestress aging effect the conservative design values used to calculate creep and shrinkage of concrete and relaxation of steel through the subsequent period of extended operation.

Regression Analysis. The staff reviewed the amended SLRA Section 4.5 and noted that the applicant's regression analysis-based trend lines and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(iii) are consistent with the review procedures in SRP-SLR Section 4.5.3.1.3, which state that trend lines are developed consistent with IN 99-10 and applicable program elements of the GALL-SLR Report AMP X.S1.

The staff then examined SLRA Figures 4.5-1 through 4.5-6 and noted that the applicant considered the information provided in IN 99-10, Revision 1, Attachment 3, "Comparison and Trending of Prestressing Forces," by using each sampled tendon's lift-off force as a data point instead of the group averages at the scheduled surveillance intervals. The staff noted that this approach provides the true representation of the variability of the tendon forces (lift-off forces) with respect to time sought by IN 99-10, Revision 1, Attachment 3. Based on the applicant's regression analyses, the lift-off forces are expected to remain above the MRV for at least 80 years. The staff finds the applicant has demonstrated, in accordance with 10 CFR 54.21(c)(1)(iii), that the regression analyses trend lines for all tendon groups are updated after each surveillance to demonstrate that the loss of prestress aging effect will be adequately managed during the subsequent period of extended operation.

Furthermore, during its review of responses to RAIs 4.5-2 through 4.5-4 and RAI B.2.2.3-1, the staff noted that the applicant clarified that from the 1st through the 15th year of tendon surveillances the same preselected tendons were detensioned and retensioned, which resulted in increased tendon prestress lift-off force values when they were reexamined in subsequent surveillances. The staff finds the explanations provided by the applicant regarding the upward trending of examined tendons during the first 15 years of surveillances acceptable because the applicant performed its 1st through 15th year surveillances in accordance with its TS, which required detensioning of at least one preselected tendon from each tendon group for wire removal testing and subsequently retensioning to higher post-tensioning values (ADAMS Accession No. ML17348B474) within the ACI 318-63 Code of Record requirements, as stated in Chapter 5 of the UFSAR.

In its response to RAIs 4.5-2 through 4.5-4 and RAI B.2.2.3-1, the staff noted that the applicant clarified in SLRA Tables 4.5-1 through 4.5-10 and Figures 4.5-1 through 4.5-10 which tendon lift-off force measurements are related to RVCH replacement activities, and which are credited to common (control) tendons. The applicant also stated that "trend lines for each tendon group are constructed by regression analysis of all measured prestressing forces in individual tendons of that group obtained from all previous examinations."

The staff reviewed the applicant's input and finds it acceptable, because (i) the applicant provided separate group trend lines for the original tendons from those of RVCH related repaired/replaced tendons, and (ii) the applicant exercised conservatism of not including the RVCH related repaired/replaced tendon lift off force data, in accordance with IWL-2521(d), in the amended Figure 4.5-1 through Figure 4.5-6 for Turkey Point Unit 3 and Unit 4 tendon trending, but considered the RVCH related repaired/replaced tendon lift off force measurements separately as shown in Figures 4.5-7 through 4.5-10 and in accordance with IWL-2521.2. Therefore, the staff finds the applicant's response to RAI 4.5-4 acceptable.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of aging on the intended functions of the concrete containment prestressed tendons will be adequately managed for the period of extended operation. The staff's evaluation of the Concrete Containment Unbonded Tendon Prestress program is documented in SER Section 3.0.3.2.3, which determined that the AMP, with enhancements, will be adequate to manage the applicable aging effects.

Additionally, it meets the acceptance criteria in SRP-SLR Section 4.5.2.1.3 because the Concrete Containment Unbonded Tendon Prestress program assesses the concrete containment tendon prestressing forces and the staff has determined that the program is an acceptable way to manage aging of the containment tendon prestressing system.

4.5.3 UFSAR Supplement

SLRA Section A.17.3.5 provides the UFSAR supplement summarizing the containment tendon prestress TLAA. The staff reviewed SLRA Section A.17.3.5 consistent with the review procedures in SRP-SLR Section 4.5.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.5.2.2 and is therefore acceptable. Additionally, the staff determines that the applicant provided an adequate summary description of its actions to address the concrete containment prestress TLAA, as required by 10 CFR 54.21(d).

4.5.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of losses in prestressing forces on the intended functions of the containment prestressing system will be adequately managed by the Concrete Containment Unbonded Tendon Prestress program for the subsequent period of extended operation.

4.6 Containment Liner Plate, Metal Containments, and Penetrations Fatigue

4.6.1 Summary of Technical Information in the Application

SLRA Section 4.6 describes the applicant's TLAA for the liner attached to the entire inside surface of the containment structure that functions as a leak-tight barrier. FPL dispositioned the TLAA for the containment liner plate and penetrations in accordance with 10 CFR 54.21(c)(1)(i) to demonstrate that the analyses remain valid for the subsequent period of extended operation.

4.6.2 Staff Evaluation

The staff reviewed FPL's TLAA for the containment liner plate and piping penetrations and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR Section 4.6.3.1.1.1.

Containment Liner Plate. The staff reviewed UFSAR Section 16.3.5 and Appendix 5B, Section B.2.1, and verified that the design values used for the analysis of the containment liner plate is 500 load cycles due to containment interior temperature variations, 60 thermal cycles due to the annual outdoor temperature variations expected for 60 years of operation, and 1 thermal cycle due to the maximum hypothetical accident. Because an additional 20 thermal cycles from annual outdoor temperature variations are expected to occur during the subsequent period of extended operation, the SLRA stated that the number of thermal cycles was increased from 60 to 80 to account for this projected variation. The staff noted that the SLRA maintained all other design values for the subsequent period of extended operation.

The staff reviewed SLRA Tables 4.3-2 and 4.3-3 for Turkey Point Units 3 and 4 respectively, and confirmed that the total number of projected heat-up and cool-down cycles for 80 years of operation and the increased thermal cycles from the annual outdoor temperature variations expected during the subsequent period of extended operation will not exceed the design values used for the containment liner plate. The staff notes that a maximum hypothetical accident has not occurred, which also confirms that the assumed thermal cycle by the applicant of one remains valid for the subsequent period of extended operation.

Penetrations. The SLRA states that the main steam piping, feedwater piping, blowdown piping, and letdown piping are the only piping penetrating the containment wall and liner plate that contributes significant thermal loading on the liner plate. The SLRA further states that the projected number of actual operating thermal cycles of piping system penetration sleeves were evaluated for 80 years of operation and it was determined to be less than the design limits as demonstrated in SLRA Section 4.3.2. The staff noted from SLRA Section 4.3.2 that the number of projected full temperature cycles for piping systems listed above in this paragraph is 200 for 80 years of operation, which is not expected to exceed the 7,000 cycles for which they were evaluated. The staff's detailed evaluation of the piping systems for fatigue is documented in SER Section 4.3.2.

The staff finds that the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i) that the analyses for the containment liner plate and piping penetration sleeves (penetrating the liner) remains valid for the subsequent period of extended operation. Additionally, analyses for the containment liner plate and piping penetration sleeves (penetrating the liner)meets the acceptance criteria in SRP-SLR Section 4.6.2.1.1.1 because the number of occurrences and severity of assumed cyclic loads considered in the design are not projected to be exceeded during the subsequent period of extended operation.

4.6.3 UFSAR Supplement

SLRA Section A.17.3.6 provides the UFSAR supplement summarizing the TLAA for the containment liner plate and penetrations. The staff reviewed SLRA Section A.17.3.6 consistent with the review procedures in SRP-SLR Section 4.6.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.6.2.2 and is therefore acceptable.

4.6.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the fatigue cycles analyses for the containment liner plate and piping penetration sleeves remain valid for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.7 Other Plant-Specific TLAAs

4.7.1 Bottom-Mounted Instrumentation Thimble Tube Wear

4.7.1.1 Summary of Technical Information in the Application

SLRA Section 4.7.1 describes the applicant's TLAA for bottom-mounted instrumentation thimble tube wear. The applicant dispositioned the TLAA for the bottom-mounted instrumentation thimble tubes in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that the effects of loss of material due to fretting wear on the intended functions will be adequately managed by the Flux Thimble Tube Inspection program for the subsequent period of extended operation.

4.7.1.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the bottom-mounted instrumentation thimble tube wear and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.7.3.1.3.

The staff noted that the Flux Thimble Tube Inspection program is an existing condition monitoring program that specifically manages loss of material due to fretting wear of the bottom-mounted instrumentation thimble tubes. This program performs periodic bobbin coil eddy current testing to manage this aging effect at a frequency based on site-specific wear data and wear predictions. These tube wear rates are projected over future operating cycles and future examination intervals are determined based on the disposition of examination results and engineering evaluations that have been completed. The applicant takes corrective actions when trending results project that acceptance criteria would not be met before the next planned inspection or the end of the subsequent period of extended operation. Inspection results are reported using the applicant's corrective action program and are provided to the appropriate engineering personnel who evaluate, disposition, and recommend any necessary corrective actions. The evaluation must determine the need for repositioning, capping, or replacing the applicable damaged thimble tubing, or may provide justification to retain the original configuration of the existing thimble tube if it remains within the acceptance criteria. The staff's evaluation of the Flux Thimble Tube Inspection program is documented in SER Section 3.0.3.2.23, which determined that the AMP, with enhancements, will be adequate to manage the applicable aging effects.

The staff finds the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of loss of material due to fretting wear on the intended functions of the bottom-mounted instrumentation thimble tubes will be adequately managed for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.7.2.1.3 because eddy current testing at a periodicity based on site-specific wear data will be performed to manage loss of material due to fretting wear of the bottom-mounted instrumentation thimble tubes to ensure the flux thimble tubes maintain their intended function until the next scheduled inspection.

4.7.1.3 UFSAR Supplement

SLRA Section A.17.3.7.1 provides the UFSAR supplement summarizing the TLAA for bottom-mounted instrumentation thimble tube wear. The staff reviewed SLRA Section A.17.3.7.1 consistent with the review procedures in SRP-SLR Section 4.7.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is therefore acceptable.

4.7.1.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the effects of loss of material due to fretting wear on the intended functions of the bottom-mounted instrumentation thimble tubes will be adequately managed by the Flux Thimble Tube Inspection program for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.7.2 Emergency Containment Cooler Tube Wear

4.7.2.1 Summary of Technical Information in the Application

SLRA Section 4.7.2, as modified by the applicant's RAI 4.7.2-1 response (ADAMS Accession No. ML18352A885), describes Turkey Point's TLAA for cooler tube wear in the emergency containment cooling system. FPL dispositioned this TLAA in accordance with 10 CFR 54.21(c)(1)(iii) to demonstrate that wall thinning due to erosion and impingement from high flow rates will be adequately managed to maintain intended functions during the subsequent period of extended operation. FPL will manage the effects of aging by performing periodic inspections through the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program.

4.7.2.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the emergency containment cooling system cooler tubes and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(iii), consistent with the review procedures in SRP-SLR Section 4.7.3.1.3.

The SLRA initially credited the One-Time Inspection program to manage the effects of aging for the emergency containment cooler tube wear but changed to an alternate AMP in response to RAI 4.7.2-1, as discussed below.

The staff noted that the previous evaluation of this TLAA also used a one-time inspection to determine the extent of loss of material due to erosion in the emergency containment cooler tubes. However, during its review of the previous inspection results in LRAM-00-00065, "Emergency Containment Cooler Inspection – License Renewal Basis Document," the staff identified several questions and issued an RAI. RAI 4.7.2-1 and the applicant's response are documented in ADAMS Accession No. ML18352A885.

In its RAI response, FPL stated that, due to the potential data duplication error that the staff identified, ultrasonic thickness measurements will be taken during the 2019 refueling outage. The new measurements will serve as the baseline for future inspections in the subsequent period of extended operation. FPL revised SLRA Section 4.7.2 by deleting the discussion about the 2011 inspection results and substituting periodic inspections through the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. FPL also revised SLRA Table 3.2-1 (item 3.2-1-032) and Table 3.2.2-1, "Emergency Containment Cooling;" Appendix A Section A.17.3.7.2, Section A.17.2.2.25, and Table 17-3 (item No. 29); and Appendix B Table B-4 and Section B.2.3.25 to include a new aging management review (AMR) item for managing loss of material for the cooler tubes, to reflect the alternate AMP in the associated UFSAR supplement, and to provide an enhancement to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program for specifically performing periodic ultrasonic thickness measures of the cooler tubes.

The staff finds FPL's response acceptable because periodic ultrasonic thickness measurements of the cooler tubes provide reasonable assurance that wall thinning in emergency containment coolers will be adequately managed. The staff's determination includes the specific enhancement to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program in SLRA Section B.2.3.25 for: a) determining the inspection frequency, b) applying the calculated wear rate to the limiting locations, c) considering additional thinning during off-normal conditions, d) considering instrument uncertainty in the calculated wear rate, and e) including a 10 percent safety factor on the calculated wear rate. The staff's evaluation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is documented in SER Section 3.0.3.1.6, which determined that the AMP, with enhancement, will be adequate to manage the applicable aging effects.

The staff finds, pursuant to 10 CFR 54.21(c)(1)(iii), that FPL has demonstrated that the wall thinning due to erosion and impingement on the intended functions of the emergency containment cooler tubes will be adequately managed for the subsequent period of extended operation. In addition, FPL's TLAA evaluation meets the acceptance criteria in SRP-SLR Section 4.7.3.1.3, because periodic inspections will ensure that the pressure boundary function of emergency containment cooler tubes will be maintained throughout the subsequent period of extended operation.

4.7.2.3 UFSAR Supplement

SLRA Section A.17.3.7.2, as amended by letter dated December 14, 2018, provides the UFSAR supplement summarizing the emergency containment cooler tube wear TLAA. The staff reviewed SLRA Section A.17.3.7.2 consistent with the review procedures in SRP-SLR Section 4.7.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is therefore acceptable.

4.7.2.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(iii), that the wall thinning due to erosion and impingement on the intended functions of the emergency containment cooling system cooler tubes will be adequately managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.7.3 Leak-Before-Break Analysis for Reactor Coolant System Piping

4.7.3.1 Summary of Technical Information in the Application

SLRA Section 4.7.3 describes the applicant's LBB analysis for RCS primary piping TLAA. The applicant dispositioned this TLAA in accordance with 10 CFR 54.21(c)(1)(ii), stating that the LBB analysis has been projected to the end of the subsequent period of extended operation.

In 1994, the applicant performed a plant-specific LBB analysis for RCS primary loop piping at Turkey Point Units 3 and 4 as documented in Westinghouse report, WCAP-14237, "Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for the Turkey Point Units 3 and 4 Nuclear Power Plant." At the time, the applicant performed the LBB analysis to show that any potential leaks that develop in the RCS primary loop piping can be detected by RCS leakage detection systems before the crack would grow to unstable proportions during the 40-year plant life. By letter dated June 23, 1995 (ADAMS Accession No. ML17353A243), the staff approved the applicant's LBB application for the RCS primary loop piping.

In 2000, the applicant updated the LBB analysis for the RCS primary loop piping to support the first license renewal application (LRA) to extend operation to 60 years. The applicant's analysis was documented in WCAP-15354, Revision 0, "Technical Justification for Eliminating Large Primary Loop Pipe Rupture as the Structural Design Basis for the Turkey Point Units 3 and 4 Nuclear Power Plant for the 60 Year Plant Life (License Renewal Program)."

In 2009, the applicant evaluated the effect of the power uprate (EPU) on the LBB analysis of the RCS primary loop piping with acceptable results as part of the EPU application. By letter dated October 21, 2010 (ADAMS Accession No. ML103560169), the applicant submitted a license amendment request for EPU. By letter dated June 15, 2012 (ADAMS Accession No. ML11293A365), the NRC issued an amendment approving the EPU application for Turkey Point.

In 2017, as part of the SLRA, the applicant performed an LBB analysis of RCS primary loop piping as documented in WCAP-15354, Revision 1, "Technical Justification for Eliminating Primary Loop Pipe Rupture as the Structural Design Basis for Turkey Point Units 3 and 4 Nuclear Power Plants for the Subsequent License Renewal Time-Limited Aging Analysis Program (80 Years) Leak-Before-Break Evaluation." The WCAP-15354, Revision 1, report is Reference 4.7.7.6 in the SLRA and was submitted in Enclosure 4, Attachment 11 to the SLRA.

The applicant stated that WCAP-15354, Revision 1, documents the plant-specific geometry, loading, and material properties used in the LBB evaluation that are valid for the subsequent period of extended operation. The applicant stated that the aging effects that must be addressed for the subsequent period of extended operation include (1) thermal aging of the primary loop piping components, and (2) fatigue crack growth. The applicant noted that thermal aging refers to the gradual change in the microstructure and properties of a material due to its exposure to elevated temperatures for an extended period of time. The applicant stated that the only significant thermal aging effect on the RCS loop piping is embrittlement of the duplex ferritic cast austenitic stainless steel (CASS) components.

The SLRA states that, while the forged stainless steel RCS primary loop piping (A376, TP316) does not degrade due to thermal aging, the elbows in the primary loop that are made of CASS (A351, CF8M) are susceptible to thermal aging at RCS operating temperatures. Thermal aging of CASS elbows results in embrittlement, which leads to a decrease in the ductility, impact strength, and fracture toughness of the material.

The applicant stated that for the fully aged fracture toughness properties for 80 years of plant service, it used revised material correlations per NUREG/CR-4513, Revision 2, "Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems," Revision 2, in predicting the fracture toughness properties for the primary loop elbows based on RCS operating temperatures. The applicant stated that the fully aged condition is applicable for plants operating at beyond 15 EFPY for the A351, CF8M materials in the elbows of the RCS primary loop piping. The applicant further stated that that both Turkey Point Units 3 and 4 have operated more years (33 EFPY) than the 15 EFPY that would lead the elbow material to the fully aged condition. The applicant concluded that the use of the fracture toughness correlations is applicable for the fully aged or saturated condition of the elbows made of A351, CF8M to demonstrate the stability of postulated cracks in the RCS primary piping for 80 years of plant service.

The applicant determined critical locations and analyzed crack stability at these locations based on loading, pipe geometry, and fracture toughness. The applicant postulated through-wall flaw sizes at the critical locations that would cause leakage at a rate 10 times the RCS leakage detection system capability. The applicant demonstrated large margins against flaw instability for the postulated flaw sizes, including the requirement for margin of applied loads.

In the FCG analysis, the applicant used cycles from a design transient set that bounds the design transient cycles. The applicant determined that FCG for the subsequent period of extended operation is negligible.

The applicant reported that there is no Alloy 82/182 weld material in the RCS primary loop piping in Turkey Point Units 3 and 4. Therefore, the potential for primary water stress corrosion cracking (PWSCC) is precluded in the RCS primary loop piping for 80 years of plant service.

The applicant stated that the revised LBB analysis has demonstrated compliance with general design criterion (GDC)-4, Fluid Systems, for the RCS primary loop piping for 80 years of plant operation based on a plant-specific LBB analysis, and that the dynamic effects of RCS primary loop pipe breaks need not be considered in the structural design basis for the 80-year plant service.

The applicant concluded that, because the crack stability analysis in the LBB evaluation is related to the period of plant operation, the LBB analysis is a TLAA.

4.7.3.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the LBB analysis of the RCS primary piping 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.

By letter dated June 6, 2002 (ADAMS Accession No. ML012320135), the staff approved the 60-year license for Turkey Point Units 3 and 4 in which the staff confirmed that the LBB evaluation of the RCS primary piping in WCAP-15354, Revision 0, is applicable for 60 years.

By letter dated June 15, 2012 (ADAMS Accession No. ML11293A359), the staff also approved the power uprate application for Turkey Point Units 3 and 4 in which the staff confirmed that the LBB evaluation for the RCS primary piping is valid under power uprated conditions.

Turkey Point Units 3 and 4 entered the 40-to-60-year period of extended operation on July 19, 2012 and April 10, 2013, respectively.

In addition to using the review procedures in SRP-SLR Section 4.7.3.1.2, the staff evaluated WCAP-15354, Revision 1, to determine the validity of LBB application on the RCS primary piping for the subsequent period of extended operation in accordance with NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," (SRP) Section 3.6.3, "Leak-Before-Break Evaluation Procedures," Revision 1 (ADAMS Accession No. ML063600396). The staff's evaluation is divided into two major sections, screening criteria and flaw evaluation, as discussed below.

4.7.3.2.1 Screening Criteria

SRP 3.6.3 specifies screening criteria that is used to rule out the application of LBB to piping that is susceptible to active degradation mechanisms such as corrosion, water hammer, fatigue, erosion, creep, and cleavage. The staff's evaluation of whether the RCS primary piping satisfies these screening criteria is discussed below.

<u>Corrosion</u>

The applicant stated that the RCS primary loops of the Westinghouse RCS have a low susceptibility to cracking failure from the effects of corrosion (e.g., intergranular stress corrosion cracking (IGSCC)) based on an operating history of over 1,400 reactor-years.

For stress corrosion cracking (SCC) to occur in piping, the following three conditions must exist simultaneously: high tensile stresses, susceptible material, and a corrosive environment. Because some residual stresses and some degree of material susceptibility exist in any stainless steel piping, the potential for stress corrosion is minimized by properly selecting a material immune to SCC and preventing the occurrence of a corrosive environment. The material used in the primary loop piping was selected to be compatible with the system's operating environment (both internal and external) and other material in the system, applicable ASME Code rules, fracture toughness, welding, fabrication, and processing.

The elements of a water environment known to increase the susceptibility of austenitic stainless steel to stress corrosion are: oxygen, fluorides, chlorides, hydroxides, hydrogen peroxide, and reduced forms of sulfur (e.g., sulfides, sulfites, and thionates). The applicant stated that it used strict pipe cleaning standards before operation and careful control of water chemistry during plant operation to prevent the occurrence of a corrosive environment. Before being put into service, the piping is cleaned internally and externally. During flushes and preoperational testing, water chemistry is controlled in accordance with written specifications. Requirements for chlorides, fluorides, conductivity, and pH are included in the acceptance criteria for the piping.

The applicant stated that during plant operation, the reactor coolant water chemistry is monitored and maintained within very specific limits. Contaminant concentrations are kept below the thresholds known to be conducive to SCC with the major water chemistry control standards being included in the plant operating procedures as a condition for plant operation. The applicant stated that, for example, during normal power operation, oxygen concentration in the RCS is expected to be in the parts per billion range by controlling charging flow chemistry and maintaining hydrogen in the reactor coolant at specified concentrations. Halogen concentrations are also stringently controlled by maintaining concentrations of chlorides and fluorides within the specified limits.

The staff notes that operating experience has shown that PWSCC has occurred in nickel-based Alloy 600/82/182 components in pressurized-water reactors (PWRs). Specifically, cracking has occurred in Alloy 82/182 dissimilar metal butt welds in primary loop piping and associated branch piping in PWRs. The applicant reported that welds in primary loop piping at Turkey Point Units 3 and 4 do not use Alloy 82/182 filler metal.

Because the RCS piping at Turkey Point does not utilize this material, and based on the evaluation above, the staff finds that SCC is not an active degradation mechanism in the RCS primary piping.

Water Hammer

The applicant stated that there is a low potential for water hammer in the RCS because it is designed and operated to preclude the voiding condition in normally filled lines. The RCS is designed for normal, upset, emergency, and faulted condition transients. The design requirements are conservative relative to both the number of transients and their severity. Relief valve actuation and the associated hydraulic transients following valve opening are considered in the system design. Other valve and pump actuations are relatively slow transients with no significant effect on the system dynamic loads. The applicant stated that to ensure dynamic system stability, reactor coolant parameters are stringently controlled. Temperature during normal operation is maintained within a narrow range and pressure is controlled by pressurizer heaters and pressurizer spray also within a narrow range for steady-state conditions. The flow characteristics of the system remain constant during a fuel cycle because the only governing parameters, namely system resistance and the RCP characteristics, are controlled in the design process. Additionally, RCS is monitored for the flow and vibration characteristics. The applicant stated that operating transients of the RCS primary piping are such that no significant water hammer can occur.

Based on the above evaluation, the staff finds that water hammer is not an active degradation mechanism in the RCS primary piping.

Fatigue

The applicant assessed the low cycle fatigue loadings as part of the FCG analysis. High cycle fatigue loads in the RCS piping system would result primarily from pump vibrations. These are minimized by restrictions placed on shaft vibrations during hot functional testing and operation. During operation, an alarm signals the exceedance of the vibration limits. The applicant indicated that field vibration measurements have been made on a number of plants during hot functional testing, including plants similar to Turkey Point Units 3 and 4. The applicant stated that stresses in the elbow below the RCP resulting from system vibration have been found to be very small, between 2 and 3 ksi at the highest. These stresses are well below the fatigue endurance limit for the material and would also result in an applied stress intensity factor below the threshold for FCG.

During its review of the applicant's LBB TLAA, the staff needed additional information and issued an RAI. RAI 4.7.3-5 and the applicant's response are documented in ADAMS Accession No. ML18299A214.

In RAI 4.7.3-5, the staff questioned the impact of thermal fatigue on RCS primary piping with respect to Electric Power Research Institute (EPRI) TR, MRP-192, "Materials Reliability Program: Assessment of Residual Heat Removal Mixing Tee Thermal Fatigue in PWR Plants MRP-192, Revision 2)," August 2012, and MRP-146, "Materials Reliability Program: Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines (MRP-146, Revision 1)," June 2011.

In its response, the applicant stated that the reactor coolant loop piping (i.e., RCS primary piping) of Turkey Point Units 3 and 4 are not subject to the thermal fatigue effects identified in MRP-146 and MRP-192. The applicant stated that MRP-146 provides guidance related to the screening and evaluation of locations in normally stagnant, non-isolable piping systems attached to the RCS primary piping where swirl penetration and/or valve in-leakage may cause thermal fatigue cracking. The RCS primary piping of Turkey Point Units 3 and 4 are not normal stagnant lines; therefore, the screening and evaluation guidance of MRP-146 does not apply to the RCS primary piping analysis and does not impact the conclusion of the LBB evaluation.

The applicant stated that MRP-192 addressed an occurrence of thermal fatigue cracking in a mixing tee component of a residual heat removal (RHR) line. The thermal fatigue cracking was caused by cyclic mixing of hot and cold reactor coolant in a zone where hot heat exchanger bypass flow rejoined the cold heat exchanger outlet flow. The applicant further stated that this type of cyclic thermal mixing cannot occur at any location of the RCS primary piping at Turkey Point Units 3 and 4; therefore, an assessment related to MRP-192 does not apply to the RCS primary piping analysis and does not impact the conclusion of the LBB evaluation.

The applicant explained that the assessment of low cycle fatigue is performed in the form of a FCG analysis that is documented in Section 8 of WCAP-15354, Revision 1. The applied transients, which contribute to the thermal fatigue effects for the 80-year period of operation of Turkey Point Units 3 and 4, are identified in Table 8-1 of WCAP-15354, Revision 1.

The staff finds that the thermal fatigue issues identified in MRP-146 and MRP-192 will not impact the LBB evaluation. The staff finds that the applicant has performed a FCG analysis to ensure that fatigue will not affect the structural integrity of the primary loop piping. The staff evaluated the details of the applicant's FCG analysis further in this SER.

Erosion

The applicant stated that wall thinning by erosion should not occur in the primary loop piping due to the low velocity, typically less than 1.0 ft/sec and the stainless steel material, which is highly resistant to these degradation mechanisms. The cause of wall thinning is related to the high water velocity and is, therefore, not a mechanism that would affect the primary loop piping.

Creep

The applicant reported that creep is typically experienced at temperatures over 700 °F for stainless steel material, and the maximum operating temperature of the primary loop piping is well below the temperature range. Therefore, there would be no significant mechanical creep damage in the RCS primary stainless steel piping.

Cleavage

The applicant stated that cleavage type failures are not a concern for the operating temperatures and the stainless steel material used in the primary loop piping.

Based on its evaluation, the staff finds that erosion, creep, and cleavage are not active degradation mechanisms in the RCS primary loop piping.

In addition to the above evaluation, the staff notes that the applicant has operated Turkey Point Units 3 and 4 for more than 40 years without having any active degradation mechanism in the RCS primary piping. The staff concludes that the RCS primary piping satisfies the screening criteria in SRP 3.6.3.

4.7.3.2.2 Flaw Evaluation

SRP 3.6.3 states that an acceptable deterministic LBB evaluation analysis includes the following parameters for a postulated through-wall flaw: (1) the critical crack size should be at least two times the leakage crack size to achieve a minimum margin of 2, (2) the leak rate from the leakage crack should be 10 times more than the leak rate that the RCS leakage detection systems are capable of detecting, (3) the leakage crack growth should be stable, and (4) potential for crack growth caused by fatigue should be insignificant.

This TLAA of the postulated flaw evaluation involves thermal aging of the CASS material which relates to crack stability analysis and FCG analysis of the RCS primary piping because these two issues are time-dependent. The staff evaluated the applicant's crack stability analysis and FCG analysis to determine whether the RCS primary piping is acceptable for the LBB application for the subsequent period of extended operation.

To verify that the LBB analysis for the RCS primary piping is valid for the subsequent period of extended operation, the staff reviewed the following: the applied loads and stresses, material properties, critical locations, leak rate calculations, crack stability analysis, and FCG calculations. The staff's review is documented in the following sections.

Applied Loads and Stresses

The applicant stated that the as-built outside diameter and minimum wall thickness of the RCS primary coolant hot leg pipe are 34.00 inches and 2.395 inches, respectively. The normal stresses at the weld locations are from the load combination procedure. The components for normal loads are pressure, dead weight, and thermal expansion. An additional component, safe shutdown earthquake (SSE) is considered for faulted loads. The applicant analyzed critical locations with high stresses to meet the safety margins. The applicant postulated a circumferential flaw at the critical location that is subjected to both the normal and faulted loads to assess leakage and stability, respectively.

The applicant explained that because the elbows are made of different materials than the pipe, locations other than the highest stressed pipe location were examined based on both fracture toughness and stress. Once loads and fracture toughness were obtained from the stress analysis and Certified Mill Test Reports, the applicant determined the critical locations that have the highest applied loads and stresses. For the critical locations, the applicant performed leak rate evaluations and fracture mechanics evaluations per the guidance of SRP 3.6.3.

The applicant indicated that it considered the piping loads and stresses based on the LBB re-evaluation performed as part of the EPU program as described in Revision 1 of WCAP-15354.

In accordance with SRP 3.6.3, the margin in terms of applied loads needs to be demonstrated. Margin on loads of 1.4 (√2) can be demonstrated if normal plus SSE are applied. The 1.4 (√2) margin could be reduced to 1.0 if the deadweight, thermal expansion, internal pressure, SSE, and seismic anchor motion loads are combined based on individual absolute values. To calculate the loads for the leak rate evaluation, the applicant used the normal operating loads of deadweight, thermal, and pressure based on the algebraic sum method per SRP 3.6.3. The applicant used the absolute sum of loading for the LBB analysis that results in a higher magnitude of combined loads and thus satisfies a margin on loads of 1.0. For the load combination, the applicant added the forces and moments for deadweight, thermal, SSE, and SSE anchor movement.

The applicant calculated resulting stresses from applied axial loads and bending moments based on pipe cross-sectional area and section modulus at critical pipe locations. The bending moments are calculated by combining bending moments in the Y and X axis.

In the audit of the applicant’s documents, the staff found the onsite document AR 01610224 that discussed errors in a pipe stress analysis. The staff needed additional information regarding these errors and issued an RAI. RAI 4.7.3-4 and the applicant’s response are documented in ADAMS Accession No. ML18299A214.

In RAI 4.7.3-4, the staff requested additional information to understand whether errors in pipe stress software as discussed in AR 01610224 affected the applied loads and stresses used in the LBB analysis of reactor coolant piping. In its response, the applicant stated that error report AR 01610224 is associated with the PIPESTRESS computer code. The applicant confirmed that the PIPESTRESS computer code was not used in the piping analysis inputs to the LBB evaluation of the RCS primary piping. As such, the software error discussed in AR 01610224 does not apply to the RCS primary piping analysis and does not impact the applied loads and stresses used in the LBB evaluation. The staff finds that this issue is closed because the errors in the pipe stress analysis are not associated with the LBB evaluation.

The staff finds it acceptable that the applicant included the piping loads and stresses based on the power uprated conditions in the flaw calculations, and the applicant followed the guidance of load combinations in SRP 3.6.3.

Material Properties

The applicant stated that the RCS primary loop pipe is fabricated with austenitic stainless steel A376-TP316 and the elbow is fabricated with CASS A351-CF8M. The pipe and elbow certified materials test reports (CMTRs) for Turkey Point Units 3 and 4 were used to establish the tensile properties for the LBB analyses. The pipe CMTRs include tensile properties at room temperature and at 650 °F for each of the heats of material, while the elbow fitting CMTRs include tensile properties at room temperature.

For the A376 TP316 material, the applicant obtained the representative mechanical properties at 616.8 °F (hot leg temperature) from the tensile properties at 650 °F using the 1989 edition of the ASME Code, Section III. The applicant reported that there is no significant impact on the LBB analysis by using the 1989 edition of the ASME Code Section III for material properties, as compared to the ASME Code of record for Turkey Point at the time of the LBB analysis.

For the A351-CF8M material, the applicant established the representative mechanical properties at 616.8 °F and 549.2 °F (cold leg temperature conservatively bounds crossover leg temperature) from the tensile properties at room temperature as listed in the 1989 edition of the ASME Code.

The applicant stated that the forged stainless steel piping (A376-TP316) of the RCS primary piping does not degrade due to thermal aging. However, the CASS elbow fittings (A351-CF8M) in the RCS primary piping subjected to a high temperature environment are potentially susceptible to degradation due to thermal aging. Therefore, the applicant's analysis provides the aged, EOL fracture toughness properties for cast CF8M elbows due to thermal aging embrittlement.

The applicant stated that the pre-service fracture toughness (J) of CASS that are of interest in terms of J_{Ic} (J at crack initiation) have been found to be very high at 600 °F. The applicant stated that CASS is susceptible to thermal aging at the reactor operating temperature of about 550 °F. Thermal aging of CASS results in embrittlement, which causes a decrease in the ductility, impact strength, and fracture toughness of the material. The applicant explained that depending on the material composition, the Charpy impact energy of a CASS component could decrease to a small fraction of its original value after exposure to reactor temperatures during service.

The applicant indicated that the susceptibility of the material to thermal aging increases with increasing ferrite contents. The molybdenum-bearing CF8M shows increased susceptibility to thermal aging. In 1994, Argonne National Laboratory (ANL), under the sponsorship of the NRC, completed an extensive research program to assess the extent of thermal aging of cast stainless steel materials as discussed in NUREG/CR-6177, "Assessment of Thermal Embrittlement of Cast Stainless Steels." The ANL research program measured mechanical properties of CASS after they had been heated in controlled ovens for long periods of time. ANL compiled a database, from data within ANL and from international sources, of about 85 compositions of cast stainless steel exposed to a temperature range of 550-750 °F for up to 58,000 hours (6.5 years).

In 2015, the work done by ANL was augmented, and the fracture toughness database for the CASS materials was aged to 100,000 hours at 554–633 °F. The methodology for estimating fracture properties has been extended to cover CASS materials with a ferrite content up to 40 percent. From this database, ANL developed correlations for estimating the extent of thermal aging of CASS as shown in NUREG/CR-4513, Revision 2, "Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems."

ANL developed the fracture toughness estimation procedures by correlating data in the database conservatively. After developing the correlations, ANL validated the estimation procedures by comparing the estimated fracture toughness with the measured value for several cast stainless steel plant components removed from actual plant service. In the LBB analysis, the applicant used the procedure that ANL developed in NUREG/CR-4513, Revision 2 to calculate the EOL fracture toughness values.

The applicant stated that based on NUREG/CR-4513, Revision 2, the fracture toughness correlations used for the fully aged condition is applicable for plants operating at and beyond 15 EFPY for the CF8M materials of elbows in RCS primary loop piping at Turkey Point Units 3 and 4. The applicant reported that as of June 1, 2017, Turkey Point Units 3 and 4 are operating at 33.16 EFPY and 33.23 EFPY, respectively. Therefore, the use of the fracture toughness correlations per NUREG/CR-4513, Revision 2, is applicable for the fully aged or saturated condition of the elbow materials made of CF8M at Turkey Point Units 3 and 4.

The applicant stated that results from the ANL research program indicate that the lower-bound fracture toughness of thermally aged CASS is similar to that of submerged arc welds. The applied value of the J-integral for a flaw in the weld regions will be lower than that in the base metal because the yield stress for the weld materials is much higher at the operating temperature. Therefore, weld regions are less limiting than the CASS material.

The applicant used toughness properties calculated in the fracture mechanics analyses as the criteria against which the applied fracture toughness values will be compared.

The staff notes that GALL-SLR Report AMP XI.M12, “Thermal Aging Embrittlement of Cast Austenitic Stainless Steel,” which references NUREG-4513, Revision 1, not Revision 2, in the discussion of fracture toughness. However, the staff does not object to the applicant’s use of NUREG-4513, Revision 2 because the staff finds that the approaches between Revision 1 and Revision 2 are very similar.

The staff finds that the material properties used in the applicant’s LBB analysis are acceptable because the applicant used acceptable sources to obtain the appropriate material property values to perform the flaw evaluation.

Critical Location

SRP 3.6.3 specifies that the LBB margins are to be demonstrated for the limiting locations (governing locations) of the subject piping. They are called critical locations and are established based on the applied loads and material properties. The highest stressed location for the entire primary loop is selected as the critical location(s) of the pipe and it is analyzed.

The applicant selected three critical locations based on loads, stresses, and fracture toughness. The applicant stated that because the elbows are made of CASS and can be susceptible to thermal aging embrittlement, the critical locations for the elbows are also analyzed.

The staff finds that the critical locations that the applicant has selected are acceptable because they are selected adequately based on the load, stresses, and limiting material properties.

Critical Crack Size

The applicant used the limit load method to obtain the critical crack size at the critical locations. The applicant stated that determination of the conditions that lead to failure in stainless steel should be done with plastic fracture methodology because of the large amount of deformation accompanying fracture. One method for predicting the failure of ductile material is the plastic instability method, based on traditional plastic limit load concepts but accounting for strain hardening and taking into account the presence of a flaw. The degraded pipe is predicted to fail when the remaining net section[4] at the degraded location of the pipe reaches a stress level at which a plastic hinge is formed at the degraded location. The stress level at which this occurs is called the flow stress. The flow stress is generally taken as the average of the yield and ultimate tensile strength of the material at the temperature of interest. The applicant stated that the limit load methodology has been shown to be applicable to ductile piping through a large number of experiments and will also be used to predict the critical flaw size in the primary coolant piping. The applicant stated that the failure criterion has been obtained by requiring equilibrium of the section containing the flaw when loads are applied.

The analytical model accounts for the piping internal pressure as well as imposed axial force as they affect the limit moment. The applicant stated that good agreement was found between the analytical predictions and the experimental results (Reference: Kanninen, M.F. et. al., “Mechanical Fracture Predictions for Sensitized Stainless Steel Piping with Circumferential Cracks,” EPRI NP-192, September 1976). For application of the limit load methodology, the material, including consideration of the configuration, must have a sufficient ductility and ductile tearing resistance to sustain the limit load. The applicant calculated the critical crack size at the three critical pipe locations from the limit load method.

The staff notes that the applicant is permitted to use either the elastic-plastic fracture mechanics (EPFM) method or the limit load method to calculate the critical crack size. The staff determines that the applicant has used the appropriate limit load method to obtain the critical crack sizes at the critical pipe locations in the RCS primary piping.

Leak Rate Predictions and Leakage Crack Size

To predict leak rate from the crack opening, the applicant used a two-phase flow approach. The applicant used Figure 6-1 in WCAP-15354, which was taken from M.M., El-Wakil, “Nuclear Heat Transport,” International Textbook Company,’ New York, N.Y, 1971, to estimate the critical pressure, P_c, for the enthalpy condition with an assumed flow in the RCS primary piping. Once P_c was found for a given mass flow, the stagnation pressure was found from Figure 6-2 of WCAP-15354. This method will yield the two-phase pressure drop due to momentum effects. Using the assumed flow rate, the frictional pressure drop can be calculated and added to the pressure drop to obtain the total pressure drop from the primary piping to the atmosphere. The pressure drop equation is iteratively solved, such that the pressure difference between the RCS primary piping and the atmosphere is adequately calculated with a specific leak rate for the given crack size.

Per SRP 3.6.3, the applicant used the normal operating loads to calculate the leak rate as a function of crack length at the critical pipe locations. The crack opening areas (i.e., leakage crack size) were estimated using the method in Section II-1 of NUREG/CR-3464 prepared by Tada, H., “The Effects of Shell Corrections on Stress Intensity Factors and the Crack Opening Area of Circumferential and a Longitudinal Through-Crack in a Pipe,” September 1983. The applicant calculated the flaw sizes that yield a leak rate of 10 gallons per minute (gpm) at the critical locations. The applicant stated that the RCS pressure boundary leak detection system at

[4] “Net section” refers to the final cross section of the cracked pipe wall (the metal part) after the cracked metal area is subtracted from the original pipe cross section. The final cross sectional area (i.e., net section) will support the applied loading so that the cracked pipe will not rupture.

Turkey Point Units 3 and 4 meets the intent of RG 1.45, and the RCS leakage detection capability is 1 gpm. Thus, to satisfy the margin of 10 on the leak rate in accordance with SRP SLR Section 3.6.3, the applicant calculated leakage flaw sizes that yield at least a leak rate of 10 gpm.

The staff determines that the applicant calculated that critical crack sizes are more than two times larger than the leakage crack sizes. Therefore, the staff finds acceptable that the crack size margin of 2 per SRP-SLR Section 3.6.3 has been satisfied.

The staff determines that the applicant used appropriate methods to calculate the leak rate and leakage crack size. Therefore, the staff finds that the leakage crack sizes have satisfied the margin of 10 with respect to the RCS leakage detection capability of 1 gpm.

Crack Stability Analysis

The applicant performed crack stability analyses based on loads and postulated leakage flaw size. The applicant stated that the local mechanism of failure is primarily dominated by the crack tip behavior in terms of crack-tip blunting, initiation, extension, and final crack instability. The local stability will be assumed if the crack does not initiate at all. It has been accepted that the initiation toughness measured in terms of J_{Ic} from a J-integral resistance curve is a material property parameter beyond which a crack will be initiated. If, for a given load, the calculated J-integral value (i.e., applied J, $J_{applied}$, or J_{app}) is shown to be less than the J_{Ic} of the material, then a crack will not initiate. If the criterion for absence of initiation is not met and a crack is initiated, one can determine the crack stability based on the concept of ductile tearing (denoted ‘T’). Crack stability exists when ductile tearing does not occur (i.e., T_{app} is less than T_{mat} where T_{app} is the applied tearing modulus and T_{mat} is the experimentally determined material tearing modulus). Because a constant T_{mat} is assumed, a further restriction is placed in J_{app} for crack stability. J_{app} must be less than J_{max} where J_{max} is the maximum J value of the material for which the experimental T_{mat} is greater than or equal to the T_{app} used.

The local crack stability criteria are as follows:

(1) If $J_{app} < J_{Ic}$, the crack will not initiate and the crack is stable

(2) If $J_{app} \geq J_{Ic}$; and $T_{app} < T_{mat}$ and $J_{app} < J_{max}$, the crack is stable

The applicant performed the EPFM for through-wall circumferential cracks in a cylinder using the procedure in the EPRI fracture mechanics handbook by Kumar, V., German, M.D. and Shih, C.P., “An Engineering Approach for Elastic-Plastic Fracture Analysis,” EPRI Report NP-1931, Project 1237-1, Electric Power Research Institute, July 1981.

The staff determined that the key issue in the crack stability analysis for the SLRA is whether the applicant used the fully aged, saturated fracture toughness, J_{Ic} value, for the CASS elbow in its crack stability analysis because the fracture toughness of CASS material will decrease with time as a result of the aging effect.

WCAP-14237 is the original LBB analysis for the primary loop piping through 60 years of operation. WCAP-15354 is the LBB analysis for the primary loop piping through 80 years of operation. The staff noted differences between fracture toughness values J_{Ic} and J_{max} of locations 2 and 11 of the primary loop piping and issued an RAI. RAI 4.7.3-2 and the applicant’s response are documented in ADAMS Accession No. ML18299A214.

In RAI 4.7.3-2, the staff requested that the applicant explain the differences between the fracture toughness values. In its response, the applicant stated that the original LBB analysis for the RCS primary piping, as documented in WCAP-14237, calculates the aged fracture toughness properties of cast stainless steel components using the Westinghouse methodology that is documented in WCAP-10931, Revision 1. This methodology was based on a nominal set of material testing data and results in conservative approximations of the aged fracture toughness values; J_{Ic} and J_{max}. Specifically, for a critical location as shown in WCAP-14237, the chemical composition of the cast material results in the calculation of a very low value of Charpy U-notch fracture toughness (KCU). For very low values of KCU, the methodology of WCAP-10931, Revision 1 required the assumption that this material be considered as fully aged, and the maximum fracture toughness (J_{max}) is conservatively taken to be equal to the crack initiation fracture toughness (J_{Ic}).

The applicant stated that the update to the LBB analysis for the RCS primary piping for the 80-year operation period, documented in WCAP-15354-P, Revision 1, considers the methodology in NUREG-4513, Revision 2 for estimating the aged fracture toughness properties of cast stainless steel components. The methodology of NUREG-4513, Revision 2 is based on a considerably more extensive set of material testing data that eliminates the need for some of the overly conservative approximations that were inherent in the methodology of WCAP-10931, Revision 1. By using the methodology of NUREG-4513, Revision 2, the updated LBB analysis for the RCS primary piping for the 80-year period of operation was able to establish increases to the aged fracture toughness values, J_{Ic} and J_{max}, for the most limiting material locations.

The staff determined that the J_{Ic} value used in the applicant's crack stability analysis is comparable to the J_{Ic} values taken from the fracture toughness data for the CASS material in the RCP casing as shown in Westinghouse TR WCAP-13045, "Compliance to ASME Code Case N-481 of the Primary Loop Pump Casings of Westinghouse Type Nuclear Steam Supply Systems" (ADAMS Legacy Accession No. 9111080138).

The elbows in the RCS primary loop piping are made of CASS material, which is susceptible to thermal embrittlement when the component is placed in long-term service. In SLRA Section 4.7.3, the applicant used the method in NRC document NUREG/CR-4513, "Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems," Revision 2, to predict the fully aged fracture toughness values for the elbows at the end of 80 years. SLRA Section 4.7.5 discusses thermal embrittlement of the reactor coolant pump casing that is made of CASS material. In SLRA Section 4.7.5, the applicant used NUREG/CR-4513, Revision 2 and Westinghouse report, WCAP-13045, to predict the fully aged fracture toughness values for the reactor coolant pump casing.

The staff needed more information to reconcile the different methodologies used in the two different SLRA sections and issued an RAI. RAI 4.7.3-6 and the applicant's response are documented in ADAMS Accession No. ML18299A214.

In RAI 4.7.3-6, the staff asked the applicant to explain whether the fracture toughness data in WCAP-13045 as discussed in Section 4.7.5 are applicable to the elbows in the RCS primary piping as discussed in Section 4.7.3. In its response, the applicant stated that the aged fracture toughness values presented in WCAP-13045 are based on specific material testing composition data for RCS primary pump casings and are not specific to any cast RCS primary piping component for Turkey Point Units 3 and 4. As such, the aged fracture toughness values in WCAP-13045 are not applicable to the Turkey Point Units 3 and 4 LBB evaluation of the RCS primary piping. The applicant stated that instead, for the CF8M cast RCS primary piping elbows, the aged fracture toughness values were calculated for the specific elbow material compositions; first in WCAP-14237, then most recently in WCAP-15354-P, Revision 1, using the updated methodology of NUREG-4513, Revision 2. However, the applicant stated that both WCAP-14237 and WCAP-13045 consider the same methodology for calculating aged fracture toughness properties of cast stainless steel components from WCAP-10931, Revision 1, "Toughness Criteria for Thermally Aged Cast Stainless Steel," July 1986. The applicant explained that although the fracture toughness properties of WCAP-13045 are not applicable to the LBB evaluation of the RCS primary piping, the corresponding methodology for the calculation of the fracture toughness properties was considered in previous the revision of the LBB evaluation of the RCS primary piping, WCAP-14237. The applicant explained that this methodology has since been superseded by NUREG-4513, Revision 2, which is used in the current LBB evaluation, WCAP-15354-P, Revision 1.

The staff questioned whether the applicant used the lowest (i.e., conservative) fracture toughness in its crack stability analysis. Based on its review, the staff finds that the applicant has used the appropriate aged, fully saturated fracture toughness J_{Ic} values to perform the crack stability analysis. The staff finds that the J_{app} value at the postulated leakage crack is less than the aged saturated fracture toughness of J_{Ic} and J_{max} at the limiting pipe locations. Therefore, the staff finds that the applicant has demonstrated that the postulated through-wall flaw will be stable to the end of the subsequent period of extended operation.

Fatigue Crack Growth Analysis

In order to review the acceptability of fatigue crack growth at the end of 80 years, the staff also reviewed the applicant's fatigue crack growth analysis for the 60-year license renewal period. To determine the sensitivity of the RCS primary piping to the presence of small cracks, the applicant analyzed a plant-specific FCG for 60-year plant service for the certain pipe region as shown in WCAP-15354, Revision 0. The applicant postulated circumferentially oriented surface flaws in the pipe region and the postulated flaw was located in two different locations of the pipe region.

The applicant selected this pipe region because crack growth calculated will be representative (i.e., the design transient thermal and pressure stresses will be representative) of that in the entire RCS primary piping. The crack growth at the pipe region will demonstrate that small surface flaws would not develop to through-wall flaws during the 60-year plant life. The applicant stated that crack growths calculated at other locations can be expected to show less than 10 percent variation.

In Revision 0 of the WCAP-15354 report, the applicant predicted the transients and cycles for the 60-year plant service of Turkey Point Units 3 and 4 as shown in WCAP-15370, "Turkey Point Units 3 and 4 Design Basis Transient Evaluation for License Renewal," January 2000. The applicant reviewed the actual plant operating transient severity and the frequency of occurrences. The applicant determined that the design transients and cycles of Turkey Point Units 3 and 4 for the 60-year plant service are bounded by the 40-year design plant service transients and cycles. The applicant stated that the number of cycles predicted for the 60-year plant service is still less than the 40-year design basis cycles. WCAP-14291, "Turkey Point Units 3 and 4 Uprating Engineering Report," December 1995, shows the uprating transients for Turkey Point Units 3 and 4.

By reviewing WCAP-15370 and WCAP-14291, the applicant considered all the significant normal, upset, and test conditions for the plant-specific FCG analysis. The applicant compared the list of transients and cycles in Table 8-1 of WCAP-15370, Revision 1, that was originally applicable for 60 years of plant service, with the transients list for 80 years of plant service. The transients and associated cycles for Units 3 and 4 for 80 years are presented in SLRA Section 4.3.1. The applicant stated that 60-year transients and cycles as shown in Table 8-1 of WCAP-15370 remain applicable and bounding for 80 years of plant service transients and cycles. The applicant concluded that the FCG evaluation for Turkey Point will remain applicable for 80 years of plant service transients and cycles.

The staff reviewed SLRA Tables 4.3-2 and 4.3-3, which list design and projected cycles at the end of 80 years for Turkey Point Units 3 and 4, respectively. The staff finds that for each transient, the design basis cycles are greater than the predicted cycles at the end of 80 years. One of the parameters used in the FCG calculation is the number of transient cycles. A higher number of transient cycles will result in more—and thus conservative—calculated crack growth. The staff finds that the design transients and cycles used in the applicant's FCG calculation are acceptable.

The applicant used FCG rate laws in the ASME Code Section XI to calculate FCG for semi-elliptic surface flaws of circumferential orientation. The applicant's analysis shows that the crack growth is very small. The applicant concluded that the generic FCG analysis shown in Table 8-2 of WCAP-15354 is representative of the Turkey Point plants for 80 years of operations.

During its review of the applicant's FCG analysis, the staff needed more information and issued an RAI. RAI 4.7.3-1 and the applicant's response are documented in ADAMS Accession No. ML18299A214.

In RAI 4.7.3-1, the staff questioned why an axial oriented flaw was not postulated in the RCS primary piping in the LBB evaluation. The applicant responded that based on past evaluations of RCS primary piping for other nuclear plants, the circumferential flaw evaluations bound the axial flaws. First, the loading conditions, including internal blow-off pressure axial force and the conservative combination of moment loads stated in SRP 3.6.3 ensure that the circumferential flaw orientation is most limiting. In addition, LBB evaluations are generally focused on the weld locations because the fracture toughness of the weld material is weaker than the base piping material. As such, an axial flaw in the weld material would be unlikely to see considerable growth into the tougher pipe base metal and thus, be restricted to the weld material. Circumferential growth of a flaw through the weld material represents the more realistic scenario. Axial-oriented flaws are typically only considered for locations where Alloy 82/182 material is present, due to the susceptibility to PWSCC. However, Alloy 82/182 material is not presented in the RCS primary piping welds at Turkey Point Units 3 and 4. As such, the postulation of an axial orientation is not necessary for addressing concerns related to PWSCC susceptible materials.

The applicant stated that the intention of an LBB evaluation is to justify that the double-ended guillotine type of pipe break is not a credible failure mode for the RCS primary piping. FCG for an LBB evaluation is typically presented as a defense-in-depth justification to demonstrate that a small surface flaw would not develop a through-wall flaw during the plant design life. In the demonstration of FCG, the evaluation considers the growth of a circumferential flaw because this orientation is directly representative of a scenario that could result in a double-ended guillotine failure. The premise of an LBB evaluation is focused on the double-ended guillotine failure because it has the potential for more severe secondary damage from jet impingement and pipe whip. Therefore, the LBB evaluation of a circumferential flaw is more appropriate and conservative than an axial flaw because an axial flaw will not result in a double-ended guillotine break.

The staff finds that the applicant has demonstrated that the FCG of small circumferential flaws in the RCS primary piping will not develop into through-wall flaws through the subsequent period of extended operation. Therefore, the structural integrity of the RCS primary piping will be maintained during the subsequent period of extended operation.

4.7.3.2.3 Staff Evaluation Summary

The staff determined that the applicant has demonstrated the validity of LBB application for the RCS primary piping to the end of the subsequent period of extended operation that:

(1) There is no active degradation mechanism in the RCS primary piping.
(2) The leak rate from the postulate leakage flaws maintains a margin of 10 with the capability of the RCS leakage detection system as specified in SRP 3.6.3.
(3) The margin between the leakage flaw size and critical crack size satisfies the margin of 2 as specified in SRP 3.6.3.
(4) The fully aged, saturated fracture toughness was used to demonstrate stability of the leakage crack size to the end of 80 years.
(5) The FCG will not likely affect structural integrity of the RCS primary piping during the 80 years of operation.

Based on the above, the staff concluded that the RCS primary piping satisfies the guidance in SRP 3.6.3. As a result, dynamic effects of RCS primary pipe breaks need not be considered in the structural design basis for Turkey Point Units 3 and 4 for the 80 years of plant service.

The staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the LBB analysis for the RCS primary piping 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 because the applicant has used the fully aged saturated fracture toughness for the CASS elbow and its FCG calculation was based on the number of transient cycles projected to the end of 80 years.

4.7.3.3 UFSAR Supplement

SLRA Section A.17.3.7.3 provides the UFSAR supplement summarizing the LBB for RCS primary piping TLAA. The staff reviewed SLRA Section A.17.3.7.3 consistent with the review procedures in SRP-SLR Section 4.7.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is therefore acceptable.

4.7.3.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the LBB analyses for the RCS primary loop have been projected to the end of the subsequent period of extended operation. The staff further concludes that the UFSAR supplement contains an adequate summary description of the

RCS loop piping TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.7.4 Leak-Before-Break Analysis for Class 1 Auxiliary Piping

4.7.4.1 Summary of Technical Information in the Application

Turkey Point Units 3 and 4 SLRA Section 4.7.4 describes the applicant's TLAA on the LBB for RCS Class 1 auxiliary piping. The applicant dispositioned the LBB TLAA for the RCS Class 1 auxiliary piping in accordance with 10 CFR 54.21(c)(1)(ii) to demonstrate that the LBB analysis has been projected to the end of the subsequent period of extended operation. The subject auxiliary piping includes three accumulator lines, one RHR line, and the pressurizer surge line.

The applicant performed the LBB analysis for the RCS Class 1 auxiliary piping to support the EPU application. For the SLRA, the applicant updated the LBB analysis to address operation during the subsequent period of extended operation. The applicant performed the LBB analysis in accordance with (1) 10 CFR Part 50, Appendix A, General Design Criterion (GDC)-4; (2) NRC NUREG-1061, Volume 3, "Report of the U.S. Nuclear Regulatory Commission Piping Review Committee," April 1985; and (3) SRP 3.6.3.

The applicant stated that the subject piping is constructed of A-376, Type 316 stainless steel, and these piping systems have been shown not to be susceptible to the effects of corrosion, high cycle fatigue, or water hammer.

The applicant obtained loadings for pressure, dead weight, thermal expansion, and SSE from the original piping analysis. The applicant considered all stress locations in these piping systems from the connection to the RCS to the first isolation valve or pressurizer. The applicant used the minimum values of the ASME Code material properties in the LBB evaluations.

The applicant stated that all piping locations considered in the evaluation exhibit a minimum leakage rate of 10 gpm based on the normal operating and normal plus dynamic loads. NUREG-1061, Volume 3 recommends that the RCS leakage detection system be capable of measuring leakage rates 1/10 of the minimum leakage rate. The applicant stated that the plant leak detection capability for both Turkey Point Units 3 and 4 is 1 gpm, thereby satisfying the leakage rate detection requirement.

The applicant calculated crack growth at the most critical locations on the subject piping, considering the cyclic stresses predicted to occur during the plant operation. For hypothetical flaws, the final flaw size after considering all plant transients for both 60 years and 80 years of operation is less than the allowable flaw size of 75 percent depth of the pipe wall thickness as specified in the ASME Code, Section XI, IWB-3642. The applicant stated that its FCG calculation showed that crack growth due to cyclic loadings was not significant so that the potential FCG of postulated flaws could be managed by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP described in SLRA Section B.2.3.1. The applicant concluded that FCG is well within the allowable flaw size for the RCS Class 1 auxiliary piping.

The applicant used the limit load analysis as outlined in SRP 3.6.3 to determine the critical crack sizes, because the pipe materials are stainless steel piping that retains high fracture toughness. For all locations, the applicant determined the critical circumferential crack size using the combination of absolute values of normal operating plus SSE loads. The applicant chose the leakage crack size such that there is a margin of 2 between the leakage crack size and critical crack size.

The applicant has demonstrated by analysis that the subject RCS Class 1 auxiliary piping is qualified for LBB because the piping is not likely to experience a large pipe break before leakage detection.

4.7.4.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the LBB analysis of the RCS Class 1 auxiliary piping 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. The staff also reviewed the applicant's LBB analysis in accordance with 10 CFR Part 50, Appendix A, GDC-4, and SRP 3.6.3.

4.7.4.2.1 Background

In order to review the acceptability of the LBB analysis for the branch lines to the end of 80 years, the staff reviewed the applicant's LBB analysis for the 60-year license renewal period. In 2000, the applicant submitted an initial LRA to extend the period of operation from 40 years to 60 years. By letter dated June 6, 2002 (ADAMS Accession No. ML012320135), the staff approved the 60-year license for Turkey Point Units 3 and 4.

From 2009 to 2010, to prepare for the EPU application, the applicant performed the LBB analysis of the RCS Class 1 auxiliary piping as documented in the following vendor report: SIA Engineering Report No. 0901350.401, Revision 0, "Leak-Before-Break Evaluation—Accumulator, Pressurizer Surge, and Residual Heat Removal Lines, Turkey Point Units 3 and 4," April 2010. By letter dated October 21, 2010 (ADAMS Accession No. ML103560169), the applicant submitted a license amendment request for EPU at Turkey Point. By letter dated June 15, 2012 (ADAMS Accession No. ML11293A365), the NRC issued an amendment approving the EPU application for Turkey Point.

During its review of the LBB TLAA for subsequent license renewal, the staff noted that the applicant's submittal for the EPU application did not include the SIA LBB analysis of the RCS Class 1 auxiliary lines. The staff determined that the LBB analysis for the Class 1 auxiliary piping had never been submitted to the NRC for review and approval before the SLRA submission, including during the period of the 40-year operating license.

Based on this discovery and other questions regarding the analysis, the staff needed additional information and issued RAIs. RAIs 4.7.4-1, 4.7.4-3, 4.7.4-4, 4.7.4-16, and 4.7.4-17, and the applicant's responses are documented in ADAMS Accession No. ML18299A214.

In RAI 4.7.4-1, the staff asked about the status of the LBB analysis of the RCS Class 1 auxiliary piping at Turkey Point Units 3 and 4. In its response, the applicant explained that the EPU license amendment request contained a reference to the LBB analysis of the RCS Class 1 auxiliary line. The applicant acknowledged that based on discussions with the staff, the LBB analysis for the RCS Class 1 auxiliary piping was never submitted nor reviewed and approved by the staff. As a result of the staff's RAI, the applicant revised SLRA Section 4.7.4 to include the following statement "However, this analysis [the LBB analysis of the Class 1 auxiliary piping] was never submitted to the NRC for review and approval…" Accordingly, the applicant requested NRC review and approval of the RCS Class 1 auxiliary line LBB analysis as part of the SLRA for the 80-year operating license. The staff determined that because the LBB analysis was never submitted to the NRC for review and approval, the staff would review the LBB analysis in accordance with 10 CFR Part 50 as well as 10 CFR 54.21(c)(1).

In RAI 4.7.4-3, the staff asked about the proprietary marking on the applicant's LBB analysis in SIA Engineering Report No. 0901350.401, Revision 3 and associated FCG analysis in SIA Engineering Report No. 0901350.302, Revision 2. In its response, the applicant revised the analyses and submitted SIA Engineering Report No. 0901350.401, Revision 4, October 12, 2018 (Enclosure 4, Attachment 12 of the SLRA) and SIA Engineering Report No. 0901350.302, Revision 3, October 12, 2018 (SLRA Reference 4.7.7.18).

The staff's RAIs and part of the applicant's response referenced previous revisions (i.e., SIA Reports 0901350.401, Revision 3, and 0901350.302, Revision 2), as discussed further in this this SER Section. However, discussions based on previous revisions do not affect the staff's approval of the LBB analysis. The staff's approval of the LBB analysis and the official design basis is based on the latest version of these two reports (i.e., SIA Report No. 0901350.401, Revision 4, and Report No. 0901350.302, Revision 3).

The staff noted that Reference 51 in Section 8 of SIA Report No. 0901350.401, Revision 3, is titled "SIA Report No. 1700109.402, (under Preparation), Evaluation of Fatigue of ASME Section III, Class 1 Components for Turkey Point Units 3 and 4 for Subsequent License Renewal." In RAI 4.7.4-16, the staff questioned the use of an unpublished document. In its response, the applicant stated that the incomplete reference was inadvertently left in the report. The current revision of SIA Report 1700109.402 is Revision 4, which has been referenced in the revised SIA Report No. 0901350.401, Revision 4. The applicant stated that Reference 51 has been published and the data in the incomplete Reference 51 that were used to perform the FCG calculations in SIA Report No. 0901350.401, Revision 3 are still valid. The current revision of SIA Report 1700109.402P is Revision 4, which will be referenced when the LBB report is updated. The staff finds it acceptable that the applicant has issued the subject report and that the FCG calculations are not affected.

During its audit of the applicant's onsite documents, the staff noted that the applicant's document AR 01610224 addresses errors in a pipe stress software. In RAI 4.7.4-4, the staff asked whether errors in the pipe stress software affected the loading used in the LBB analysis of RCS Class 1 auxiliary piping. In its response, the applicant explained that the software error identified in AR 01610224 is related to the thermal stratification calculation module in the software PIPESTRSS. For the loading calculation used in the LBB analysis of RCS Class 1 auxiliary piping, the use of the PIPESTRESS software was limited to the evaluation of design loads such as deadweight plus pressure, thermal expansion, seismic inertia, transient loading, and wind loading. Therefore, the software error is not applicable to LBB evaluations of the RCS Class 1 auxiliary piping. The staff finds the applicant's response acceptable; therefore, this issue is closed.

In RAI 4.7.4-17, the staff asked about the reference in Section 1 of SIA report 0901350.304, Revision 3, which discussed Corrective Action Report (CAR) No. 17-012, Revision 0, "Turkey Point LBB Evaluation, Calculation Package File No. 0901350.304, Revision 0, Calculation Title: Fatigue Crack Growth Evaluation," dated April 17, 2017. In its response, the applicant explained that the error occurred in the input of the crack length in the Turkey Point LBB analysis and the error does not affect LBB analyses performed for other nuclear power plants. The applicant further explained that the error affected the original FCG calculations for 60 years. However, for 80 years, the applicant used the recently developed FCG method of Code

Case N-809, "Reference Fatigue Crack Growth Rate Curves for Austenitic Stainless Steels in Pressurized Water Reactor Environments Section XI, Division 1," dated June 23, 2015. The staff finds the applicant's response acceptable because (1) the calculation error was specific to Turkey Point and has no generic implications, and (2) the applicant has appropriately revised the FCG evaluation for 60 years and has revised the FCG report.

4.7.4.2.2 Scope

SRP Section 3.6.3.III.1 specifies that the LBB analysis should be based on the as-built pipe configuration. The applicant's LBB analysis as presented in SIA Report No. 0901350.401, Revision 4 provides piping configurations for the subject piping. The applicant stated that the following five RCS Class 1 auxiliary lines are in scope of the applicant's LBB application. They are attached to the RCS primary loop and span from the connection to the RCS primary loop piping to the first isolation valve or the pressurizer as applicable. The specific lines within the scope of LBB analysis are described below:

(1) 10-inch diameter accumulator lines – three lines (one per RCS connected to cold leg) in each unit.

(2) 12-inch pressurizer surge line – one line attached to "B" loop (connected to hot leg) in each unit. However, the nozzle at the pressurizer is 14 inches.

(3) 14-inch residual heat removal (RHR) lines – one line attached to "C" loop in Unit 3 and one line attached to "A" loop in Unit 4 (connected to hot leg).

4.7.4.2.3 Screening Criteria

SRP 3.6.3 limits the applicability of the LBB approach to those pipes where degradation mechanisms such as water hammer, erosion/corrosion, fatigue, and SCC are not a significant possibility. The applicant discussed these potential degradation mechanisms with regard to the subject piping as follows.

Water Hammer

The applicant stated that NUREG-0927, "Evaluation of Water Hammer Occurrence in Nuclear Power Plants," Revision 1, indicated that the probability of water hammer occurrence in the RHR systems of a PWR is very low. In NUREG-0927, only a single event of water hammer was reported for PWR RHR systems with the cause being incorrect valve alignment. The applicant further stated that there was no indication as to which portion of the system was affected, but it would not be that portion adjacent to the RCS attached piping evaluated for LBB.

The applicant indicated that NUREG-0927 also reported that the safety significance of water hammer events in the safety injection system is moderate. With four water hammer events reported in the safety injection systems, three of these events were associated with voided lines and the other event was associated with steam bubble collapse. Although there was no indication of the affected portions of the safety injection system, the portions susceptible to water hammer would not be adjacent to the RCS attached piping evaluated for LBB as further discussed in the following paragraph.

The applicant indicated that portions of the piping evaluated for LBB are inboard of the first isolation valves for the safety injection (accumulator) and RHR piping. Thus, during normal operation, these lines experience reactor coolant pressure and temperature conditions such that there is no potential for steam/water mixtures that might lead to water hammer. Portions of these systems that are adjacent to the reactor coolant piping are not in use during normal operation. The RHR system is not used except during low-pressure low-temperature cooldown conditions. The safety injection system is used only during loss-of-coolant-accident conditions. During normal plant operation, the portions of the system beyond the first isolation valve are expected to run at low temperature conditions. Thus, there should never be any voiding or potential for steam bubble collapse, which could result in water hammer loads on the subject piping. The applicant stated that to date, there has been no experience related to water hammer events in either the RHR or safety injection systems at Turkey Point.

The applicant searched Turkey Point condition report databases for water hammer events on the RHR Lines. The search looked back as early as 1992, and none were found in the condition reports databases. The applicant concluded that water hammer is highly unlikely for the piping systems considered for LBB. Therefore, water hammer will have no impact on the LBB analysis for the affected portions of the safety injection and RHR systems at Turkey Point.

The applicant stated that the surge line also experiences reactor coolant pressure and temperature conditions such that there is no potential for steam/water mixtures that might lead to water hammer.

Based on the above, the staff finds that water hammer is not an active degradation mechanism in the subject RCS Class 1 auxiliary piping.

Corrosion

The applicant indicated that two corrosion damage mechanisms that can lead to rapid piping failure are IGSCC in austenitic stainless steel pipes and flow-accelerated corrosion (FAC) in carbon steel pipes. The applicant stated that IGSCC has principally been an issue in austenitic stainless steel piping in boiling water reactors resulting from a combination of tensile stresses, susceptible material, and oxygenated environment. The applicant explained that IGSCC is not typically a problem for the RCS primary loop in a PWR because the accumulator lines, surge line and RHR piping lines are fabricated with stainless steel and the environment has relatively low concentrations of oxygen. In addition, the applicant stated that there are no Alloy 600/82/182 materials in the subject auxiliary lines. The applicant concluded that primary water SCC is not an active degradation mechanism.

The applicant stated that FAC is a problem for carbon steel piping with two-phase flow. FAC is not anticipated for the subject piping lines because the piping is fabricated from stainless steel that is not susceptible to FAC.

The staff noted that operating experience has shown that PWSCC has occurred in nickel-based Alloy 600/82/182 components in PWRs. Specifically, cracking has occurred in Alloy 82/182 dissimilar metal butt welds in primary loop piping and associated branch piping in PWRs. As discussed above, the applicant confirmed that welds in Turkey Point Class 1 auxiliary piping do not use Alloy 82/182 filler metal that is susceptible to PWSCC.

The staff finds that SCC and FAC are not active degradation mechanisms in the primary loop piping.

Fatigue

The staff noted that SRP 3.6.3 prohibits application of LBB to Class 1 piping for which fatigue is an active degradation mechanism. The applicant stated that metal fatigue in piping connected to the reactor coolant loops of Westinghouse-designed PWR was identified in Bulletin 88-08, "Thermal Stresses in Piping Connected to Reactor Coolant Systems," June 22, 1988. The applicant previously submitted to the NRC the statement demonstrating that the bulletin does not apply to Turkey Point as shown in Document EPU-PTN-10-0536, "FPL Turkey Point Units 3 & 4 Extended Power Uprate (EPU) Information For Leak Before Break Methodology Applied To RCL Branch Piping." The applicant further stated that for the safety injection accumulator piping, there is no interconnection to the charging pumps that will lead to in-leakage leading to cracking. For the RHR piping, any out-leakage at the isolation valve leak-off lines is monitored and can be corrected such that cracking will not occur. The applicant concluded that there is no potential for unidentified high cycle fatigue. In addition, the applicant has considered postulated fatigue and resultant possible crack growth based on calculation. The applicant concluded that fatigue will not be a significant issue for the subject piping systems.

The staff noted that PWR operating experience has shown thermal fatigue in certain piping systems as documented in two EPRI TRs, MRP-192, "Materials Reliability Program: Assessment of Residual Heat Removal Mixing Tee Thermal Fatigue in PWR Plants MRP-192, Revision 2," August 2012, and MRP-146, "Materials Reliability Program: Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines (MRP-146, Revision 1)," June 2011. The staff needed additional information and issued an RAI. RAI 4.7.4-7 and the applicant's response are documented in ADAMS Accession No. ML18299A214.

In RAI 4.7.4-7, the staff questioned the impact of these two documents on the subject piping. In its response, the applicant stated that thermal fatigue issues identified in MRP-146 were evaluated for all RCS Class 1 auxiliary piping lines at Turkey Point. The evaluation concluded that the surge line, RHR line, and safety injection line (of which the accumulator lines are part of) were screened out and did not warrant any further evaluation. Because the RHR line considered for the LBB analysis does not include mixing tee, MRP-192 is not applicable. The staff finds that the thermal fatigue issues identified in MRP-146 and MRP-192 are not applicable to the RCS Class 1 auxiliary piping. The staff further finds that fatigue is not an active degradation mechanism in the subject RCS Class 1 auxiliary piping.

Wall Thinning

During its review of wall thinning, creep, and cleavage as they relate to the LBB TLAA, the staff needed additional information and issued an RAI. RAI 4.7.4-6 and the applicant's response are documented in ADAMS Accession No. ML18299A214.

In RAI 4.7.4-6, the staff noted that SRP 3.6.3 specifies that piping qualified for LBB be evaluated to determine whether the degradation mechanism of wall thinning exists and asked the applicant to address wall thinning in RCS Class 1 auxiliary piping. In its response, the applicant stated that wall thinning is not expected to occur in the piping systems under consideration because the piping of these systems is fabricated from stainless steel that is not susceptible to wall thinning. This was covered in Section 3.2 of SIA Report No. 0901350.401, Revision 4 as part of the evaluation of FAC. In addition, wall thinning is not an aging effect requiring management for RCS piping as indicated in SLRA Table 3.1.2-1.

Creep

In RAI 4.7.4-6, the staff noted that SRP 3.6.3 specifies that piping qualified for LBB be evaluated to determine whether the degradation mechanism of creep exists. The staff asked the applicant to address creep in RCS Class 1 auxiliary piping. The applicant stated that creep is not expected to occur in the piping under consideration because these are stainless steel piping systems that operate at temperatures below 800 °F.

Cleavage

In RAI 4.7.4-6, the staff noted that SRP 3.6.3 specifies that piping qualified for LBB be evaluated to determine whether the degradation mechanisms of cleavage exists. The staff asked the applicant to address cleavage in RCS Class 1 auxiliary piping. The applicant indicated that cleavage is not expected to occur in the piping systems under consideration because these are fabricated from stainless steel that is very ductile at the operating temperatures of these piping systems.

Based on its evaluation, the staff finds that erosion (wall thinning), creep, and cleavage are not active degradation mechanisms in the RCS Class 1 auxiliary piping.

Inspection History

During its review of the applicant's LBB TLAA and related report, the staff needed additional information and issued an RAI. RAI 4.7.4-5 and the applicant's response are documented in ADAMS Accession No. ML18299A214.

In RAI 4.7.4-5, the staff noted that SIA Report No. 0901350.401 did not provide the inspection history of the subject piping. In its response, the applicant stated that SLRA Appendix B, Paragraph B.2.3.1, provides details on the inspection history of the subject piping since commercial operation. The history includes inspections performed in accordance with the ASME Code, Section XI, Subsections IWB, IWC, and IWD; industry and site-specific operating experience; quality assurance audits; and NRC-mandated inspections. The applicant concluded that the inspection history demonstrates that the subject piping has no active degradation mechanisms such as water hammer, corrosion, and high cycle fatigue.

Based on the above evaluation, the staff finds that no active degradation mechanisms, as specified in SRP 3.6.3, exists in the RCS Class 1 auxiliary piping at Turkey Point.

4.7.4.2.4 Flaw Evaluation

Material Properties

SRP Section 3.6.3.III.11.A.i states that an acceptable deterministic LBB evaluation procedure should "…[i]dentify the types of materials and materials specifications used for base metal, weldments, nozzles, and safe ends. Provide the materials properties including toughness and tensile data, long-term effects such as thermal aging." SRP Section 3.6.3.III.11.B specifies material properties that should be identified based on testing.

The applicant stated that the base material used for all the subject piping with diameters between 10-inch and 16-inch is SA-376 Type 316 stainless steel. The welding procedure is either gas tungsten arc weld (GTAW) or shielded metal arc weld (SMAW), except for the nozzle welds which are tungsten inert gas (TIG) welds. The applicant further stated that because SMAW welds have a lower toughness (i.e., higher Z factor per the rules of the ASME Code, Section XI, IWB-3640) than GTAW and TIG welds, it is assumed conservatively to be the only weld process used for the subject piping. The weld material used is stainless steel Type 316/317/317L. The applicant used A-376 Type 317L material properties for the flaw size calculation because it provides lower yield strength compared to that of the base material A-376 Type 316, which is conservatively used for the leakage evaluation. Similarly, A-376 Type 316 material properties give lower Ramberg-Osgood parameters compared to A-376 Type 317L material and are therefore used in the LBB evaluation.

The applicant used the minimum values of the ASME Code material properties to establish conservative lower bound stress-strain properties to be used in the LBB evaluations. For the fracture toughness properties, lower-bound generic industry material properties for the piping and welds have been used in the evaluations.

The applicant stated that it did not perform special testing to determine material properties for the fracture mechanics evaluation. Instead, the applicant used the ASME Code minimum properties. The material properties so determined have been shown to be applicable near the upper range of normal plant operation and exhibit ductile behavior at these temperatures.

During its review, the staff needed additional information and issued an RAI. RAI 4.7.4-8 and the applicant's response are documented in ADAMS Accession No. ML18299A214.

In RAI 4.7.4-8, the staff questioned why SLRA Section 4.7.3 states that the elbows in the RCS primary loop piping are made of CASS, whereas Section 4 of SIA Report No. 0901350.401 does not mention any pipe components made of CASS in the RCS Class 1 auxiliary piping. In its response, the applicant confirmed that the accumulator, RHR, and surge piping lines do not use any components or fittings that are made of CASS. The applicant stated that the piping materials are fabricated with austenitic stainless steel whose fracture toughness is not affected by thermal embrittlement.

The staff finds that the applicant has appropriately identified the material of construction for the subject piping. Although the applicant did not perform testing to obtain the properties of the piping material, the staff finds it acceptable that the applicant used minimum ASME Code material properties in the flaw evaluation. The staff also finds that, because the subject piping does not contain CASS, thermal embrittlement is not an issue; therefore, a TLAA is not necessary to address material property changes due to thermal aging embrittlement.

Critical Crack Size

SRP 3.6.3.III.11.C specifies the acceptance criteria for critical flaws as follows: (1) determine a critical flaw size for the postulated through-wall crack using loads from normal operating conditions plus SSE loads and demonstrate that there is a margin of 2 between the leakage crack size and critical crack size, and (2) demonstrate that the critical flaw size is based on normal operating conditions plus SSE loads multiplied by a factor of $\sqrt{2}$ and calculate the margin on the flaw size in terms of applied loads by a crack stability analysis.

The applicant stated that LBB evaluations from other nuclear plants have found that the first criterion bounds the second. Therefore, the applicant only considered the first criterion in determining the critical flaw size. The applicant further stated that LBB evaluations in general have found that the critical through-wall flaw length for an axial flaw is always greater than that of a circumferential flaw. Also, the higher hoop stress results in more leakage for an axial flaw compared to a circumferential flaw of the same length. The applicant stated that because axial flaws have both a larger critical through-wall flaw length and more leakage for a given flaw size as compared to circumferential flaws which are not limiting in terms of early warning, only circumferential flaws are considered in the LBB evaluation.

The staff noted that SRP 3.6.3.III.11.C.(iv) permits the use of either the EPFM method or limit load method in determining critical flaw sizes. The applicant indicated that because the material of the subject piping systems is stainless steel, which is ductile at high temperatures, the limit load method is used to determine the critical flaw sizes.

Following SRP 3.6.3, the applicant constructed the master curve of maximum stress versus critical crack size for the subject piping.

The applicant determined the relationship between the critical through-wall flaw length and the applied stress (or moments) on a generic basis for circumferential flaws. The applicant stated that the critical flaw size is the through-wall flaw length that becomes unstable under a given set of applied loads. Using the limit load method, the applicant calculated the critical flaw sizes based on the net limit load (net section plastic collapse). The applicant indicated that NUREG-1061, Volume 3, specifies that the load combination considered in determining the 100 percent through-wall flaw length include the normal operating loads (NOP), which consists of internal pressure, dead weight, and thermal expansion loads, plus the SSE loads. The applicant explained that once the NOP+SSE loads for a given location is known, the critical flaw length can be determined from the generic relationship. After the critical flaw size is determined, the applicant derived the leakage flaw size as the minimum of one half the critical flaw size with a factor of unity on normal operating plus SSE loads. Thus, the leakage flaw size maintains a safety factor of 2 as compared to the critical flaw size under normal plus SSE loads.

Because the weld made by SMAW has a lower toughness (i.e., higher Z factor) than the weld made by GTAW and TIG, the applicant assumed SMAW to be the only weld process used for all the flaw locations for conservative purposes.

During its review, the staff needed additional information and issued an RAI. RAI 4.7.4-12 and the applicant's response are documented in ADAMS Accession No. ML18299A214.

In RAI 4.7.4-12, the staff noted that Section 5 of SIA Report No. 0901350.401, Revision 3, does not contain the master curves of critical crack sizes and requested that the applicant provide curves of critical crack sizes for each subject piping. In its response, the applicant provided master curves of maximum stress versus critical crack size and they have been incorporated in Figures 5-1 to 5-7 of the revised SIA Report No. 0901350.401, Revision 4. The maximum stresses at each nodal point are calculated in Section 4 of the SIA report. Using the maximum stresses, the critical crack size can be determined in the master curve in Figures 5-1 to 5-7. The staff's concern in RAI 4.7.4-12 is resolved.

Leakage Crack Size

SRP Section 3.6.3.III.11.C.(iii) and (iv) specify a leakage crack to be postulated and the leakage flaw size to maintain a margin of 2 as compared to the critical flaw size. The applicant determined leakage rates as a function of stress (or moment) on a generic basis for a given through-wall flaw length. The applicant stated that NUREG-1061, Volume 3 specifies that the NOP loads be used to determine the leakage. The applicant explained that given the relationships between the leakage flaw size versus NOP+SSE moments, and leakage flaw size versus NOP moments (for a particular leak rate), a relationship was developed between the NOP+SSE moments and the NOP moments that would result in a particular leak rate. The actual piping NOP+SSE and NOP loads were then used to determine if the combination of those loads would meet that leakage. The applicant used this approach to determine whether a particular leak rate will be met for a piping system with many nodal points and associated moments.

The applicant determined the leak rate using the modification of Henry's homogeneous non-equilibrium critical flow model. The applicant considered the non-equilibrium mass transfer between liquid and vapor phases, fluid friction due to surface roughness and convergent flow paths. The applicant stated that the analytical model was validated for steam and water leakage conditions.

The applicant included a plastic zone correction in calculating the opening displacement of the leakage crack. The applicant explained that this is consistent with fracture mechanics principles for ductile materials. The leakage crack is assumed to be elliptical, such that the maximum crack opening displacement is at the center of the crack. The crack roughness is an input parameter. The leakage cracks are assumed to have a constant through-wall depth and include a sharp-edged entrance loss factor. The applicant assumed the same crack opening area at the inlet and outlet.

Based on the above evaluation, the staff finds that the applicant has demonstrated that the leakage crack size is at least half of the critical crack size for the subject auxiliary piping. Therefore, the applicant has satisfied the margin of 2 on crack size as specified in SRP 3.6.3.

<u>Bounding Analysis Curve</u>

The applicant used the concept of bounding analysis curves (BACs) to show the relationship between the critical crack size and leakage crack size with respect to the margin of 10 for the leak rate and a margin of 2 for the crack sizes. The BACs are plots of the maximum stress versus normal operating stress with respect to leak rates. Thus, the BACs are simply a pictorial representation demonstrating whether the LBB margins have been met or not.

During its review, the staff needed additional information and issued RAIs. RAIs 4.7.4-10, 4.7.4-11, and 4.7.4-15, and the applicant's response are documented in ADAMS Accession No. ML18299A214.

In RAI 4.7.4-11, the staff asked the applicant to explain how the margins on the crack size and leakage detection in SRP 3.6.3 have been satisfied based on BACs. In its response, the applicant explained that the BACs provide the loci of normal operating (i.e., NOP) stresses as compared to maximum (i.e., NOP+SSE) stresses that must be met to achieve the margins as specified by SRP 3.6.3. The BACs represent the maximum allowable membrane (pressure) plus bending stress (as determined from piping analysis) as a function of the applied membrane (pressure) plus bending stress during normal plant operation. The applicant explained that points on or below the BAC curve meet the stability margin for a particular leakage detection capability whereas points above the BAC curve do not meet the stability margin.

In RAI 4.7.4-10, the staff asked why pressurizer surge lines have only one stress data point in each of Figures 5-9 to 5-12 whereas multiple stress points are indicated for the accumulator and RHR piping in Figures 5-7 and 5-8, respectively. In response, the applicant stated that for the accumulator and RHR piping, stresses were available for all the nodal points; therefore, all of these locations were considered in the BACs. However, for the surge line, only the bounding stress locations, which happened to be at the terminal ends, were available. These terminal end locations were therefore used for the LBB evaluation. The applicant stated that this is deemed acceptable because, as noted in subparagraphs SRP 3.6.3.III.11.C(ii) and SRP Section 3.6.3.III.11.C(iii), for each pipe size, the through-wall flaw can be postulated at the location that has the least favorable combination of stress and material properties for base metal, weldments, nozzles, and safe ends. For the surge line, node points corresponding to bounding locations in the 12-inch pipe and the 14-inch pipe at the nozzle end were selected for both the pressurizer end and the hot leg end. Because the BACs are a function of the pipe diameter and operating conditions, separate figures are need for the 12-inch pipe and the 14-inch pipe at the nozzle end of the surge line. For each of the surge pipe configurations, there are two figures because of two different operating conditions.

In RAI 4.7.4-15, item (a), the staff noted that Section 6.4.4 of SIA Report No. 0901350.401 provides the leakage flaw size for the subject piping. However, the report does not provide specific calculated critical crack size for the subject piping. The report does state that the critical crack size is two times the calculated leakage flaw size, without showing the actual calculated critical crack size based on material fracture toughness. The staff asked the applicant to provide the calculated critical crack size based on material fracture toughness for the accumulator, RHR, and surge lines. In response, the applicant stated that in using the BAC approach, the critical crack size is not specifically calculated for each nodal point in the accumulator, RHR, and surge line piping. Rather, the applicant developed a generic relationship between the critical crack size and the maximum stress as part of the BAC approach. In developing the BACs, the applicant assumed the critical crack size to be equal to twice the leakage flaw size to meet the stability margin of 2 stipulated in SRP 3.6.3. Because all points are below the BACs, it implies that a margin of at least 2 between the critical crack size and leakage crack size is achieved for all nodal points considered in the analysis. The applicant stated that it calculated the critical crack size using the modified limit load approach in SRP 3.6.3 because all piping materials are stainless steel; therefore, the fracture mechanics analysis was not needed.

In RAI 4.7.4-15, item (b), the staff noted that the second paragraph on pages 6-7 of SIA Report No. 0901350.401, Revision 4 compares the calculated crack growth to the circumference of the accumulator pipe to demonstrate the crack stability. However, in a typical LBB evaluation, the crack growth is added to the leakage crack size to obtain the final leakage crack size at the end of 80 years. Per SRP 3.6.3, the final leakage crack size is compared to the critical crack size. The final leakage crack size should not exceed the half of the critical crack size to satisfy the margin of 2 as specified in SRP 3.6.3. The staff asked the applicant to show that the leakage flaw size plus the crack growth (i.e., the final leakage crack size considering the potential 80-year FCG) still maintain a margin of 2 with respect to the critical crack size for each of the subject piping at the end of 80 years.

In response, the applicant stated that the margin of 2 between the leakage crack size and the critical crack size has already been demonstrated in the BAC approach and is not required to be demonstrated in the crack growth analysis. The objective of the FCG analysis is to show that the growth of an initial part through-wall flaw (which is equivalent to the ASME Section XI acceptance standard flaw) will be below the ASME Code, Section XI, allowable flaw size and will be detected by the plant inservice inspection program as part of defense-in-depth for the LBB analysis. The applicant also calculated crack growth of a 100 percent through-wall crack to show that there is adequate time for the plant to take the necessary action before the crack reaches the critical through-wall crack size. The applicant stated that the initial 100 percent through-wall flaw size was set at the "maximum" leakage flaw size considering all the nodal points (even though from the part-wall crack growth analysis, the initial ASME Section XI acceptance standard flaw would not become a 100 percent through-wall flaw after 80 years). The critical flaw size was also set as the "minimum" critical flaw size considering all node points.

The staff finds that, based on the data on the BACs, the postulated critical crack size and leakage crack size in the subject piping satisfy the margins of 2 and 10, respectively. In addition, the applicant has performed FCG calculations to demonstrate that crack will be stable as discussed further in this SER section. The staff finds that the leak rate calculated from the leakage crack size is acceptable because it has a margin of 10 with respect to the RCS leakage detection system capability of 1 gpm. The capability of the RCS leakage detection system is discussed further in this SER section.

<u>Fatigue Crack Growth and Crack Stability Calculation</u>

SRP 3.6.3.III.11.C.(v) states "…Demonstrate that the crack growth is stable and the final crack size is limited such that a double-ended pipe break will not occur." NUREG-1061, Section 5.2(g) specifies that an evaluation should be performed to show that the leakage flaw size is stable during an SSE event.

To address the crack growth, the applicant analyzed the growth of two postulated flaws--a partial through-wall flaw and a 100 percent through-wall flaw. The applicant stated that the goal of the FCG analysis is to show that the growth of an initial partial through-wall flaw (which is equivalent to the ASME Section XI acceptance standard flaw) will be below the allowable flaw size per ASME Code, Section XI and will be detected by the plant inservice inspection program as part of defense-in-depth for the LBB analysis. Although not specified by the SRP 3.6.3, the applicant also performed a crack growth analysis for a 100 percent through-wall flaw to show that there is adequate time for the plant to take the necessary action before the 100 percent through-wall crack reaches the critical through-wall crack size. The applicant set the initial 100 percent through-wall flaw size at the "maximum" leakage flaw size considering all the nodal points.

The applicant used the growth of the 100 percent through-wall leaking flaw to demonstrate crack stability. The initial 100 percent through-wall flaw is assumed to correspond to the leakage flaw length for the most limiting location. The applicant generated a crack model assuming 100 percent through-wall circumferential crack in a cylinder under tension and bending to calculate the stress intensity factor, K. In this evaluation, the maximum membrane and bending stresses are conservatively applied as tension stress. To be conservative, the applicant set the critical flaw size as the "minimum" critical flaw size considering all node points of subject piping.

The applicant had three objectives in performing the FCG calculation. The first objective is to show that a postulated circumferential partial through-wall crack does not grow significantly between inservice inspection intervals. The postulated partial through-wall flaw is based on the allowable depth for stainless steel (up to 12.5 percent of wall thickness) in accordance with the ASME Code, Section XI, IWB-3514. The second objective is to demonstrate that if a larger partial through-wall crack exists, it would tend to grow in the depth direction and through the pipe wall before extending significantly in the circumferential direction length-wise to cause double-ended guillotine pipe break. This crack propagation pattern would exhibit LBB behavior.

The third objective is to show that a 100 percent through-wall crack is stable during an SSE event per NUREG-1061, Section 5.2(g).

The applicant calculated crack growth in stainless steel for 60 years using the austenitic steel FCG method in air from Article C-3210 of the ASME Code, Section XI. The applicant stated that it updated the previous FCG evaluation for 60 years to use the current version of the software and to correct for the errors documented in Corrective Action Report (CAR) 17-012. In the update, the applicant calculated the FCG for 80 years of operation using the FCG rate in the updated ASME Code Case N-809. In addition, the applicant applied a factor of 2 to account for a PWR environment based on the data from a technical paper, the ASME Code, Section XI Task Group for Piping Flaw Evaluation, ASME Code, "Evaluation of Flaws in Austenitic Steel Piping," *Journal of Pressure Vessel Technology*, Volume 108, August 1986. The applicant accounted for the factor of 2 for the PWR environment in the crack growth calculation by doubling the number of cycles.

The staff noted that the NRC has not approved ASME Code Case N-809 in RG 1.147 for generic use. However, the staff finds acceptable that the applicant used the crack growth rate in Code Case N-809 for the plant-specific case at Turkey Point because in the crack growth calculation, the applicant has shown that the crack growth rate derived from Code Case N-809 is higher than the crack growth rate derived from ASME Code, Section XI, Appendix C.

<u>Plant Design Transients</u>

The applicant stated that the FCG analysis is performed for the number of cycles corresponding to the 40-year design plant life. These cycles are applicable to both 60 years of operation as documented in Turkey Point initial license renewal document, "Position Document to Address GSI-190 Issues Related to Fatigue Evaluation for Turkey Point Units 3 and 4" (SIA Report No. SIR-00-089, Revision 0), and 80 years of operation as documented in Turkey Point subsequent license renewal document, "Evaluation of Fatigue of ASME Section III, Class 1 Components for Turkey Point Units 3 and 4 for Subsequent License Renewal" (SIA Report No. 1700109.402, Revision 4).

In the definition of the stress ranges, the stresses are cycled around the sum of deadweight and weld residual stresses, which are always in effect. The applicant explained that for each enveloping transient category, the appropriate scaling factors (transient stress/reference stress) are input to obtain the actual stress intensity factor (K) values for the FCG.

The applicant stated that because the RCS Class 1 auxiliary lines at Turkey Point Units 3 and 4 were designed to the requirements of ANSI B31.1, the applicant did not analyze or define specific transients in the design basis for the subject piping. Therefore, for the accumulator and RHR lines, the applicant used the generic transient information from TR "Material Reliability Program: Characterization of U.S. Pressurized Water Reactor (PWR) Fleet Operational Transients (MRP-393)," EPRI, Palo Alto, CA; 2014, Report 3002003085.

For the transients in the surge line, the applicant stated that the surge line experiences thermal stratification that results in larger stress ranges, thus more FCG during transients. The applicant used the definition of transients for crack growth, number of cycles, and the stress range for each transient from the Westinghouse fatigue calculation, FPL Stress Report (TR 0537), "FPL/FLA (Turkey Point 3 and 4) Pressurizer Surge Nozzle Fatigue Calculation Due to Thermal Stratification Pipe Loads."

During its review, the staff needed additional information and issued RAIs. RAIs 4.7.4-13 and 4.7.4-18, and the applicant's response are documented in ADAMS Accession No. ML18299A214.

In RAI 4.7.4-13, the staff questioned whether the generic transient information is applicable to and bounds the subject piping at Turkey Point. In its response, the applicant stated that the generic transient information bounds the plant-specific transients at Turkey Point that are predicted to the end of the 80 years. The staff finds it acceptable that the number of transient cycles used in the crack growth calculation bound the transient cycles projected to the end of 80 years at Turkey Point.

The staff noted that Section 3.2.5 of SIA Report, 0901350.304, Revision 2, states that 51 cycles of SSE loading (one SSE cycle assumed, along with 50 cycles of operating basis earthquake (OBE)) were used in the FCG calculations. The staff noted that the 51 cycles of SSE and OBE loads in calculating the FCG for the subject piping are based on generic values, not plant-specific values.

In RAI 4.7.4-18, the staff asked the applicant to demonstrate that the 51 cycles of OBE plus SSE, with associated earthquake loads used in the FCG calculations, bound the plant-specific transient cycles and earthquake loadings specified in the CLB at Turkey Point Units 3 and 4. In its response, the applicant stated that 50 cycles of OBE bound the actual number of cycles for 80-year projections. The applicant stated that for the FCG calculations, 51 cycles of SSE loading was used as a conservative input to represent one SSE cycle and 50 cycles of OBE. The staff finds it acceptable that the applicant used the bounding transient cycles for seismic events in the FCG calculations.

Loading Combination

The applicant reported that axial stresses in the RCS Class 1 auxiliary lines need to be determined to evaluate the stability of the postulated circumferential flaws. The axial stress due to the pressure, deadweight, and thermal differentials for each of the transient and the seismic loads are calculated using the respective moments. For all the subject lines, the applicant used a pure through-wall bending stress equal to the yield stress of the pipe material at the operating temperature to represent the weld residual stress. The applicant stated that accumulator, RHR, and surge lines are made of materials of similar type, and the most conservative yield strength (Sy) was chosen for all three types of lines. The applicant used 18.28 thousand pounds per square inch (ksi) for yield stress of Type 316 stainless steel at 653 °F in the FCG analyses. The staff finds that the weld residual stress is appropriately calculated based on yield stress of the pipe material because yield stress is acceptable for use in the FCG calculation.

The applicant combined the axial stress due to pressure, thermal, deadweight, seismic, and residual stresses to obtain the stress ranges corresponding to each of the transients for the accumulator line and RHR line. The applicant separated the stresses based on their distribution across the thickness of the pipe. The pressure stresses are taken as uniform stresses whereas the stresses due to the other loads are assumed to vary linearly through the pipe wall. The applicant further stated that the pressurizer surge line experiences thermal stratification that results in a larger stress range, and thus more fatigue growth during transients. The applicant used Westinghouse fatigue calculations for pressurizer surge nozzle considering loads from thermal stratification, transients for crack growth, number of cycles, and the stress range for each transient. The staff finds that the applicant combined stresses appropriately for the subject piping based on generally accepted practice in FCG calculations.

Allowable Flaw Size

The staff noted that Section 6.3 of SIA Report No. 0901350.401 discusses the derivation of an allowable flaw size; however, SRP 3.6.3 does not specify an allowable flaw size. The staff needed additional information and issued an RAI. RAI 4.7.4-14 and the applicant's response are documented in ADAMS Accession No. ML18299A214.

In RAI 4.7.4-14, the staff asked how the allowable flaw size was used in the LBB analysis. In its response, the applicant explained that the allowable flaw size was not used in the mechanistic LBB analysis as outlined in SRP 3.6.3. Rather, it was used in the FCG analysis as an acceptance criterion for partial through-wall flaws to which the final crack size is compared. The allowable flaw size is represented in terms of the allowable end-of-evaluation period flaw depth-to-thickness ratio per the ASME Code, Section XI, Appendix C. The staff finds acceptable that the allowable flaw size is used in the FCG calculation of partial through-wall flaws but not in the calculations to derive the critical crack size or leakage crack size.

The applicant used the net section plastic collapse methodology in Appendix C of the ASME Code, Section XI, to determine the allowable flaw size for the growth of a postulated circumferential surface flaw. To determine the allowable circumferential flaw size, the applicant used pressure, deadweight, thermal, and seismic loads. The flow stress for all three types of lines is conservatively calculated as 45.14 ksi for Type 316 stainless steel at 653 °F.

For the accumulator lines, the total stress for the load combination is 19.02 ksi. The stress ratio (membrane plus bending stress divided by flow stress) is 0.42. With an aspect ratio a/l of 0.1 (where "a" is the flaw depth and "l" is the flaw length) and a pipe wall thickness of 1.0 inch, starting with the maximum allowable flaw depth-to-thickness ratio of 0.75, the maximum possible circumferential flaw length is 7.5 inches. The ratio of this flaw length to the pipe circumference is 0.22. Using Table C-5310-3 and Table C-5310-4 of the ASME Code, Section XI, Appendix C for emergency and faulted conditions, the allowable end-of-evaluation period flaw depth-to-thickness ratio is determined to be 0.75. The staff noted that with a pipe wall thickness of 1.0 inch, the allowable depth is 0.75 inch for the accumulator line.

For the RHR line, the total stress for this load combination is 17.38 ksi. The stress ratio is 0.55. With an aspect ratio a/l of 0.1 and a pipe wall thickness of 1.125 inch, starting with the maximum allowable flaw depth-to-thickness ratio of 0.75, the maximum possible circumferential flaw length is 9.34 inches. The ratio of this flaw length to the pipe circumference is 0.22. Using Tables C-5310-3 and C-5310-4 of the ASME Code, Section XI, Appendix C, for emergency and faulted conditions, the applicant determined the allowable end-of-evaluation period flaw depth-to-thickness ratio to be 0.70.

For the surge line, the total stress for this load combination is 24.73 ksi. The stress ratio is 0.39. With an aspect ratio a/l of 0.1 and a pipe wall thickness of 1.125 inch, starting with the maximum allowable flaw depth-to-thickness ratio of 0.75, the maximum possible flaw length is 8.44 inches. The ratio of this flaw length to the pipe circumference is 0.21. Using Tables C-5310-3 and C- 5310-4 of the ASME Code, Section XI, Appendix C, for emergency and faulted conditions, the applicant determined that the allowable end-of-evaluation period flaw depth-to-thickness ratio to be 0.75.

The applicant compared the FCG results with these allowable flaw sizes for the postulated partial through-wall flaw to determine the acceptability of the crack growth at the end of 80 years.

Partial Through-Wall Crack Model

The applicant stated that NUREG-1061, Volume 3 specifies that a partial through-wall flaw will not grow due to fatigue to a depth that would produce instability over the life of the plant. To calculate the FCG, the applicant postulated a partial through-wall flaw with an initial depth up to 12.5 percent of wall thickness (i.e., a/t = 0.125 where "a" is the flaw depth, "t" is the pipe wall thickness) based on the guidelines of the ASME Code, Section XI, IWB-3514. The initial length of the flaw is based on an aspect ratio a/l of 0.1.

100 Percent Through-Wall Crack Model

The staff noted that SRP 3.6.3.III.11.C.(v) states "…Calculate the margin on the flaw size in terms of applied loads by a crack stability analysis. Demonstrate that the size of leaking cracks will not become unstable if 1.4 times the normal plus safe-shutdown earthquake (SSE) loads are applied. Demonstrate that the crack growth is stable and the final crack size is limited such that a double-ended pipe break will not occur." Similarly, the applicant stated that NUREG-1061, Section 5.2(g) specified that the 100 percent through-wall crack should be stable during an SSE event. As such, the applicant calculated crack growth of a 100 percent through-wall leakage size flaw to demonstrate crack stability. The applicant postulated an initial 100 percent through-wall flaw to correspond to the leakage flaw length for the most limiting location. The applicant assumed that the 100 percent through-wall circumferential crack occurs in a cylinder under tension and bending for the stress intensity factor, K, calculation.

Fatigue Crack Growth Results

Partial Through-Wall Crack

For the accumulator lines, the results show that the postulated partial through-wall crack does not grow during the operation of 80 years.

For the RHR line, the postulated through-wall crack grows only 0.0014 inch in the depth direction and 0.0004 inches in the length direction during the operation of 80 years. The final a/t ratio is 0.1262, which is less than the allowable ratio of 0.70.

For the Surge line, the postulated partial through-wall crack grows 0.0855 inch in the depth direction and 0.0452 inch in the length direction during the operation of 80 years. The final a/t ratio is 0.2010, which is less than the allowable ratio of 0.75. The crack growth is 0.113 percent of the 40.03-inch circumference length, and 7.6 percent in the depth direction.

The staff finds that the crack growth of the postulated partial through-wall flaws for the accumulator, RHR, and surge lines is not significant enough to cause pipe rupture because the final flaw size is well within the allowable flaw size.

100 Percent Through-Wall Crack

For the FCG calculation for the accumulator lines, the applicant applied a maximum membrane and bending stresses of 19.02 ksi (including internal pressure) and used the bounding half leakage flaw size of 2.53 inches in circumferential length as the initial flaw size. The staff noted that for the crack growth of a 100 percent through-wall crack, the goal is to calculate only the final length, not depth, of the crack because the depth of the crack does not need to be calculated as the depth is already 100 percent through-wall. The applicant used the maximum membrane and bending stresses as tension stress. The resultant stress intensity factors K_{max} and K_{min} are 69.09 ksi√in and -33.20 ksi√in, respectively. As stated above, the applicant used the crack growth rate obtained from the ASME Code, Section XI, Appendix C to calculate the crack growth for the design life of 60 years. For the 80-year operation period, the applicant used the crack growth rate in ASME Code Case N-809. For the 60-year operation period, the crack growth rate was 1.81×10^{-3} inches per cycle, whereas for 80 years the crack growth rate was 4.51×10^{-3} inches per cycle. For the accumulator lines, the applicant calculated the crack growth of 0.092 inches and 0.23 inches for 60 years and 80 years, respectively. The applicant reported that final half flaw sizes are 2.622 inches for 60 years and 2.760 inches for 80 years. These final half flaw sizes are less than the critical half flaw size of 4.61 inches.

For the RHR line, the applicant used the maximum membrane and bending stresses of 17.38 ksi (including internal pressure), and the half leakage flaw size of 3.12 inches as the initial flaw size. The resultant stress intensity factors K_{max} and K_{min} are 68.86 ksi√in and -30.19 ksi√in, respectively. For 60 years, the crack growth per cycle is 1.62×10^{-3} inches, whereas for 80 years the crack growth rate is 4.19×10^{-3} inches per cycle. The applicant calculated the crack growth of 0.083 inches and 0.214 inches for 60 years and 80 years, respectively. The applicant reported that final half flaw sizes are 3.203 inches for 60 years and 3.334 inches for 80 years. These final half flaw sizes are less than the critical half flaw size of 6.35 inches.

For the surge line, the applicant used the maximum membrane and bending stresses of 24.73 ksi (including internal pressure), and the bounding half leakage flaw size of 3.30 inches as the initial flaw size. The resultant stress intensity factors K_{max} and K_{min} are 107.35 ksi√in and -0.39 ksi√in, respectively. For 60 years, the crack growth per cycle is $2.14 \text{x} 10^{-3}$ inches, whereas for 80 years the crack growth rate is $5.06 \text{x} 10^{-3}$ inches per cycle. The applicant calculated a crack growth of 0.109 inches and 0.258 inches for 60 years and 80 years, respectively. The applicant reported that final half flaw sizes are 3.409 inches for 60 years and 3.558 inches for 80 years. These final half flaw sizes are less than the critical half flaw size of 4.06 inches

The staff finds that for the 100 percent through-wall flaw calculations, the final half leakage crack size is less than critical half flaw size. For the partial through-wall flaws, the FCG in the length and depth direction is insignificant as compared to the allowable flaw size. The staff determines that the applicant has demonstrated, by analysis, stability of postulated flaws for the accumulator, RHR, and surge lines.

4.7.4.2.5 RCS Leakage Detection Systems

SRP 3.6.3.III.4 specifies that application of LBB is predicated on having a reliable RCS leak detection system at the plant and that the capability of the RCS leakage detection system be 1/10 of the calculated leak rate from the calculated leakage crack. The applicant stated that the RCS leakage detection system at Turkey Point Units 3 and 4 is capable of detecting 1 gpm. In terms of leakage detection, the applicant stated that it is committed to NRC Generic Letter (GL) 84-04, which considers a 4-hour response time for detecting 1 gpm leak rate.

The staff noted that the Turkey Point plant TS 3/4.4.6, “Reactor Coolant System Leakage,” states that the RCS leakage detection systems consist of the containment atmosphere gaseous system, particulate radioactivity monitoring system, containment sump level monitoring system, and RCS water inventory balance calculation. TS 3/4.4.6 provides various LCOs, action statements, and surveillance requirements that require the applicant to perform corrective actions if RCS leakage is detected and periodic testing and calibration of the detection equipment. LCO 3.4.6.2 requires that reactor coolant system operational leakage shall be limited to no pressure boundary leakage.

The staff finds that the RCS leakage detection system is acceptable for the LBB analysis because its capability satisfies the 1 gpm detection capability as specified in SRP 3.6.3.

4.7.4.2.6 Summary

Based on the above evaluation, the staff finds that the applicant's LBB analysis of the RCS Class 1 auxiliary piping satisfies the guidance of SRP 3.6.3 and thereby has provided reasonable assurance that the accumulator, RHR, and surge piping will have an extremely low probability of failure.

The staff further finds that the applicant's LBB analysis satisfies the TLAA acceptance criteria of SRP-SLR Section 4.7.2.1.2 because the LBB analysis is valid for the subsequent period of extended operation based on transient cycles projected to the end of 80 years.

4.7.4.3 UFSAR Supplement

SLRA Section A.17.3.7.4 provides the UFSAR supplement summarizing the LBB analysis of RCS Class 1 auxiliary piping TLAA. The staff reviewed SLRA Section A.17.3.7.4 consistent with the review procedures in SRP-SLR Section 4.7.3.2. The staff noted that the original UFSAR supplement stated "[a]n LBB analysis of the Class 1 auxiliary lines was performed for the EPU, during the initial PEO, and it is valid for the current 60-year period of operation." The staff needed additional information and issued an RAI. RAI 4.7.4-2 and the applicant's response are documented in ADAMS Accession No. ML18299A214.

In RAI 4.7.4-2, the staff requested information regarding whether the applicant's LBB analysis of the RCS Class 1 auxiliary lines had been submitted to the NRC for review and approval before the SLRA submission. In its response, the applicant revised the UFSAR supplement in SLRA Section A.17.3.7.4, as follows:

> The LBB analysis for Class 1 auxiliary lines depends on the potential that a postulated crack would grow to unstable proportions during the plant life, thus the analysis is dependent on the length of plant operation. Since the LBB analysis for Class 1 auxiliary lines for 80 years was submitted to the NRC for review and approval as part of the SLRA, this analysis is a TLAA. To demonstrate compliance during the [subsequent period of extended operation], the analysis associated with Class 1 auxiliary line LBB was performed by Structural Integrity Associates for 80 years. Since the Class 1 auxiliary piping has been projected to the end of the [subsequent period of extended operation], this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.7.2.2, and is therefore acceptable.

4.7.4.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the LBB analysis for the RCS Class 1 auxiliary piping has been projected to the end of the subsequent period of extended operation.

The staff further concludes that the UFSAR supplement contains an adequate summary description of the LBB analysis of the RCS Class 1 auxiliary piping evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

Additionally, the staff concludes that, pursuant to GDC 4 of Appendix A to 10 CFR Part 50, the applicant is permitted to exclude consideration of the dynamic effects associated with the postulated rupture of the subject accumulator, RHR, and pressurizer surge piping from the CLB at Turkey Point Units 3 and 4.

4.7.5 Code Case N-481 Reactor Coolant Pump Integrity Analysis

4.7.5.1 Summary of Technical Information in the Application

SLRA Section 4.7.5 describes the applicant's TLAA for RCP casing integrity. The applicant dispositioned the TLAA for the RCP casing integrity in accordance with 10 CFR 54.21(c)(1)(ii) to demonstrate that the integrity analysis has been projected to the end of the subsequent period of extended operation.

The applicant stated that, to support the EPU project, it analyzed the RCP casing integrity in accordance with ASME Code Case N-481, "Alternative Examination Requirements for Austenitic Pump Casings," to determine the acceptability of the RCP casing analysis for the current 60-year operating period. The applicant concluded that the previous RCP integrity analysis conclusions documented in the Westinghouse TR, WCAP-13045, "Compliance to ASME Code Case N-481 of the Primary Loop Pump Casings of Westinghouse Type Nuclear Steam Supply Systems," and WCAP-15355, "A Demonstration of Applicability of ASME Code Case N-481 to the Primary Loop Pump Casings of the Turkey Point Units 3 and 4," for the RCP casings remain valid for the 60-year licensed operating period at EPU conditions. The applicant also concluded that no AMP beyond the examinations required by the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program described in Section B.2.3.1 is required to manage the thermal embrittlement for the RCP casings.

The applicant further stated that to demonstrate continued compliance during the subsequent period of extended operation, the PWROG re-evaluated the analyses associated with the application of Code Case N-481 to the RCP casing during the subsequent period of extended operation. The PWROG documented its finding in a TR, PWROG-17033-P/NP, Revision 0, entitled "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," October 2017.

The applicant stated that the PWROG-17033 evaluation provides continued justification of the fracture mechanics integrity analysis in WCAP-13045 for the subsequent period of extended operation. The fracture mechanics evaluation for the subsequent period of extended operation allows the applicant to continue performing visual inspections, in lieu of volumetric inspections, for the RCP casings.

4.7.5.2 Staff Evaluation

The staff reviewed the applicant's TLAA for the RCP casing integrity 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.

The staff focused its review on the crack stability analysis and FCG analysis of the RCP casings at Turkey Point Units 3 and 4 through the 80 years of operation.

Background

The ASME Code, Section XI, Table IWB-2500-1, requires periodic volumetric inspections of the welds associated with the RCP casings. Most RCP casings are made of heavy-wall CASS. PWROG-17033 indicated that a volumetric inspection of the full thickness of the welds in the RCP casings using the ultrasonic testing method from the outside diameter surface is impractical because of the severe attenuation associated with the large grain microstructure in cast stainless steel. Volumetric inspections of the full thickness of the welds in RCP casings would require unconventional approaches (inside diameter and outside diameter ultrasonic testing or radiographic testing) that require access to the internal of the pump casing.

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," in April 1992. ASME Code Case N-481 allowed the elimination of volumetric examination of the RCP casing with a fracture-mechanics-based integrity evaluation supplemented by specific visual inspections.

Specifically, Code Case N-481(d) requires that licensees and applicants "…perform an evaluation to demonstrate the safety and serviceability of the pump casing. The evaluation shall include the following: (1) evaluating material properties, including fracture toughness values; (2) performing a stress analysis of the pump casing; (3) reviewing the operating history of the pump; (4) selecting locations for postulating flaws; (5) postulating one-quarter thickness reference flaw with a length six times its depth; (6) establishing the stability of the selected flaw under the governing stress conditions; (7) considering thermal aging embrittlement and any other processes that may degrade the properties of the pump casing during service…."

In September 1991, Westinghouse published TR WCAP-13045, which presented the structural integrity evaluation of the RCP casing to demonstrate compliance with ASME Code Case N-481. TR WCAP-13045 was based on structural integrity evaluations for a 40-year service life.

Since 1991, the inspection requirements of the ASME Code, Section XI, have been updated to be consistent with the guidance of Code Case N-481 in permitting visual inspections of the RCP casings. In March 2004, ASME annulled the code case and incorporated the provisions of the code case into the 2008 addenda of the ASME Code, Section XI.

In 2000, the applicant submitted for NRC review and approval the LRA for Turkey Point Units 3 and 4. As part of that application, the applicant performed a plant-specific RCP casing integrity analysis for Turkey Point Units 3 and 4 as documented in WCAP-15355. By letter dated June 6, 2002, the staff approved the LRA for Turkey Point Units 3 and 4 (ADAMS Accession No. ML012320135).

In 2009, the applicant submitted an EPU application for Turkey Point Units 3 and 4. As part of the EPU application, the applicant used the EPU conditions to re-evaluate the acceptability of WCAP-13045 and WCAP-15355 for the 60-year service life. The applicant concluded that WCAP-13045 and WCAP-15355 for the RCP casings remain valid for the 60-year license term at EPU conditions. The staff had reviewed WCAP-15355 as part of the EPU application. In

June 2012, the staff concluded in its SE that WCAP-15355 is acceptable under EPU conditions (ADAMS Accession No. ML11293A365).

PWROG-17033 stated that as part of the SLRA TLAA, WCAP-13045 is needed to be evaluated to determine its applicability for the 80 years of operation. The fracture mechanics integrity assessment and the requirements of Code Case N-481 need to be reaffirmed to demonstrate that the visual inspections for RCP casings continue to remain valid for an 80-year life. As such, PWROG completed PWROG-17033, Revision 0, in October 2017. On January 30, 2018, the applicant submitted the SLRA, including PWROG-17033, Revision 0, as part of Enclosure 5.

Subsequent to the Turkey Point SLRA, the PWROG revised PWROG-17033 in June 2018 to ensure clarity of information. On June 24, 2018, PWROG submitted to the NRC for review and approval PWROG-17033, Revision 1, as a TR for generic use independent of the Turkey Point SLRA. The staff needed additional information regarding the documentation used and issued an RAI. RAI 4.7.5-1 and the applicant's response are documented in ADAMS Accession No. ML18296A024.

In RAI 4.7.5-1, the staff asked the applicant whether Revision 1 instead of Revision 0 of PWROG-17033 should be part of the technical basis for the Turkey Point SLRA. In its response, the applicant stated that no new analysis was performed during the revision process for PWROG-17033. In Revision 1 of PWROG-17033, PWROG expanded the "Purpose and Background" sections to provide past examples of NRC approval of Code Case N-481 evaluations based on WCAP-13045. The applicant stated that between Revision 0 and Revision 1 of PWROG-170333, the methodology, inputs, reported numerical results, margins to criteria allowable values, and conclusions remain unchanged. The staff confirms that no significant difference exists between Revision 0 and Revision 1 of PWROG-17033. Therefore, the staff will review Revision 0 of PWROG-17033 as part of technical basis for the Turkey Point SLRA.

The applicant reported that the EFPY through December 31, 2017, for Turkey Point Units 3 and 4 are 33.69 EFPY and 33.74 EFPY, respectively.

Reactor Coolant Pump Information

PWROG-17033 states that the integrity evaluations in WCAP-13045 are applicable to Westinghouse-designed main coolant pumps. There are eight different models of pumps in Westinghouse-type PWR, Models 63, 70, 93, 93A, 93A-1, 93D, 100A, and 100D. Models 63, 70, 93, and 93D all have a tangent outlet nozzle. Models 93A and 93A-1 have outlet nozzles that are radially orientated. Models 100A and 100D are similar to the general shape of Model 93 but with a radially oriented outlet nozzle like Model 93A. Models 93, 93A, and 93A-1 are the most common among Westinghouse-type PWRs, making up around 90 percent of the total on a domestic plant basis.

During its review, the staff needed additional information and issued an RAI. RAI 4.7.5-2 and the applicant's response are documented in ADAMS Accession No. ML18296A024.

In RAI 4.7.5-2, the staff requested that the applicant discuss the material, casing wall thickness, and model number of RCP casing at Turkey Point and whether the pump drawings in Section 3 of WCAP-13045 are consistent with or representative of the actual pumps installed at Turkey Point. In its response, the applicant stated that the RCPs are Westinghouse Model 93 design. The RCP casings are made from SA-351 CF8 cast stainless steel. The pump casing drawing, as shown in Figure 3-3 in Section 3 of WCAP-13045, is representative of the Model 93 pump casings installed at Turkey Point Units 3 and 4. The Model 93 pump design drawing as shown in Figure 2-1 of WCAP-15355, which is consistent with the drawing in Figure 3-3 of WCAP-13045, is used in the plant-specific flaw evaluations per Code Case N-481.

PWROG-17033 states that in WCAP-13045, a model representative of each of the outlet nozzle configurations was chosen for a three-dimensional finite element stress analysis and fracture evaluation (the inlet nozzles are reasonably axisymmetric with the pump casing proper). The representative models chosen were the Model 93A (radial outlet nozzle) and Model 93 (tangential outlet nozzle). The pump casings are fabricated from SA-351 CF8, except for the pumps of three plants fabricated from SA-351 CF8M. The SA-351 CF8M and CF8 are known to be susceptible to thermal aging.

<u>Staff Evaluation</u>

In accordance with Code Case N-481(d), the staff reviewed the applicant's crack stability analysis and FCG analysis to determine whether the analysis results will demonstrate the structural integrity of the RCP casings at Turkey Point Units 3 and 4 at the end of the 80-year operation.

As stated above, WCAP-13045 contains the generic crack stability analysis and FCG analysis of generic RCP casings for the 40-year term. WCAP-15355 contains the plant-specific crack stability analysis and FCG analysis for the Turkey Point RCP casings for 60 years of operation. PWROG-17033 contains the confirmatory analysis of the generic crack stability and FCG analyses in WCAP-13045 for 80 years of operation.

Although WCAP-13045 and PWROG-17033 provide generic analyses, the staff determines that they contain relevant information that is applicable to Turkey Point RCP casings. Therefore, the staff's evaluation is divided into generic and plant-specific crack stability and FCG analyses as discussed below.

<u>*Crack Stability Analysis*</u>

Generic Crack Stability Analysis

PWROG-17033 stated that it re-evaluated and confirmed that the generic crack stability calculation in WCAP-13045 is still valid for the subsequent period of extended operation. Specifically, PWROG-17033 re-evaluated and confirmed that the fracture toughness of the CASS (J_{Ic} = J at crack initiation and J_{max} = J at the maximum crack extension) used in WCAP-13045 and the associated tearing modulus (T_{mat}) used in the stability analysis remain applicable for 80 years of service.

PWROG-17033 also stated that in WCAP-13045, thermal aging of the CASS pump casings (CF8M and CF8) was addressed using the EOL fracture toughness values for all Westinghouse design pump casings. The fracture toughness criteria were established using the lowest toughness for each pump component. The fracture mechanics evaluation is based on the EPFM methodology. The EPFM is determined for a postulated 1/4T (1/4 thickness of RCP casing wall) flaw size with a six-to-one (6:1) aspect ratio. This reference flaw size is consistent with the guidelines of Code Case N-481. The postulated 1/4T flaws are considered to occur at the highest stressed regions, regions of significant stress concentrations, or locations in welds not affected by discontinuities such as nozzles.

PWROG-17033 stated that the crack stability is based on the fracture toughness of the pump casings and the tearing modulus, T, as follows: A crack is stable if either of the following criteria is met: (1) $J_{applied} < J_{Ic}$, or (2) if $J_{applied} \geq J_{Ic}$, then $T_{applied} < T_{material}$ and $J_{applied} \leq J_{maximum}$.

PWROG-17033 stated that the applied J-integral ($J_{applied}$ or J_{app}) and applied tearing modulus ($T_{applied}$ or T_{app}) are calculated based on the report by Kumar, V., German, M.D. and Shih, C.P., "An Engineering Approach for Elastic-Plastic Fracture Analysis," EPRI Report NP-1931, Project 1237-1, Electric Power Research Institute, July 1981. This method is based on various combinations of loading parameters and material properties for various pump designs.

PWROG-17033 further stated that applied J_{app} and T_{app} will not be affected by the extension of the operating period to 80 years. The staff confirmed that the applied J_{app} and T_{app} are not affected by the operating time period unless the applicant modifies system operation such as in an EPU that may increase the applied loadings. The staff noted that the applicant already addressed the loading as a result of EPU in the crack stability analysis of Turkey Point RCP casing as shown in WCAP-15355.

The staff evaluated the fracture toughness of the CASS material properties such as the crack initiation toughness (J_{Ic}), which is based on a J-integral resistance curve, the maximum fracture toughness ($J_{maximum}$ or J_{max}), and the tearing modulus ($T_{material}$ or T_{mat}) to determine that the worst case values were used for 80 years of operation in WCAP-13045, WCAP-15355, and PWROG-17033.

PWROG-17033 used the fracture toughness values in WCAP-13045 as part of the EPFM analysis based on the J-integral approach. PWROG-17033 reconfirmed the fracture toughness values for an 80-year evaluation and demonstrated that the EPFM analysis continues to remain valid for 80 years. PWROG-17033 indicated that the J-integral evaluation also used bounding loads that covered a wide range of pump casing nozzle loads from the different plant designs. PWROG-17033 noted that the fracture toughness material properties based on the CF8M (high molybdenum) material is more susceptible (limiting) to thermal aging than CF8 materials. Therefore, PWROG-17033 used the CF8M material in the generic fracture mechanics assessment in WCAP-13045. PWROG-17033 stated that the stability analysis results using CF8M fracture toughness will apply for the CF8 material as well.

In Table 5.1 of WCAP-13045, PWROG-17033 calculated the minimum, EOL saturated fracture toughness (J_{Ic}, T_{mat}, and J_{max}) of the pump casings based on the most limiting SA-351 CF8M component. The fracture toughness properties shown in Table 5-1 of WCAP-13045 are already at the fully-aged saturated condition and are therefore applicable for the 80-year operation. The saturation room temperature impact energies of the CASS materials are determined from the chemical composition. PWROG-17033 stated that the fracture toughness data in Table 5-1 of WCAP-13045 is based on the chemistry data from Appendix A to WCAP-13045. The fracture toughness of CASS material is based on the chemistry in CASS, such as silicon, chromium, molybdenum, nickel, carbon, manganese, and nitrogen in percent weight, and percent delta ferrite. PWROG-17033 stated that the fracture toughness properties for CF8M from WCAP-13045 are projected to envelop the CF8 material, as thermal aging is more limiting for CF8M materials as compared to CF8.

PWROG-17033 indicated that its fracture mechanics evaluation considers the latest fracture toughness correlations that have been developed for the CASS pump casings based on NUREG/CR-4513, Revision 2, "Estimation of Fracture Toughness of Cast Stainless Steels during Thermal Aging in LWR systems," by Chopra, O., published May 2016.

PWROG-17033 explained that NUREG/CR-4513, Revision 2, provides a large database for CASS material and thermal aging, and it builds on the work performed in 1994 for Revision 1 of NUREG/CR-4513. In 1994, ANL completed an extensive research program in assessing the extent of thermal aging of cast stainless steel materials. The ANL research program measured mechanical properties of CASS materials after they had been heated in controlled ovens for long periods of time. ANL compiled a database, both from data within ANL and from international sources, of about 85 compositions of CASS exposed to a temperature range of 290-400 °C (550-750 °F) for up to 58,000 hours (6.5 years). In 2015, the work done by ANL was augmented, and the fracture toughness database for CASS materials was aged to 100,000 hours at 290-350 °C (554-633 °F). The methodology for estimating fracture properties has been extended to cover CASS materials with a ferrite content of up to 40 percent. From the database in NUREG/CR-4513, Revision 2, ANL developed lower bound correlations for estimating the extent of thermal aging of CASS. ANL developed the fracture toughness estimation procedures by correlating data in the database conservatively. After developing the correlations, ANL validated the estimation procedures by comparing the estimated fracture toughness with the measured value for several CASS components harvested from actual plant service.

PWROG-17033 used the procedure developed by ANL to derive the fully saturated fracture toughness values for CASS material of RCP casing. PWROG-17033 indicated that its confirmatory analysis showed that the minimum fracture toughness values based on the original methodology in WCAP-13045 is still limiting (more conservatively estimated) as compared to the fracture toughness properties based on NUREG/CR-4513, Revision 2.

PWROG-17033 stated that based on NUREG/CR-4513, Revision 2, the fracture toughness correlations used for the fully aged condition are applicable for plants operating at and beyond 15 EFPY for the CF8M materials. PWROG-17033 further states that currently, RCP pumps in the fleet are operating well beyond the 15 EFPY service life; therefore, the use of the fracture toughness correlations described in NUREG/CR-4513, Revision 2, is applicable for the fully aged or saturated conditions.

Plant-Specific Crack Stability Analysis

As noted above, PWROG-17033 and WCAP-13045 address generic crack stability analysis based on bounding parameters. The staff needed to determine whether the generic bounding crack stability analysis is applicable to the RCP casings at Turkey Point Units 3 and 4. The staff evaluated the following plant-specific issues related to the crack stability analysis of the Turkey Point RCP casings.

To demonstrate crack stability in the RCP casings, PWROG-17033 postulated a flaw of 1/4T depth (T is the wall thickness of the RCP casing). The staff needed additional information and issued an RAI. RAI 4.7.5-3 and the applicant’s response are documented in ADAMS Accession No. ML18296A024.

In RAI 4.7.5-3, item (a), the staff requested that the applicant confirm that the locations of the postulated flaws in WCAP-13045 represent the high stress areas of the pump casing at Turkey Point. In its response, the applicant clarified that the locations of the postulated flaws shown in Figure 9-1 of WCAP-13045, which is for Model 93 pump design, represent the high stress areas of the pump casing for Turkey Point. The same high stress locations are also shown in Figure 5-1 of WCAP-15355. Therefore, the staff finds that the applicant satisfied Code Case N-481(d)(4), which requires that the structural integrity evaluation include the selection of the locations for postulated flaws. The staff also finds that the selection of the high stress locations is adequate for the pump casing integrity evaluation.

In RAI 4.7.5-3 item (b), the staff requested that the applicant explain whether the J_{app} values in WCAP-13045 bound the J_{app} values from the RCPs at Turkey Point. In its response, the applicant indicated that the pump casing evaluations in WCAP-13045 are a generic integrity evaluation applicable to all Westinghouse design pump casings that demonstrates compliance with ASME Code Case N-481. WCAP-13045 provides enveloping or bounding criteria whereby a specific plant, such as Turkey Point, needs only to show that the pump casings of interest fall under the umbrella established in WCAP-13045. The loads used in the crack stability analysis in WCAP-13045 were selected to be conservative for a majority of the plants. The applicant explained that for Turkey Point, the plant-specific loads were not adequately covered by the umbrella loads considered in WCAP-13045; thus, the J_{app} values of WCAP-13045 do not completely bound Turkey Point. Therefore, the applicant performed a plant-specific flaw evaluation for Turkey Point in WCAP-15355. In WCAP-15355, the J_{app} values have been recalculated using Turkey Point specific loads and material properties. As shown in Section 5.4 of WCAP-15355, the plant-specific evaluations continue to meet the crack stability criteria.

The applicant also stated that since the analysis performed in WCAP-15355 in 2000, Turkey Point Units 3 and 4 implemented an EPU. The applicant stated that the EPU evaluations demonstrated that the changes in the operating parameters (temperature or pressure) and loads due to the EPU have an insignificant impact on the flaw evaluations in WCAP-15355. The applicant further stated that there have been no other plant modifications that would impact the flaw evaluations in WCAP-15355. Therefore, the plant-specific J_{app} values considered in WCAP-15355 are still applicable for the 80 years operation of the RCP casings at Turkey Point Units 3 and 4. The staff finds that appropriate loads and stresses have been used in the stability analysis for the Turkey Point RCP casings, consistent with the flaw evaluations in WCAP-15355.

In RAI 4.7.5-3 item (c), the staff requested that the applicant explain which flaw identification number represents the worst (limiting) case in pump casing at Turkey Point. In its response, the applicant stated that the stability results presented in WCAP-13045 were re-evaluated using Turkey Point specific loads and material properties. These plant-specific stability results are provided in Table 5-2 of WCAP-15355. Table 5-2 of WCAP-15355 identified the most limiting flaw location on the Turkey Point RCP casing. The applicant stated that even for this most limiting flaw scenario, the stability margins are met, as J_{app} is less than the J_{max}, and the T_{app} is below T_{mat}.

In RAI 4.7.5-3, item (d), the staff noted that the postulated 1/4T flaw in the pump casing satisfies the crack stability criteria, but requested that the applicant “discuss the depth of a flaw in the pump casing that would not satisfy the crack stability criteria.” In its response, the applicant stated that although the most limiting flaw location meets the stability criteria with sufficient margin, as shown in Section 4.2 of WCAP-15355, there is more margin available in the stability analysis because the fracture toughness values used in Table 5-2 of WCAP-15355 are based on fracture toughness values from WCAP-13045, which are very conservative. The staff noted that material fracture toughness values in WCAP-13045 were not derived from NUREG/CR-4513, Revision 1 or Revision 2. They were developed based on a method in Appendix A to WCAP-13045, which predates the fracture toughness calculation correlations in NUREG/CR-4513.

The applicant stated that it used a method based on NUREG/CR-4513, Revision 1, “Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems,” to recalculate the fully aged toughness values using the actual chemistry of Turkey Point Units 3 and 4 pump casings as shown in Section 4.2 of WCAP-15355. The applicant stated that these values are higher than the generic fracture toughness values used in Table 5-2 of WCAP-15355, which were derived based on the fracture toughness method in WCAP-13045. The applicant stated that additional margin is available for the stability criteria if the industry and NRC-approved methodology is used from NUREG/CR-4513, Revision 1. The applicant noted that subsequent to the work performed in WCAP-15355, the correlations in NUREG/CR-4513, Revision 1 were updated in May 2016, as documented in NUREG/CR-4513, Revision 2. The applicant compared the fracture toughness correlations for CF8 materials showing that there is a minor change in the equation to calculate the fracture toughness (specifically the “n” term in the equation, $J = C\Delta a^n$). The applicant stated that based on NUREG/CR-4513, Revision 2, there is additional margin available in the stability analysis for Turkey Point Units 3 and 4 pump casings than that shown in Table 5-2 of WCAP-15355.

The staff noted that the fracture toughness values derived in WCAP-13045 are still the lowest (fully aged) fracture toughness as compared to the fracture toughness values derived based on NUREG/CR-4513, Revisions 1 and 2. The staff further noted that the applicant’s TLAA of the RCP casings for 80 years of operation is based on the fully aged fracture toughness values derived in WCAP-13045.

As discussed above, in RAI 4.7.5-3, item (d), the staff asked the applicant to specify the largest flaw in the RCP casing that would exceed the crack stability criteria. In its response, the applicant stated that the applied fracture toughness J_{app} values exponentially increase with increasing flaw sizes; thus, on a generic basis for Turkey Point, the stability criteria can be met for flaw depths larger than 1/4T (25 percent of thickness) with certain allowable range depth of the wall thickness at the different flaw locations. The applicant stated that postulated flaws larger than this allowable certain range would have difficulty in satisfying the crack stability criteria, unless other parameters can be re-assessed (e.g., refinement in loads, stresses, material properties). However, for Turkey Point, as discussed in WCAP-15355, the stability criteria are met per the guidance of Code Case N-481 for the postulated flaw depth of 1/4T. The staff finds that the applicant’s postulated flaw depth of 1/4T in the crack stability analysis is acceptable because it is consistent with Code Case N-481(d)(5).

The staff noted that Section 2.2 of PWROG-17033 discusses fracture toughness calculations based on NUREG/CR-4513, Revision 2. The staff stated that GALL-SLR Report AMP XI.M12, “Thermal Aging Embrittlement of Cast Austenitic Stainless Steel,” discusses fracture toughness values based on the prediction method in NUREG/CR-4513, Revision 1. The GALL-SLR Report does not reference NUREG/CR-4513, Revision 2. The staff needed additional information and issued an RAI. RAI 4.7.5-9 and the applicant’s response are documented in ADAMS Accession No. ML18311A307.

In RAI 4.7.5-9, the staff requested that the applicant explain whether the saturated fracture toughness value used in the crack stability analysis of pump casing at Turkey Point would still be limiting and bounding if the method of predicting fracture toughness in accordance with NUREG/CR-4513, Revision 1 was used. In its response, the applicant stated that Section 4.2 of WCAP-15355 provides the saturated fracture toughness values (as shown in Table 4.7.5-9.1 of the RAI response) that were derived using the methodology of NUREG/CR-4513, Revision 1, considering the limiting Turkey Point CF8 material chemistry. The NUREG/CR-4513, Revision 1 values were used for comparison to the generic fracture toughness values used in the stability criteria per Table 5-2 of WCAP-15355 (as shown in Table 4.7.5-9.2 of the RAI response) for the Turkey Point pump casings. The fracture toughness values in Table 4.7.5-9.2 were reported in WCAP-13045 for the Model 93 pump casing considering CF8 material. Finally, Table 4.7.5-9.3 of the RAI response provides the fracture toughness values for the Model 93 pump casing using the methodology of NUREG/CR-4513, Revision 2, also considering the limiting Turkey Point CF8 material chemistry. As shown by comparing Tables 4.7.5-9.1, 4.7.5-9.2, and 4.7.5-9.3, the saturated fracture toughness values derived using NUREG/CR-4513, Revision 1 and Revision 2 are higher than the generic CF8 material fracture toughness values reported in WCAP-13045. Therefore, the fracture toughness values used in the crack stability analyses of the pump casing for Turkey Point, as reported in WCAP-15355 and WCAP-13045, are limiting and more bounding than the fracture toughness values determined by either Revision 1 or Revision 2 of NUREG/CR-4513 for the Turkey Point CF8 material chemistry.

The staff further noted that PWROG-17033 stated that the fracture toughness values (J_{IC}, J_{max}, and T_{mat}) in Table 1 of PWROG-17033 are bounding and used to demonstrate the crack stability of the pump casings. However, the J_{IC}, J_{max}, and T_{mat} values used in Tables 11-2 and 11-3 of WCAP-13045 to demonstrate the crack stability of the critical flaw were higher than those listed in Table 1 of PWROG-17033. The staff needed additional information and issued an RAI. RAI 4.7.5-10 and the applicant's response are documented in ADAMS Accession No. ML18311A307.

In RAI 4.7.5-10, the staff noted that if the lower J_{IC}, J_{max}, and T_{mat} values in Table 1 of PWROG-17033 were used to analyze the critical flaw, crack stability may not be demonstrated for the critical flaw. The staff also questioned whether various material fracture toughness value criteria are needed to qualify various flaws to demonstrate crack stability, and not a single set of fracture toughness value as specified in Table 1 of PWROG-17033. In addition, the staff noted that Table 5-1 of WCAP-13045 does provide four sets of fracture toughness values as end of service life criteria to determine crack stability. The staff questioned whether the fracture toughness values in Table 5-1 of WCAP-13045 should be compared to the fracture toughness values predicted based on the method in NUREG/CR-4513, Revision 1. As such, the staff asked the applicant to discuss whether the four sets of fracture toughness values in Table 5-1 of WCAP-13045 satisfy the fracture toughness values as predicted using the method in NUREG/CR-4513, Revision 1.

In its response, the applicant stated that the limiting fracture toughness values from WCAP-13045 as reported in Table 1 of PWROG-17033 for the nozzle outer quarter flaw location were used to generically demonstrate that the method in WCAP-13045 will produce more limiting fracture toughness values than those derived using the method in NUREG/CR-4513, Revision 2, for the same flaw location with the same chemistry. PWROG-17033 sought to demonstrate that one of the most limiting CF8M material heats for the pump casing has reached the saturated condition based on the latest NUREG/CR-4513, Revision 2, and therefore, the stability criteria for the fracture toughness values in WCAP-13045 are limiting.

The applicant further stated that for the SLRA, the fracture toughness values that apply to Turkey Point were derived in WCAP-13045 and are shown in Table 4.7.5-9.2 in the response to RAI 4.7.5-9 (discussed above). The other three sets of values in Table 5-1 of WCAP-13045 are for pump casings with CF8M material chemistry and therefore do not apply to Turkey Point. The fracture toughness values that apply to Turkey Point were qualified for crack stability in WCAP-15355. The applicant explained that, as discussed in the response to RAI 4.7.5-9, the saturated fracture toughness values derived using NUREG/CR-4513, Revision 1 and Revision 2 are greater than the fracture toughness values used for the crack stability analysis for Turkey Point. Therefore, the fracture toughness values used in the crack stability analyses of the pump casings for Turkey Point, as reported in WCAP-15355, are limiting and more bounding than the fracture toughness values determined by either Revision 1 or Revision 2 of NUREG/CR-4513.

Based on the applicant's responses to RAI 4.7.5-9 and RAI 4.7.5-10, the staff finds that the applicant has used the fully aged, saturated, and limiting fracture toughness for the Turkey Point RCP casing material in its crack stability analysis; therefore, this issue is closed.

During its review, the staff needed additional information and issued RAIs. RAI 4.7.5-6 and 4.7.5-8, and the applicant's responses are documented in ADAMS Accession No. ML18296A024.

In RAI 4.7.5-6, the staff noted that different yield strength values were indicated in WCAP-13054 and PWROG-17033 for CF8M material, and requested that the applicant describe how its crack stability analysis confirms the stability of postulated flaw 5-93 taking into account the plant-specific yield strength of the material and actual loading conditions. In its response, the applicant stated that the RCP casings at Turkey Point Units 3 and 4 are fabricated from SA-351 CF8 cast stainless steel. The discussion on evaluation of postulated flaws with assumptions on certain yield strengths in WCAP-13045 (Tables 11-2 through 11-4) are for SA-351 CF8M materials but not for CF8 materials. Furthermore, the Turkey Point crack stability analysis was completed on a plant-specific basis in Section 4, "Material Characterization," and Section 5, "Stability Evaluations," of WCAP-15355. The applicant determined that the stability results were required to be recalculated based on Turkey Point -specific material properties and loads as shown in Table 5-2 of WCAP-15355. Also, the plant-specific evaluation in WCAP-15355 demonstrated that there are additional margins available if the fracture toughness values of NUREG/CR-4513, Revision 1 or Revision 2, were to be used in the stability criteria in lieu of the conservative fracture toughness values of WCAP-13045. The staff finds the applicant's response acceptable; therefore, this issue is closed.

In RAI 4.7.5-8, the staff noted that Section 11.2 of WCAP-13045 discusses a postulated flaw that exceeded the crack stability criteria, and requested that the applicant clarify whether the Turkey Point RCP casing would have such a postulated flaw. In its response, the applicant stated that assumptions on certain yield strengths that would exceed crack stability criteria pertain to Tables 11-2 through 11-4 of WCAP-13045, which is for SA-351 CF8M materials and not CF8 materials. For CF8 material, as discussed in Section 11.2 of WCAP-13045, the stability criteria are met for all conditions, as shown in Table 11-5 of WCAP-13045. The applicant explained that the discussion of a postulated flaw that exceeded the stability criteria under assumptions on yield and operating conditions is not applicable for Turkey Point. The staff finds the applicant's response clarified the concern regarding the CF8M casings is not applicable; therefore, this issue is closed.

Based on the reviews of WCAP-13045, WCAP-15355, and PWROG-17033, the staff determines that the applicant has used the appropriate applied loads and material fracture toughness values to perform the acceptable crack stability analysis for the Turkey Point RCP casings for the 80 years of operation.

<u>Fatigue Crack Growth Analysis</u>

Generic Fatigue Crack Growth Analysis

PWROG-17033 re-evaluated and confirmed that the FCG calculation in WCAP-13045 is still valid for the subsequent period of extended operation. Specifically, PWROG-17033 confirmed that the generic FCG analysis performed in WCAP-13045 remains applicable for 80 years of operation, specifically in terms of the stresses, stress intensity factor equations, transient definitions and cycles, and FCG rates.

PWROG-17033 stated that two FCG analyses originally were performed in Section 12 of WCAP-13045 for the postulated crack in the highest stressed outlet nozzle knuckle of the Model 93 and 93A pump casings. PWROG-17033 also stated that the FCG analysis of the Model 93A pump was performed before publication of the stainless steel FCG law in the ASME Code, Section XI. Therefore, the FCG law from the technical paper by Bamford, W.H., "Fatigue Crack Growth of Stainless Steel Piping in a Pressurized Water Reactor Environment," Trans. ASME, *Journal of Pressure Vessel Technology*, February 1979, was initially considered in WCAP-13045. The FCG law used for the postulated flaw in Model 93 was based on Figure C-3210-1 of Article C-3000 of the 1989 edition of the ASME Code, Section XI.

PWROG-17033 compared the FCG rate used in WCAP-13045 with the FCG rate for stainless steel in air environment from the NRC-approved 2007 edition with 2008 addenda of ASME Code, Section XI, Appendix C. PWROG applied a factor of 2 to the FCG rate to account for environmental effects of a postulated flaw in water as described in "Evaluation of Flaws in Austenitic Steel Piping," Trans. ASME, *Journal of Pressure Vessel Technology*, Volume 108, pp. 352-366, 1986.

PWROG-17033 stated that there are no significant differences between the FCG rate in stainless steel in water in the NRC-approved 2007 edition with 2008 addenda of the ASME Code, Section XI, Appendix C and the FCG rate used in WCAP-13045 for the postulated flaws in Model 93 RCPs. The difference between the current stainless steel FCG rate in water and the FCG rate considered in WCAP-13045 for the postulated flaw in Model 93A RCP casing is also insignificant. PWROG-17033 concluded that the existing FCG rates in Section 12 of WCAP-13045 are acceptable based on current industry standards for FCG for stainless steel material in a water environment.

PWROG-17033 stated that other inputs required for an FCG analysis are the stress intensity factors), stresses, transient cycles, and transient definitions. The stress intensity factor correlations used for the FCG analysis in WCAP-13045 are consistent with the current correlations provided in the ASME Code, Section XI, Appendix A. The transient stresses used in the FCG analysis are generic and encompass the various pump designs. These stresses have not changed for the subsequent period of extended operation. PWROG-17033 further indicated that the numbers of predicted cycles for 80 years of operation is assumed to be bounded by the transient cycles considered in Table 12-2 of WCAP-13045. The transient definitions are also not expected to change over 80 years of operation. PWROG-17033 concludes that the generic transient descriptions and numbers of transient cycles in Table 12-2 of WCAP-13045 envelop the transient conditions for 80 years of operation.

PWROG-17033 also explained that plants considering the 80-year life count cycles and typically comply with original design basis cycles for 40 years; therefore, there will be no significant increase in the number of cycles for 80 years. For a confirmatory evaluation, PWROG-17033 doubled FCG cycles for 40 years to apply to the 80-year FCG analysis and to account for any large differences in the transient cycles. PWROG-17033 demonstrated that the final flaw size at the end of 80 years would still be less than the critical flaw size for crack instability at the high stress location. PWROG-17033 stated that three flaw sizes were postulated in the Model 93 pump casing as shown in Table 12-3 of WCAP-13045. The staff needed additional information regarding postulated flaws and issued an RAI. RAI 4.7.5-4 and the applicant's response are documented in ADAMS Accession No. ML18296A024.

In RAI 4.7.5-4, item (c), the staff requested that the applicant provide the length of the postulate flaw, orientation of the flaw, and the direction of its growth (e.g., crack grows radially, axially or circumferentially; or into the wall thickness) in the fatigue crack growth calculations. In its response, the applicant stated that it postulated flaws at the location that would produce the most limiting results in the FCG evaluation. The postulated flaw depths and flaw lengths are based on an aspect ratio (length/depth) of 6:1. The smallest postulated flaw depth evaluated in WCAP-13045 is based on an initial depth of 0.3 inches. This particular flaw depth was the maximum acceptable flaw size in the acceptance standards in Table IWB-3518-2 (for pressure-retaining welds in pump casings) in the editions up to the 2007 Edition of the ASME Code, Section XI. The flaw depth of 0.3 inches is still the maximum acceptable flaw size in the acceptance standards of Table IWB-3519.2-2 (for pump casings) in later editions of the ASME Code, Section XI. The applicant used additional postulated flaw sizes that are equal to and exceed the maximum acceptable flaw size of 0.3 inches in sensitivity studies to demonstrate that the flaws do not grow significantly over time.

The staff finds that the postulated flaw with a depth of 0.3 inches is acceptable to be used in the FCG analysis because it is the maximum acceptable flaw size in accordance with Table IWB-3519.2-2 of the ASME Code, Section XI.

PWROG-17033 also stated that if all other inputs for an FCG analysis (stress intensity factors, stress, transient cycles, and transient definitions) are bounded by or are similar to the inputs of WCAP-13045, then the FCGs for 80 years are expected to be similar to Table 12-1 and Table 12-3 of WCAP-13045 for 40 years. PWROG-17033 reported that even if the number of transient cycles for 40 years is doubled for 80 years to account for any large differences in the transient cycles, the final flaw size would still be less than the minimum stability flaw size of 1/4T flaw depth provided in Table 11-6 of WCAP-13045, at the location of the highest stressed region. PWROG-17033 concluded that the FCG analysis provided in Section 12 of WCAP-13045 continues to remain valid for 80 years.

Plant-Specific Fatigue Crack Growth Analysis

For the plant-specific FCG analysis, the staff focuses on whether the applied loading, stresses, and transient cycles used in the generic analysis are applicable to the analysis for the Turkey Point RCP casing.

In RAI 4.7.5-4, item (a), the staff asked the applicant to demonstrate that the stresses used in FCG analyses in WCAP-13045 bound the stresses at the Turkey Point pump casings. In its response, the applicant stated that the Turkey Point Units 3 and 4 plant-specific report WCAP-15355, Section 6.0, "Fatigue Crack Growth Assessment" states that postulated cracks subject to various cyclic conditions were considered for the FCG analysis of Model 93 pump casings. The stresses representative of the highest stress location are shown in Figure 8-8 of WCAP-13045, which is for the Model 93 design that is present at Turkey Point Units 3 and 4. The applicant stated that the material, geometry and model number of the RCP casings at

Turkey Point is the same as those analyzed in WCAP-13045. The applicant indicated that Tables 3-1 and 3-2 of WCAP-15355 show a comparison of the normal and faulted loads between the analysis for Turkey Point in WCAP-15355 and the analysis in WCAP-13045. As shown in Table 3-2 of WCAP-15355, the faulted loads (forces and moments) based on WCAP-13045 are larger (bounding) than the Turkey Point loads. The applicant explained that the normal moments as shown in Table 3-1 of WCAP-15355, which are from WCAP-13045, are larger (bounding) than the Turkey Point moments; however, the generic normal force as shown in Table 3-1 is slightly lower than the Turkey Point force. The applicant explained that the FCG evaluations are based on the stress that is a combination of forces and moments. Therefore, the slight difference in force is accounted for by the bounding moments considered in the generic analysis from WCAP-13045. The applicant confirmed that the piping stresses in WCAP-13045 are bounding for Turkey Point Units 3 and 4. The loads and moments as shown in Tables 3-1 and 3-2 of WCAP-15355 are for normal operating steady-state stresses (e.g., deadweight, pressure, and thermal expansion piping loads), which are considered in the FCG analysis; however, the FCG analysis is also based on transient stress ranges. As stated in Section 6 of WCAP-15355, the applicant reviewed the generic transients considered in the FCG evaluation of WCAP-13045 against the actual plant operating transient severity and frequency. The applicant concluded that the typical design transients and cycles use in WCAP-13045 can also be applied to Turkey Point Units 3 and 4. The applicant further clarified that the EPU conditions do not impact the loads and transient.

The staff finds that the applied loads and stresses used for the FCG analysis in WCAP-13045 are acceptable because they bound the applied loads and stresses in the Turkey Point RCP casing.

In RAI 4.7.5-4, item (b), the staff asked whether the transient cycles used in the FCG analysis in WCAP-13045 bound the transient cycles that are projected for the 80 years of operation at Turkey Point. In its response, the applicant stated that the design transients and cycles for Turkey Point Units 3 and 4 are provided in Tables 4.3-2 and 4.3-3 of the SLRA, in which the numbers of design cycles bound the projected 80-year transient cycles in all cases. Comparing the design transients and cycles between the SLRA and Table 12-2 of WCAP-13045 demonstrates that the numbers of transient cycles considered in the FCG evaluations in WCAP-13045 bound the numbers of design cycles for Turkey Point Units 3 and 4. The applicant indicated that even if the numbers of transient cycles used in WCAP-13045 were doubled to account for the increase in plant operation from 40 to 80 years, the FCG analysis performed in WCAP-13045 would still remain valid, which also demonstrates that the FCG analysis for Turkey Point Units 3 and 4 in WCAP-15355 remains valid.

The staff finds that the transients and cycles used in the FCG analyses in WCAP-13045 and WCAP-15355 are acceptable because they bound the transients and cycles projected to the end of 80 years at Turkey Point Units 3 and 4. Based on the above evaluation, the staff finds that the FCG evaluations for Model 93 pump design are acceptable and representative for the Turkey Point RCP casings. The staff also finds that the applicant has demonstrated through appropriate FCG analyses that the final flaw size at the end of 80 years will not affect the structural integrity of the Turkey Point RCP casings.

Defense-in-Depth Measures

During its review of defense-in-depth measures, the staff needed additional information and issued an RAI. RAI 4.7.5-5 and the applicant’s response are documented in ADAMS Accession No. ML18296A024.

In its response to RAI 4.7.5-5, the applicant stated that, consistent with the requirements of Code Case N-481, it has performed VT-1 visual examinations of the external surfaces of the RCP casings during the applicable refueling outages. The applicant further stated that no recordable indications were identified during these inspections. In addition, the applicant has performed partial VT-3 visual examinations of the internal surfaces of the Turkey Point Unit 3 and 4 RCP casings during refueling outages when the pumps were disassembled. These were partial examinations of accessible portions of the internal surfaces of the pump casings with the pump diffuser in place. No recordable indications were identified during these inspections. The applicant indicated that based on these inspection results to date, there is no pump casing degradation that needs to be addressed during the subsequent period of extended operation at this time.

The applicant stated that the AMP in Section B.2.3.1, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD is required to manage the aging effect of thermal embrittlement for the RCP casings. The applicant indicated that the examination requirements of Code Case N-481 were incorporated into the 2000 Addenda of the ASME Code, Section XI.

The applicant stated that the “Containment” section of SLRA Section 2.1.5.2.3, Revision 1, discusses the defense-in-depth measures that are in place to alert operators to take corrective actions should leakage occur in containment. The applicant further stated that plant TS 3/4.4.6 includes the operability requirements for the RCS leakage detection systems and TS 3.4.6.2 provides the operational leakage limits for the RCS. The plant operating procedures provide the methodology to be used when performing RCS leak rate calculations.

PWROG-17033 stated that the primary RCP casings in Westinghouse type PWR designs have an operating history that demonstrates the inherent flaw tolerance and structural stability of the pump casings. Based on industry information, there have been no detectable service-induced flaws nor discernible degradation of the CASS pump casings and welds in the PWR operating history.

The staff finds that, based on operating experience, the RCP casings at Turkey Point Units 3 and 4 have not had active degradation mechanisms. Should degradation occur in the future, the applicant has various defense-in-depth measures and the plant TS require operators to take corrective actions within specific time periods.

<u>Summary</u>

Regarding the crack stability analysis, the staff has determined that (1) the applicant has used the most limiting fracture toughness values for the Turkey Point RCP casing material, (2) the fracture toughness values used in the analysis are at fully-aged saturated conditions so any additional aging does not lower the fracture toughness values and, therefore, will continue to remain applicable for 80 years of operation, (3) the applicant has demonstrated that the fracture toughness values used in WCAP-13045 are acceptable for the applicant’s TLAA on the RCP casing integrity because they are less than (more conservative and limiting than) the fracture toughness values obtained through the method in NUREG/CR-4513, Revisions 1 and 2, and (4) the applied loads and stresses used are appropriate. Therefore, the staff finds that the crack stability analysis for RCP pump casings performed in WCAP-13045, WCAP-15355, and PWROG-17033 is valid for the 80 years of operation.

With respect to the FCG analysis, the staff determined that (1) the FCG rates used in WCAP-13045 are comparable to the current FCG rate for stainless steel in water environment based on the ASME Code, Section XI, (2) the stresses used are appropriate, (3) the cycles used in the WCAP-13045 bound the predicted 80-year transient cycles, and (4) when the cycles were doubled, the final flaw size would still be less than the stability flaw size, which is 1/4T flaw depth. The staff finds that there is sufficient margin between the projected final flaw size and the flaw size used for crack stability.

The staff concludes that (1) the structural integrity evaluations in WCAP-13045, WCAP-15355, and PWROG-17033 for the Turkey Point RCP casings continue to remain applicable for the 60-to-80-year subsequent period of extended operation term, (2) the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(ii), that the RCP casing integrity analyses have been projected to the end of the subsequent period of extended operation, (3) the integrity analyses satisfy the acceptance criteria in SRP-SLR Section 4.7 because the applicant has used the fully aged saturated fracture toughness for the Turkey Point RCP casings and the final size of the postulated flaw in Turkey Point RCP casing projected at the end of 80 years will still be stable (i.e., less than the postulated flaw size in the stability analysis), and (4) the structural integrity of the Turkey Point RCPs will be maintained to the end of 80 years.

4.7.5.3 UFSAR Supplement

SLRA Section A.17.3.7.5 provides the UFSAR supplement summarizing the RCP casing integrity analysis TLAA. The staff reviewed SLRA Section A.17.3.7.5 consistent with the review procedures in SRP-SLR Section 4.7.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is therefore acceptable.

4.7.5.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(ii), that the Code Case N-481 RCP integrity analyses have been projected to the end of the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the RCP casing integrity TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.7.6 Crane Load Cycle Limit

4.7.6.1 Summary of Technical Information in the Application

SLRA Section 4.7.6 describes the applicant's TLAAs related to crane load cycles for the following cranes:

- reactor building polar cranes
- spent fuel cask cranes
- intake structure bridge cranes
- turbine gantry cranes
- charging pump monorails
- safety injection pump monorails
- main steam platform monorails
- reactor cavity manipulator cranes
- fuel transfer machines
- fuel pool bulkhead monorails

- intake cooling water valve pit rigging beam
- turbine plant cooling water (TPCW) basket strainer monorail
- spent fuel bridge cranes

The applicant dispositioned the TLAAs for the cranes load cycles in accordance with 10 CFR 54.21(c)(1)(i) to demonstrate that the analyses remain valid for the subsequent period of extended operation.

4.7.6.2 Staff Evaluation

All Cranes Except Spent Fuel Bridge Cranes. The staff reviewed the applicant's TLAAs for all cranes listed above, except for the spent fuel bridge cranes (which is discussed in the subsection below), 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.

During its review of SLRA Section 4.7.6, the staff audited FPL documents to identify the crane design specifications and confirm that the applicant had identified the correct TLAA crane load cycles in the SLRA. The staff noted that the SLRA was not clear in its identification of the design specification used for the design of these cranes; however, audited document FPLCORP020-REPT-115 identified EOCI-61, "Specification for Electric Overhead Traveling Cranes," dated 1961, as the specification to which these cranes were designed. To obtain FPL's confirmation on the docket regarding whether these cranes were designed in accordance with EOCI-61, the staff issued requests for confirmation of information (RCIs) 4.7.6-A and 4.7.6-B (ADAMS Accession Nos. ML18253A243 and ML18253A244). FPL's response to RCIs 4.7.6-A and 4.7.6-B are documented in ADAMS Accession No. ML18284A335.

During its evaluation of the applicant's response, the staff noted that only the following cranes are identified as TLAAs in the applicant's TLAA calculation PTN-BFSC-99-2006 and designed in accordance with EOCI-61 and the 6th edition of the American Institute of Steel Construction (AISC) Manual of Steel Construction.

- reactor building polar cranes
- spent fuel cask cranes
- intake structure bridge cranes
- turbine gantry cranes
- reactor cavity manipulator cranes

The staff noted that cranes designed in accordance with EOCI-61 shall meet the following requirements:

- Load carrying parts, except girders and hoisting ropes, shall not be subject to a static stress exceeding 20 percent of the average ultimate strength of the material, based on rated load.
- All steel shall conform to ASTM-A7 specifications or approved equal and as such cranes structural steel have a yield strength of 33 ksi and tensile strength of no less than 60 ksi.
- The maximum allowable design stresses for crane girders is equal or less than 16 ksi in both tension and compression and shall not exceed 12 ksi in shear.

The staff also noted that the following cranes are not considered TLAAs and are removed from SLRA Section 4.7.6 because their design does not consider cyclic loading; therefore, the crane fatigue cycle TLAA is not applicable.

- charging pump monorails
- safety injection pump monorails
- main steam platform monorails
- fuel transfer machines
- fuel pool bulkhead monorails
- ICW valve pit rigging beam
- TPCW basket strainer monorail

The staff reviewed the applicant's claim that the above cranes have no analyses that involve TLAAs and finds the applicant's claim acceptable because based on its review of the UFSAR, audited documentation, and the staff's SER regarding the first LRA, there are no crane fatigue cycle TLAAs associated with these cranes. The staff finds the applicant's response to RCI 4.7.6-A and 4.7.6-B acceptable because FPL identified the design specifications of the crane TLAAs and identified only those crane analyses that consider cyclic loading as TLAAs.

SLRA Section 4.7.6 states that all cranes, except the spent fuel bridge crane, are acceptable for 2,000,000 cycles. As such, for these cranes to exceed this cycle limit through the extended period of operation. they would have to experience 68 cycles per day, which is far more than what the cranes would experience during the subsequent period of extended operation. The staff noted that the applicant established a limit of 2,000,000 load cycles for these cranes using the AISC Manual, Section 1.7.3 (6th Edition). The staff noted that for cranes that meet the stress criteria in Section 1.7.3 of the AISC Manual (6th Edition), the load cycle limits range from 100,000 to 2,000,000 load cycles. SLRA Section 4.7.6 was not clear what the basis was for the cycle load limit for these cranes of 2,000,000 load cycles and did not identify the associated loads or number of cycles anticipated for each of these cranes through the subsequent period of extended operation. Therefore, the staff needed additional information and issued an RAI. RAI 4.7.6-1 and the applicant's response are documented in ADAMS Accession No. ML18311A299.

During its evaluation of the applicant's response to RAI 4.7.6-1, the staff noted that the cranes are designed such that the minimum computed stress is zero (i.e., there is no stress reversal) and, as such, the allowable maximum stresses control the design of these cranes. The staff noted that based on the 6th Edition of the AISC Manual, Section 1.7.3, the cranes have a cycle load limit of at least 100,000 load cycles under this stress condition. The staff noted that for each of the cranes in question the applicant provided a description of the crane's load capacity, frequency of load lifts, type of loads lifted, and based on operating experience derived the number of load cycles expected through the subsequent period of extended operation. The number of load cycles expected through the subsequent period of extended operation for each of the cranes is as follows:

- reactor building polar cranes = 300 cycles (per unit)
- spent fuel cask crane = 1,355 cycles
- intake structure bridge crane = 3,200 cycles
- turbine gantry crane = 2,374 cycles
- reactor cavity manipulator cranes = 16,642 cycles (per unit)

The staff finds the applicant's response to RAI 4.7.6-1 acceptable because (1) the associated cranes are designed to withstand at least 100,000 cycles; (2) the applicant provided a description of the loads, number of load cycles assumed in the analyses, and the anticipated number of load cycles through the subsequent period of extended operation for each of the cranes; and (3) the expected number of load cycles through the subsequent period of extended operation for each crane is considerably below the AISC (6th edition) lower limit of 100,000 cycles.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for the cranes load cycles of the reactor building polar cranes, spent fuel cask crane, intake structure bridge crane, turbine gantry crane, and reactor cavity manipulator cranes remain valid for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.7.2.1.1 because the applicant has demonstrated that the crane load cycle analyses remain within the bounds of the AISC (6th edition) allowable load cycles and therefore are valid through the subsequent period of extended operation.

<u>Spent Fuel Bridge Cranes</u>. The staff reviewed the applicant's TLAAs for the spent fuel bridge cranes and the corresponding disposition of the TLAA in accordance with 10 CFR 54.21(c)(1)(i), consistent with the review procedures in SRP-SLR Section 4.7.3.1.1.

SLRA Section 4.7.6 states that the spent fuel bridge cranes design "was in accordance with CMAA-70 […], with added seismic requirements," and is acceptable for up to 200,000 cycles of maximum loads. To provide the anticipated number of cycles through the subsequent period of extended operation for the spent fuel bridge cranes, SLRA Section 4.7.6 states the following:

> For original license renewal, the projected number of cycles for these cranes was 16,000. Applying a simple 80/60 multiplier, the total number of cycles for SLR would be conservatively estimated to be 22,000. This is well below the design cycles of 200,000.

The staff noted that its review of the spent fuel bridge crane TLAA for the original license renewal of Turkey Point Units 3 and 4 is documented in Section 4.7.4 of NUREG-1759, "Safety Evaluation Report Related to the License Renewal of Turkey Point Nuclear Plant, Units 3 and 4," dated April 30, 2002 (ADAMS Accession No. ML021280532), and is also based on the applicant's response to RAI 4.7.4-1 provided by letter dated April 19, 2001 (ADAMS Accession No. ML011170195). It was not clear whether the crane seismic requirements referenced in the SLRA involve TLAAs and, if so, whether they are accounted for in the applicant's estimate for the subsequent period of extended operation. It was also not clear whether the conditions and assumptions made by the applicant in response to RAI 4.7.4-1, dated April 19, 2001, remain valid and applicable with regards to lift load cycles, usage of the spent fuel bridge cranes, and estimated number of cycles through the subsequent period of extended operation. Therefore, the staff needed additional information and issued an RAI. RAI 4.7.6-2 and the applicant's response are documented in ADAMS Accession No. ML18311A299.

In RAI 4.7.6-2, the staff requested that the applicant clarify whether the seismic requirements referenced in SLRA Section 4.7.6 are part of the cranes TLAA and whether the assumptions descried in the response to RAI 4.7.6-2 during the initial license renewal review remain valid for subsequent license renewal. During its evaluation of the applicant's response to RAI 4.7.6-2, the staff noted that the "added seismic requirements" reference made in the SLRA relates to the seismic forces and respective acceleration response spectra taken into consideration for the design of the spent fuel bridge cranes. The staff noted that the "added seismic requirements" are not relevant to the crane load cycle limits and, as such, the applicant removed the associated statement from SLRA Section 4.7.6. The staff also noted that in its response, the applicant provided a description of the different lifts made by the spent fuel bridge cranes and their frequency. The staff noted that before the introduction of new spent fuel bridge cranes requirements in 2011, related to the independent spent fuel storage installation at Turkey Point, 400 crane cycles were assumed per refueling cycle. Based on these new requirements, a total of 700 crane cycles are expected every refueling outage since 2011. The applicant therefore estimated that each unit spent fuel bridge crane will experience 29,600 crane cycles at the end of the subsequent period of extended operation. The staff finds the applicant's response acceptable because (1) the applicant provided an updated description of the loads, number of load cycles assumed in the analyses, and the anticipated number of load cycles through the subsequent period of extended operation for the spent fuel bridge cranes; and (2) the expected number of load cycles through the subsequent period of extended operation for each crane is below the CMAA-70 cycle limit of 200,000 cycles.

The staff finds the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for the spent fuel bridge cranes remain valid for the subsequent period of extended operation. Additionally, it meets the acceptance criteria in SRP-SLR Section 4.7.2.1.1 because the applicant has demonstrated that the cranes load cycle analyses remain within the bounds of the CMAA-70 allowable load cycles for Class A service cranes and therefore are valid through the subsequent period of extended operation.

4.7.6.3 UFSAR Supplement

SLRA Section A.17.3.7.6 provides the UFSAR supplement summarizing the crane load cycles for the reactor building polar cranes, spent fuel cask cranes, intake structure bridge cranes, turbine gantry cranes, reactor cavity manipulator cranes, and spent fuel bridge cranes. The staff reviewed SLRA Section A.17.3.7.6 consistent with the review procedures in SRP-SLR Section 4.7.3.2. Based on its review, the staff finds that the UFSAR supplement for this TLAA meets the acceptance criteria in SRP-SLR Section 4.7.2.2 and is therefore acceptable.

4.7.6.4 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable demonstration, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for the reactor building polar cranes, spent fuel cask cranes, intake structure bridge cranes, turbine gantry cranes, reactor cavity manipulator cranes, and spent fuel bridge cranes remain valid for the subsequent period of extended operation. The staff also concludes that the UFSAR supplement contains an adequate summary description of the TLAA evaluation for the subsequent period of extended operation, as required by 10 CFR 54.21(d).

4.8 Conclusion for TLAAs

The staff reviewed SLRA Section 4, "Time-Limited Aging Analyses." Based on its review, the staff concludes that FPL has provided a sufficient list of TLAAs, as defined in 10 CFR 54.3, and that FPL has demonstrated that: (1) the TLAAs will 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 the supplement 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 FPL will continue to conduct the activities authorized by the renewed licenses in accordance with the CLB, and that any changes made to the CLB, in order to comply with 10 CFR 54.29(a), are in accordance with the Atomic Energy Act of 1954, as amended, and NRC regulations.

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) will review the license renewal application for Turkey Point Nuclear Generating Unit Nos. 3 & 4 (Turkey Point). The ACRS Subcommittee on Plant License Renewal will also review the U.S. Nuclear Regulatory Commission staff’s safety evaluation report for the Turkey Point license renewal application. Florida Power & Light Company and the NRC staff will meet with the ACRS subcommittee and the full committee to discuss issues associated with the Turkey Point license renewal application.

The ACRS completed its review of the safety evaluation report and provided its recommendation to the Commission for issuance of the subsequent renewed licenses for Turkey Point Unit Nos. 3 and 4 in its letter dated October 7, 2019 (ADAMS Accession No. ML19275E747).

6 CONCLUSION

The staff of the U.S. Nuclear Regulatory Commission (NRC) reviewed the subsequent license renewal application (SLRA) for Turkey Point Nuclear Generating Unit Nos. 3 & 4 (Turkey Point) 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(a), the Commission may issue a renewed license if it finds that 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).

On the basis of its review of the Turkey Point license renewal application, the staff determined that the applicant has met the requirements of 10 CFR 54.29(a).

The staff notes that any 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 5, Second Renewal, Regarding Turkey Point Nuclear Generating Unit Nos. 3 & 4,” following the NRC staff’s consideration of comments received on the Draft Supplement 5, Second Renewal, dated March 31, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19078A330).

APPENDIX A
LICENSE RENEWAL COMMITMENTS

During the review of the Turkey Point Nuclear Generating Unit Nos. 3 & 4 (Turkey Point or PTN) subsequent license renewal application by the staff of the U.S. Nuclear Regulatory Commission (NRC or the staff), Florida Power & Light Company (FPL) made commitments related to aging management programs (AMPs) to manage aging effects for structures and components. The following table lists these commitments along with the implementation schedules and sources for each commitment. The subsequent period of extended operation (SPEO) for Turkey Point begins on July 20, 2032, for Unit 3 and April 11, 2033, for Unit 4.

Table A-1 Turkey Point License Renewal Commitments

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
1	Fatigue Monitoring (17.2.1.1)	X.M1	Continue the existing PTN Fatigue Monitoring AMP, including enhancement to: a) Update the plant procedure to monitor chemistry parameters that provide inputs to Fen factors used in CUF_{en} calculations. b) Update the plant procedure to identify and require monitoring of the 80-year projected plant transients that are utilized as inputs to CUF_{en} calculations. c) Update the plant procedure to identify the corrective action options to take if component specific fatigue limits are approached.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
2	Neutron Fluence Monitoring (17.2.1.2)	X.M2	Continue the existing PTN Neutron Fluence Monitoring AMP, including enhancement to: a) Follow the related industry efforts, such as by the PWROG, and use the information from supplemental nozzle region dosimetry measurements and reference cases or other information to provide additional justification for use of the approved WCAP-14040-A or similar methodology for determination of RPV fluence in regions above or below the active fuel region. b) This justification will: • draw from sections 1 and 2 of UFSAR Appendix 4A and • include discussion of the neutron source, synthesis of the flux field and the order of angular quadrature (e.g., S8), etc. used in the estimates for projection of TLAAs to 80 years.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
3	Concrete Containment Unbonded Tendon Prestress (17.2.1.3)	X.S1	Continue the existing PTN Concrete Containment Unbonded Tendon Prestress AMP, including enhancement to: a) Issue ten year interval updates and update the trend lines after each scheduled examination by calculating predicted tendon forces in accordance with NRC RG 1.35.1. b) A new common dome tendon for Unit 3 (1D50 or 2D9), which was liftoff tested during the 20th year surveillance and has not been de-tensioned, will be selected and liftoff tested during the 50th year surveillance and subsequent surveillances through the end of the SPEO. Unit 3 dome tendon 3D8 will continue to be tested for trending purposes. c) For subsequent tendon surveillance testing, common Unit 3 hoop tendon 51H18 will not be designated 15H18.	No later than: PTN3: 50th year surveillance PTN4: 55th year surveillance	L-2018-082 SLRA Rev. 1, ML18072A232 L-2019-087 5/6/2019 FPL Response to NRC RAI No. B.2.2.3-1a ML19128A149
4	Environmental Qualification of Electric Equipment (17.2.1.4)	X.E1	Continue the existing PTN Environmental Qualification of Electric Equipment AMP, including enhancement to: a) Visually inspect accessible, passive EQ equipment prior to the SPEO and for adverse localized environments that could impact qualified life, and; b) Re-inspect for same as above every 10 years thereafter.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
5	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (17.2.2.1)	XI.M1	Continue the existing PTN ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD AMP, including enhancements for the following components: 1. CRDM Head Penetrations a) Develop a wear depth measurement process for the CRDM head penetrations. b) Incorporate inspections using the demonstrated process at accessible locations to measure depth of wear on the CRDM housing penetration wall associated with contact. c) Develop a procedure to estimate the wall thickness of the accessible CRDM housing penetration wear in the area of interest at the end of the next reactor vessel head inspection interval and compare that projected wall thickness to the thickness used in the design basis analyses to demonstrate validity of the analyses. d) Evaluate industry experience related to CRDM housing penetration wear due to thermal sleeve centering pads and initiatives to measure CRDM housing penetration wear and resulting nozzle wall thickness.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-193 11/2/2018 FPL Response to NRC RAI No. B.2.3.1-2 ML18311A299

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
5 (Cont'd)			2. CRDM Thermal Sleeves a) Continue to monitor the industry operating experience regarding wear of CRDM thermal sleeves. b) Perform visual inspections of reactor vessel (RV) upper internals on the top of the upper guide tube (UGT) for wear marks during every refueling outage starting after 2025. Examinations include looking for shiny surfaces on the top edge of the upper guide tube enclosure. c) Perform visual inspections and measurements of thermal sleeves in conjunction with the RV head volumetric examination starting after 2025. Examinations include: 1) a visual inspection of 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, and 2) a visual inspection of thermal sleeve guide funnel elevations to identify whether any sleeves are noticeably lower than others.		
6	Water Chemistry (17.2.2.2)	XI.M2	Continue the existing PTN Water Chemistry AMP, including enhancement to: a) Align the PTN action level responses in 0-ADM-651 with the recommended action level responses provided in EPRI 3002000505, PWR Primary Water Chemistry Guidelines, Rev. 7 to specify prolonged abnormal values require a formal technical review.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-166 10/16/2018 FPL Response to NRC RAI No. B.2.3.2-1 ML18296A024
7	Reactor Head Closure Stud Bolting (17.2.2.3)	XI.M3	Continue the existing PTN Reactor Head Closure Stud Bolting AMP, including enhancement to: a) Include the material inspection and maximum yield strength recommendations, to address reactor head closure stud bolting degradation, provided in RG 1.65 for completeness, b) Revise procurement requirements for reactor head closure stud material to assure that the maximum yield strength of replacement material is limited to a measured yield strength less than 150 ksi and revise procedures to note that lubricants cannot contain Molybdenum Disulfide to inhibit corrosion.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
8	Boric Acid Corrosion (17.2.2.4)	XI.M10	Continue the existing PTN Boric Acid Corrosion AMP, including enhancement to: a) Include other potential means to help in the identification of borated water leakage, such as: • Humidity monitors (for trending increases in humidity levels due to unidentified RCS leakage) • Temperature monitors (for trending increases in room/area temperatures due to unidentified RCS leakage) • Containment air cooler thermal performance (for corroborating increases in containment atmosphere temperature or humidity with decreases in cooler efficiency due to boric acid plate out) These results will be reviewed on a yearly basis.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
9	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (17.2.2.5)	XI.M11B	Continue the existing PTN Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP, including enhancement to: a) Update the plant modification process to ensure that no additional nickel alloys will be used in reactor coolant pressure boundary applications during the SPEO or that, if used, appropriate baseline and subsequent inspections per MRP inspection guidance will be put in place.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
10	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (17.2.2.6)	XI.M12	Implement the new PTN Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
11	Reactor Vessel Internals (17.2.2.7)	XI.M16A	Continue the existing PTN Reactor Vessel Internals AMP, including enhancements to: a) Expand scope to incorporate the change in inspection category for the fuel alignment pins identified by the gap analysis. b) Add to the implementing procedure an explicit statement that there is a 45-day period to notify the NRC of any deviation from the I&E methodology.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
12	Flow-Accelerated Corrosion (17.2.2.8)	XI.M17	Continue the existing PTN Flow-Accelerated Corrosion AMP, including enhancement to: a) Include erosion mechanisms such as cavitation, flashing, droplet impingement, or solid particle impingement for the components that contain treated water (including borated water) or steam. b) Address erosion as an aging mechanism for components that contain treated water (including borated water) or steam. The following should be included: • Guidelines for measuring wall thickness due to erosion. Wall thickness should be trended to adjust the monitoring frequency and to predict the remaining service life of the component for scheduling repairs or replacements. • Evaluations of inspection results to determine if assumptions in the extent-of-condition review remain valid. If degradation is associated with infrequent operational alignments, such as surveillances or pump starts/stops, then trending activities should consider the number or duration of these occurrences. • Performance of periodic wall thickness measurements of replacement components until the effectiveness of corrective actions have been confirmed. c) Ensure that identification of susceptible locations of erosion is based on the extent of condition reviews from corrective actions in response to plant specific and industry OE. Components may be treated in a manner similar to “susceptible-not-modeled” lines discussed in NSAC-202L-R3. Additionally, include guidance from EPRI 1011231 for identifying potential damage locations and EPRI TR-112657 and/or NUREG/CR–6031 guidance for cavitation erosion. d) Perform a re-assessment of piping systems excluded from wall thickness monitoring due to operation less than 2 percent of plant operating time (as allowed by NSAC-202L-R3) to ensure the exclusion	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232

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12 (Cont'd)			remains valid and applicable for operation beyond 60 years. If actual wall thickness information is not available for use in this re-assessment, a representative sampling approach will be used. This re-assessment may result in additional inspections. e) Include long-term corrective actions for erosion mechanisms. The effectiveness of the corrective actions should be verified. Include periodic monitoring activities for any component replaced with an alternative material since no material is completely resistant to erosion.		
13	Bolting Integrity (17.2.2.9)	XI.M18	Continue the existing PTN Bolting Integrity AMP, including enhancement to: a) Inspect submerged pressure-retaining bolting when submerged portions of components (e.g., pump casings) are overhauled or replaced during maintenance activities; b) Evaluate closure bolting for piping systems that contain air or gas, for which leakage is difficult to detect, on a case-by-case basis through – • Visual inspection during maintenance activities; • Visual inspection for discoloration of nearby external surfaces; • Monitoring and Trending of pressure decay within an isolated boundary; • Soap bubble testing; or • Thermography when fluid temperature is higher than ambient. c) Ensure any replacement or new pressure-retaining bolting has an actual yield strength less than 150 ksi; d) Ensure that lubricants containing molybdenum disulfide or other lubricants containing sulfur will not be used in conjunction with pressure- retaining bolting; e) Include appropriate acceptance criteria for submerged pressure-retaining bolting and closure bolting for piping systems that contain gas or air for which leakage is difficult to detect.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-193 11/2/2018 FPL Response to NRC RAI No. B.2.3.9-1 ML18311A299 L-2019-012 2/13/2019 FPL Response to Follow-on NRC RAI No. B.2.3.9-1a ML19050A420

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14	Steam Generators (17.2.2.10)	XI.M19	Continue the existing PTN Steam Generators AMP, including enhancement to: a) Incorporate the latest EPRI steam generator guidelines per NEI 97-06; b) Perform one-time inspection as part of the One-Time Inspection AMP using qualified techniques capable of detecting primary water stress corrosion cracking in the divider plate assemblies and associated welds.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-193 11/2/2018 FPL Response to NRC RAI No. B.2.3.10-1 ML18311A299
15	Open-Cycle Cooling Water System (17.2.2.11)	XI.M20	Continue the existing PTN Open-Cycle Cooling Water System AMP, including enhancement to: a) Delineate within the pertinent testing specification the descriptions of the specific aging mechanisms associated with coatings/linings (blistering, cracking, flaking, peeling, delamination, and rusting); b) ICW piping internal inspections are based on an evaluation of the effect of a coating/lining failure on the in-scope component's intended function, potential problems identified during prior inspections, and known service life history. Inspection intervals are established by a coating specialist qualified in accordance with RG 1.54 [Reference B.3.20). However, inspection intervals should not exceed those specified in GALL SLR Table XI.M42-1. Then extent of the ICW piping internal inspections is not any less than the following for each coating/lining material and environment combination. The coating/lining environment includes both the environment inside the piping and the metal to which the coating/lining is attached. Since PTN is a two-unit site, a representative sample of fifty-five (55) 1-foot axial length circumferential segments of piping are inspected per unit. The inspection surface includes the entire inside surface of the 1-foot segment. If geometric limitations impede the inspection of the entire circumferential segment, the number of inspection segments is increased in order to cover an equivalent of fifty-five (55) 1-foot axial length circumferential segments. Where documentation exists that manufacturer recommendations and industry consensus documents (i.e., those recommended in RG 1.54, or earlier versions of those standards) were complied with during installation, the extend of piping inspections may be reduced to nineteen (19) 1-foot axial length circumferential segments of piping of each coating/lining material and environment combination at each unit.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-152 8/31/2018 FPL Response to NRC RAI No. B.2.3.29-2 ML18248A257 L-2019-071 04/10/2019 FPL Supplemental Response for OCCW AMP ML19102A065

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15 (Cont'd)			Reduction of the number of required ICW piping internal inspections is acceptable for PTN Units 3 and 4 as the ICW systems on each unit are essentially identical (Section 2.3.3.1). ICW system operating conditions (flowrate, pressure, temperature, cooling water source, etc.) for PTN Unit 3 and 4 will continue to provide representative inspection results for each unit. Coating/lining surfaces captured between interlocking surfaces (e.g., flange faces) are not required to be inspected unless the joint has been disassembled to allow access for an internal coating/lining inspection or other reasons. For areas not readily accessible for direct inspection, consideration is given to the use of remote or robotic inspection tools. For cementitious ICW piping coatings within the scope of the program, inspectors should have a minimum of 5 years of experience inspecting or testing concrete structures or cementitious coatings/linings or a degree in the civil/structural discipline and a minimum of 1 year of experience. c) A pre-inspection review of the previous two ICW Piping inspections is conducted, when available, that includes reviewing the results of the inspections and any subsequent repair activities. A coatings specialist prepares the post-inspection report to include: a list and location of areas evidencing deterioration, a prioritization of the repair areas into areas that must be repaired before returning the system to service and areas where repair can be postponed to the next refueling outage, and where possible, photographic documentation indexed to inspection locations. Where practical, degradation is projected until the next scheduled inspection. Results are evaluated against the acceptance criteria to confirm that the sampling bases will maintain the component's intended functions throughout the SPEO based on the projected rate and extent of degradation. d) Ensure the pertinent testing specification coating acceptance criteria include the following: • There are no indications of peeling or delamination. • Blisters are evaluated by a coatings specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54 including staff limitations associated with use of a particular standard. Blisters should be limited to a few intact small blisters that are completely surrounded by sound		

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15 (Cont'd)			coating/lining bonded to the substrate. Blister size or frequency should not be increasing between inspections (e.g., ASTM D714-02, "Standard Test Method for Evaluating Degree of Blistering of Paints"). • Indications such as cracking, flaking, and rusting are to be evaluated by a coatings specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54 including staff limitations associated with use of a particular standard. • Minor cracking and spalling of cementitious coatings/ linings is acceptable provided there is no evidence that the coating/lining is debonding from the base material. • As applicable, wall thickness measurements, projected to the next inspection, meet design minimum wall requirements. • Adhesion testing results, when conducted, meet or exceed the degree of adhesion recommended in site-specific design requirements specific to the coating/lining and substrate. e) Ensure ICW piping coatings/lining that do not meet acceptance criteria are repaired, replaced, or removed. Physical testing is performed where physically possible (i.e., sufficient room to conduct testing) or examination is conducted to ensure that the extent of repaired or replaced coatings/linings encompasses sound coating/lining material. As an alternative, internal coatings exhibiting indications of peeling and delamination may be returned to service if: (a) physical testing is conducted to ensure that the remaining coating is tightly bonded to the base metal; (b) the potential for further degradation of the coating is minimized, (i.e., any loose coating is removed, the edge of the remaining coating is feathered); (c) adhesion testing using ASTM International standards endorsed in RG 1.54 (e.g., pull-off testing, knife adhesion testing) is conducted at a minimum of 3 sample points adjacent to the defective area; (d) an evaluation is conducted of the potential impact on the system, including degraded performance of downstream components due to flow blockage and loss of material or cracking of the coated component; and (e) follow-up visual inspections of the degraded coating are conducted within 2 years from detection of the degraded condition, with a reinspection within an additional 2 years, or until the degraded coating is repaired or replaced.		

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
15 (Cont'd)			If the ICW piping base metal has been exposed or it is beneath a blister, the component's base material in the vicinity of the degraded coating/lining is examined to determine if the minimum wall thickness is met and will be met until the next inspection. When a blister does not meet the acceptance criteria, and it is not repaired, physical testing is conducted to ensure that the blister is completely surrounded by sound coating/lining bonded to the surface. Physical testing consists of adhesion testing using ASTM International standards endorsed in RG 1.54. Where adhesion testing is not possible due to physical constraints, another means of determining that the remaining coating/lining is tightly bonded to the base metal is conducted such as lightly tapping the coating/lining. Acceptance of a blister to remain in service should be based both on the potential effects of flow blockage and degradation of the base material beneath the blister. Additional inspections are conducted if one of the inspections does not meet acceptance criteria due to current or projected degradation (i.e., trending). 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. The timing of the additional inspections is based on the severity of the degradation identified and is commensurate with the potential for loss of intended function. However, in all cases, the additional inspections are completed within the interval in which the original inspection was conducted, or if identified in the latter half of the current inspection interval, within the next refueling outage interval. These additional inspections conducted in the next inspection interval cannot also be credited towards the number of inspections in the latter interval. 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 provide reasonable assurance that corrective actions appropriately address the associated causes. The additional inspections include inspections at both PTN units with the same piping material, Environment, and aging effect combination.		

16	Closed Treated Water Systems (17.2.2.12)	XI.M21A	Continue the existing PTN Closed Treated Water Systems AMP, including enhancement to: a) Expand the scope of the component inspections/testing to include any closed cooling/treated water system components that are identified in the AMR reports, which are not presently listed in the component inspection procedure. b) Perform visual inspections of all in-scope heat exchanger surfaces for cleanliness in order to assure heat transfer capability. Alternatively, functional testing can be performed instead. c) Include the following NUREG-2191 inspection requirements: At a minimum, in each 10-year period during the SPEO, a representative sample of components is inspected using techniques capable of detecting loss of material, cracking, and fouling, as appropriate. The sample population is defined as follows: • 20 percent of the population (defined as components having the same material, water treatment program, and aging effect combination) OR; • A maximum of 19 components per population at each unit. d) Evaluate water chemistry testing results and component inspection/testing results against acceptance criteria to confirm that the sampling bases will maintain components' intended functions throughout SPEO based on projected rate and extent of degradation. e) Align the program with the latest industry document, EPRI TR-3002000590, Closed Cooling Water Chemistry Guideline. f) Ensure that the following additional inspections and actions are required if a post-repair/replacement inspection or subsequent inspection fails to meet acceptance criteria: • The number of increased inspections is determined in accordance with PTN's corrective action process; however, there are no fewer than five additional inspections for each inspection that did not meet acceptance criteria. • If subsequent inspections do not meet acceptance criteria, an extent-of-condition and extent-of-cause analysis is conducted to determine the further extent of inspections. • Additional samples are inspected for any recurring degradation to ensure corrective actions appropriately address the associated causes. Since Turkey Point is a multi-unit site, the additional inspections include inspections at all of the units with the same material, environment, and aging effect combination.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232

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16 (Cont'd)			• The additional inspections are completed within the interval (e.g., refueling outage interval, 10-year inspection interval) in which the original inspection was conducted. g) Ensure that visual inspections of the closed treated water systems components internal surfaces are conducted whenever their respective system boundary is opened.		
17	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (17.2.2.13)	XI.M23	Continue the existing PTN Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP, including enhancement to: a) Perform visual inspections on the in-scope bolted connections and structural components for conditions indicative of loss of preload (loss of material due to corrosion, cracking, and loose bolts, missing or loose nuts), and evaluate and repair if necessary, in accordance with ASME B30.2, B30.11, or other applicable industry standard in the ASME B30 series. In addition to previously in-scope components, this includes the fuel transfer machines, spent fuel bridge cranes, and the following monorails and rigging beams: • Charging pump monorails • Safety injection pump monorails • Main steam platform monorails • Fuel pool bulkhead monorails • ICW valve pit rigging beam • TPCW basket strainer monorail b) Align procedures with ASME B30.2, 2005 edition, and inspect for deformed, cracked, and corroded members, and for loose or missing fasteners, such as, but not limited to bolts, nuts, pins or rivets, as described in ASME B30.2, Section 2-2.1.3. Aligning with ASME B30.2 2005 edition also ensures that the correct acceptance criteria and corrective actions are used, and to ensure that visual inspections are performed at the required frequency. According to ASME B30.2, inspections are performed within the following intervals: • "Periodic" visual inspections by a designated person are required and documented yearly for normal service applications (ASME B30.2, Section 2-2.1.1).	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
17 (Cont'd)			• A crane that is used in infrequent service, which has been idle for a period of 1 year or more, shall be inspected before being placed in service in accordance with the requirements listed in ASME B30.2 paragraph 2-2.1.3 (periodic inspection).		
18	Compressed Air Monitoring (17.2.2.14)	XI.M24	Continue the existing PTN Compressed Air Monitoring AMP, including enhancement to: a) Include acceptance criteria for compressed air moisture content and contaminant limits based on manufacturer recommendations, pertinent industry guidance (ASME OM-2012, ANSI/ISA-S7.0.0.01- 1996, and EPRI TR-108147), and site OE. b) Perform opportunistic visual inspections of accessible internal surfaces for evidence of corrosion or corrosion products at frequencies based on industry guidance and site OE. c) Include description of qualifications for personnel performing a) the inspections for evidence of corrosion or corrosion products and b) air quality tests/checks. d) Include trending for air quality, moisture content, and signs of corrosion with checking for unusual trends and comparison to previous tests. e) Address interface with PTN procurement and receiving functions regarding the quality of bottled gas (e.g., cover and backup nitrogen bottles) supplied to PTN. f) Perform assessment of existing GL 88-14 activities	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232

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19	Fire Protection (17.2.2.15)	XI.M26	Continue the existing PTN Fire Protection AMP, including enhancement to: a) Inspect for corrosion and cracking on all in-scope fire dampers assemblies. Any visual indication of cracking or corrosion on a fire damper assembly will be documented and evaluated for repair/replacement in accordance with the Turkey Point Corrective Action Program.; b) Ensure that the personnel that inspect and the personnel that evaluate the condition of penetration seals, walls, ceilings, floors, doors, fire damper assemblies, and other fire barrier materials are qualified per the NRC-approved fire protection program (NFPA 805) to perform such inspections and qualified to determine appropriate corrective action, respectively; c) Document any degradation identified in the halon fire suppression system tests and include in the trending analysis; d) Project identified degradation until the next scheduled inspection when practical; e) Evaluate trending inspection results against acceptance criteria to confirm that the sampling bases (e.g., selection, size, frequency) and the timing of subsequent inspections will maintain the components' intended functions throughout the SPEO. If any projected inspection results will not meet acceptance criteria prior to the next scheduled inspection, then inspection frequencies are adjusted as determined by the PTN corrective action program.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2019-019 01/31/2019 FPL Revision to Fire Protection AMP ML19035A195
20	Fire Water System (17.2.2.16)	XI.M27	Continue the existing PTN Fire Water System AMP, including enhancement to: a) Replace sprinklers before they reach 50 years of service or test a representative sample of sprinklers from one or more sample areas using the guidance of NFPA 25; b) Perform volumetric wall thickness inspections on the portions of the water-based FPS components periodically subjected to flow but normally dry; c) Perform additional volumetric wall thickness inspections after surface irregularities, indicative of corrosion or erosion, are visually detected; d) Perform testing and visual inspections in accordance with the methods and intervals from Table XI.M27-1 from NUREG-2191, (based on NFPA 25, 2011 Ed.) and perform external visual inspections on a refueling outage interval. These inspections and tests include	This AMP is implemented and its inspections and tests begin 5 years prior to the SPEO. Inspections or test that are required to be completed prior to SPEO are completed no later than 6 months prior to SPEO or no later than the last RFO prior to SPEO. The corresponding dates are as follows: PTN3: 7/19/2027 - 1/19/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-191 11/28/2018 FPL Supplemental Response to NRC Set 1 RAI No. B.2.3.16-3 ML18334A182

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20 (Cont'd)			inspection parameters for items such as lighting, distance offset, presence of protective coatings, and cleaning processes. e) Perform volumetric inspections from the inside surface of the raw water tanks (T63A/B) in accordance with NUREG-2191, Table XI.M29-1. These inspections are required to be performed for each 10-year period starting 10 years prior to the SPEO. The new procedure performs tank bottom thickness inspections using the low-frequency electromagnetic testing (LFET) technique and, as necessary, followup ultrasonic examinations. f) Perform the following augmented testing and inspections beyond those of NUREG-2191 Table XI.M27-1 on the portions of water-based FPS components that have been wetted but are normally dry and either cannot be drained or allow water to collect, such as dry-pipe or preaction sprinkler system piping and valves: • In each 5-year interval, beginning 5 years prior to the SPEO, either conduct a flow test/flush sufficient to detect potential flow blockage, or conduct a visual inspection of 100 percent of the internal surface of the piping segments that either cannot be drained or allow water to collect. • In each 5-year interval of the SPEO, 20 percent of the length of piping segments that either cannot be drained or allow water to collect is subject to volumetric wall thickness inspections. Measurement points are obtained to the extent that each potential degraded condition can be identified (e.g., general corrosion, erosion, MIC). The 20 percent of piping that is inspected in each 5-year interval is in different locations than previously inspected piping. If the results of a 100 percent internal visual inspection are acceptable, and the segment is not subsequently wetted, no further augmented tests or inspections are necessary. g) Extrapolate the results of the inspections of the above grade FPS piping to evaluate the condition of buried and underground fire protection piping for the purpose of identifying inside diameter loss of material if the environment (e.g., type of water, flowrate, temperature) and material that exist on the interior surface of the underground piping are similar to the conditions that exist within the above grade FPS piping; h) Project identified degradation until the next scheduled inspection and evaluate results against acceptance criteria (e.g., maintaining	PTN4: 4/20/2028 - 10/10/2032 Perform the initial tank bottoms inspections no earlier than 10 years prior to the SPEO. The inspections are required to be completed no later than 6 months prior to SPEO. The corresponding dates are as follows: PTN3: 7/19/2022 - 1/19/2032 PTN4: 4/10/2023 - 10/10/2032	

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20 (Cont'd)			minimum design wall thicknesses) to confirm that the timing of subsequent inspections will maintain the components' intended functions throughout the SPEO. If the condition of the piping/component will not meet acceptance criteria, then a condition report is written and the component is evaluated for repair/replacement. 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 SPEO based on the projected rate and extent of degradation. i) Perform additional tests if a flow test or a main drain test does not meet acceptance criteria due to current or projected degradation, then are conducted. The number of increased tests is determined in accordance with the PTN corrective action program; however, there are no fewer than two additional tests for each failed test. The additional inspections are completed within the interval (i.e., 5 years, annual) in which the original test was conducted. If subsequent tests do not meet acceptance criteria, an extent-of- condition/cause analysis is conducted to determine the further extent of test, which include inspections at all of the units with the same material, environment, and aging effect combination.		

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21	Outdoor and Large Atmospheric Metallic Storage Tanks (17.2.2.17)	XI.M29	Continue the existing PTN Outdoor and Large Atmospheric Metallic Storage Tanks AMP, including enhancement to: a) Add the U3 EDG FOST and the Unit 3 and 4 PWSTs and associated acceptance criteria to the scope of the AMP; b) Convert one-time inspections for original license renewal to the following periodic inspections, with the associated frequencies and acceptance criteria – • Visual examination of tank internal surfaces • Develop a new procedure to perform the tank bottom thickness inspections using the low-frequency electromagnetic testing (LFET) technique and, as necessary, followup ultrasonic examinations. Note: These additional inspections will be conducted each 10-year interval starting 10 years prior to entering the SPEO. c) Clarify that increased inspections address each tank in a material environment combination in the same inspection interval, including tanks from both units, IF only one tank is inspected and does not meet acceptance criteria, which requires corrective action.	This AMP is implemented and inspections or tests begin no earlier than 10 years prior to the SPEO. Inspections or tests that are required to be completed prior to the SPEO are completed no later than 6 months prior to SPEO or no later than the last RFO prior to SPEO. The corresponding dates are as follows: PTN3: 7/19/2022 - 1/19/2032 PTN4: 4/10/2023 - 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-166 10/16/2018 FPL Response to NRC RAI No. B.2.3.17-1 ML18296A024 L-2018-191 11/28/2018 FPL Supplemental Response to NRC Set 7 RAI No. B.2.3.17-3 ML18334A182

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22	Fuel Oil Chemistry (17.2.2.18)	XI.M30	Continue the existing PTN Fuel Oil Chemistry AMP, including enhancement to: a) Perform periodic draining, cleaning, and visual inspection (and volumetric inspection if degradation is identified) of the in-scope components. This will occur during the 10-year period prior to the SPEO and at least once every 10-years during the SPEO; b) Monitor the moisture, sediment content, total particulate concentration, and microbiological contamination levels of the in-scope components, compare to acceptance criteria consistent with industry standards, and trend the results; c) Perform sampling consistent with applicable industry standards, such as ASTM 4057, to address multilevel and/or bottom samples; d) Perform volumetric inspections on any degradation identified during visual inspection. Include thickness measurements of the bottoms of the in-scope tanks or, in the case of the Unit 4 EDG DOSTs, thickness measurements of the carbon steel tank liners, and evaluated against the applicable design thickness and corrosion allowance, and trend the results; e) Drain and clean the Unit 3 EDG skid tanks and SSGF pump skid tank to the greatest extent practical and perform a visual inspection of accessible locations; f) Perform a one-time inspection of selected components exposed to diesel fuel oil, prior to the SPEO and in accordance with the PTN One-Time Inspection AMP, to verify the effectiveness of this AMP; g) Provide corrective actions, such as addition of a biocide, to be taken should testing detect the presence of microbiological activity in stored diesel fuel, and removal of water found during sampling.	This AMP is implemented and inspections begin no earlier than 10 years prior to the SPEO. Inspections that are required to be completed prior to the SPEO are completed no later than six months prior to SPEO or no later than the last RFO prior to SPEO. The corresponding dates are as follows: PTN3: 7/19/2022 - 1/19/2032 PTN4: 4/10/2023 - 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
23	Reactor Vessel Material Surveillance (17.2.2.19)	XI.M31	Continue the existing PTN Reactor Vessel Material Surveillance AMP.	Ongoing	L-2018-082 SLRA Rev. 1, ML18072A232

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24	One-Time Inspection (17.2.2.20)	XI.M32	Implement the new PTN One-Time Inspection AMP.	Implement AMP and start inspections 10 years prior to the SPEO. Complete pre-SPEO inspections no later than 6 months or the last RFO prior to SPEO. Corresponding dates are as follows: PTN3: 7/19/2022 - 1/19/2032 PTN4: 4/10/2023 - 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
25	Selective Leaching (17.2.2.21)	XI.M33	Implement the new PTN Selective Leaching AMP.	Implement AMP and start inspections no earlier than 10 years prior to the SPEO. Complete the first periodic inspection no later than 6 months or the last RFO prior to SPEO. Corresponding dates are as follows: PTN3: 7/19/2022 - 1/19/2032 PTN4: 4/10/2023 - 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-222 12/12/2018 FPL Revised Response to NRC RAI No. B.2.3.21-3 ML18348A580
26	ASME Code Class 1 Small-Bore Piping (17.2.2.22)	XI.M35	Continue the existing PTN ASME Code Class 1 Small-Bore Piping AMP, including enhancement to: a) Perform the new one-time inspection of small-bore piping using the methods, frequencies, and accepted criteria; b) Evaluate the results to determine if additional or periodic inspections are required and perform any required additional inspections;	Implement AMP and complete inspections within 6 years prior the SPEO. Complete pre-SPEO inspections no later than 6 months or the last RFO prior to SPEO. Corresponding dates are as follows: PTN3: 7/19/2026 - 1/19/2032 PTN4: 4/10/2027 - 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232

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27	External Surfaces Monitoring of Mechanical Components (17.2.2.23)	XI.M36	Transition and continue the existing PTN External Surfaces Monitoring of Mechanical Components AMP, including enhancement to: a) Elastomeric and flexible polymeric components are monitored through a combination of visual inspection and manual or physical manipulation of the material. Visual inspections cover 100 percent of accessible component surfaces. Manual or physical manipulation of the material includes touching, pressing on, flexing, bending, or otherwise manually interacting with the material in order to reveal changes in material properties, such as hardness, and to make the visual examination process more effective in identifying aging effects such as cracking. The sample size for manipulation is at least 10 percent of available surface area. The inspection parameters for elastomers and polymers shall include the following: • Surface cracking, crazing, scuffing, and dimensional change (e.g., “ballooning” and “necking”) • Loss of thickness • Discoloration (evidence of a potential change in material properties that could be indicative of polymeric degradation) • Exposure of internal reinforcement for reinforced elastomers • Hardening as evidenced by a loss of suppleness during manipulation where the component and material are appropriate to manipulation b) Ensure that accumulation of debris on in-scope components is monitored. c) Ensure that seals, insulation jacketing, and air-side heat exchangers are inspected components. d) Inspections are to be performed by personnel qualified in accordance with site procedures and programs to perform the specified task, and when required by the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), inspections are conducted in accordance with the applicable code requirements. e) Perform inspections for loss of material, cracking, changes in material properties, hardening or loss of strength (of elastomeric components), reduced thermal insulation resistance, loss of preload for ducting closure bolting, and reduction of heat transfer due to fouling at an inspection frequency of every refueling outage for all in-scope non-stainless steel and non-aluminum components, which include metallic, polymeric, insulation jacketing (insulation when not jacketed), and	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-175 10/17/2018 FPL Response to NRC RAI No. B.2.3.23-1 RAI No. B.2.3.23-3 ML18292A642

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27 (Cont'd)			cementitious components. Non-ASME Code inspections and tests should include inspection parameters for items such as lighting, distance offset, surface coverage, and presence of protective coatings. Surfaces that are not readily visible during plant operations and refueling outages should be inspected when they are made accessible and at such intervals that would ensure the components' intended functions are maintained. f) Surface examinations, or VT-1 examinations, are conducted on 20 percent of the surface area unless the component is measured in linear feet, such as piping. Alternatively, any combination of 1-foot length sections and components can be used to meet the recommended extent of 25 inspections. The provisions of GALL-SLR Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," to conduct inspections in a more severe environment and combination of air environments may be incorporated for these inspections. g) Alternative methods for detecting moisture inside piping insulation (thermography, neutron backscatter devices, and moisture meters) are to be used for inspecting piping jacketing that is not installed in accordance with site-specific procedures (i.e., no minimum overlap, wrong location of seams, etc.). h) Include the following information: • Component surfaces that are insulated and exposed to condensation (because the in-scope component is operated below the dew point), and insulated outdoor components, are periodically inspected every 5 years during the SPEO. • For all outdoor components and any indoor components exposed to condensation (because the in-scope component is operated below the dew point), inspections are conducted of each material type (e.g., steel, SS, copper alloy, aluminum) and environment (e.g., air outdoor, air accompanied by leakage) where condensation or moisture on the surfaces of the component could occur routinely or seasonally. In some instances, significant moisture can accumulate under insulation during high humidity seasons, even in conditioned air. A minimum of 20 percent of the in-scope piping length, or 20 percent of the surface area for components whose configuration does not conform to a 1-foot axial length determination (e.g., valve, accumulator, tank) is inspected after the insulation is removed. Alternatively, any combination of a minimum of 25 1- foot axial		

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27 (Cont'd)			length sections and components for each material type is inspected. Inspection locations should focus on the bounding or lead components most susceptible to aging because of time in service, severity of operating conditions (e.g., amount of time that condensate would be present on the external surfaces of the component), and lowest design margin. Inspections for cracking due to SCC in aluminum components need not be conducted if it has been determined that SCC is not an applicable aging effect. i) Include guidance from EPRI TR-1007933 “Aging Assessment Field Guide” and TR-1009743 “Aging Identification and Assessment Checklist” on the evaluation of materials and criteria for their acceptance when performing visual/tactile inspections. j) Include information on the additional inspections that are conducted if one of the inspections does not meet acceptance criteria due to current or projected degradation. To ensure that the sampling-based inspections detect cracking in aluminum and stainless steel components, additional inspections should be conducted if one of the inspections does not meet acceptance criteria due to current or projected degradation (i.e., trending). 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. The additional inspections are completed within the interval (i.e., 5-year inspection interval) in which the original inspection was conducted. If subsequent inspections do not meet acceptance criteria, an extent-of-condition and extent-of-cause analysis are 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. Since PTN is a multi-unit site, the additional inspections include inspections at all of the units with the same material, environment, and aging effect combination. Revise the Corrective Action Program procedure to point to appropriate External Surfaces Monitoring of Mechanical Components AMP procedure for corrective actions. k) Include spreadsheets for tracking deficiencies associated with the program to monitor, trend, and resolve issues.		

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27 (Cont'd)			l) The AMP owner will interface with the fleet corrosion monitoring action program to identify problem areas and track resolution of deficiencies. Additionally, the requirement to project identified degradation to the next inspection and/or confirm the timing of subsequent inspections will maintain component intended function.		
28	Flux Thimble Tube Inspection (17.2.2.24)	XI.M37	Continue the existing PTN Flux Thimble Tube Inspection AMP, including enhancement to: a) Establish the interval between inspections such that no flux thimble tube is predicted to incur wear that exceeds the established acceptance criteria before the next inspection. b) Remove from service the flux thimble tubes that cannot be inspected over the tube length, yet are subject to wear due to restriction or other defects, but cannot be shown by analysis to be satisfactory for continued service. This ensures the integrity of the RCS pressure boundary. c) Use the default exponent value methodology from WCAP-12866 to calculate the wear rate. When three or greater data points exist, a calculated exponent value from the two most limiting data points may be used in accordance with the WCAP-12866 methodology.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-175 10/17/2018 FPL Response to NRC RAI No. B.2.3.24-1 ML18292A642
29	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (17.2.2.25)	XI.M38	Implement the new PTN Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP. Perform periodic ultrasonic thickness measurements of the steel containment spray piping inside containment including all stainless-to-carbon steel bimetallic welds, a representative sample (a minimum of five (5) inspections of each header) of the approximate 90 foot arc of horizontal piping in each of the 3A and 4A headers, and the air-to-borated water interface in the vertical runs of piping at the approximate 65 foot plant elevation every 10 years.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032 The first ultrasonic carbon thickness measurements of the piping will occur within 10 years prior to the SPEO.	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-223 12/14/2018 FPL Revised Response to NRC RAI No. B.2.3.20-2 ML18352A885

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30	Lubricating Oil Analysis (17.2.2.26)	XI.M39	Continue the existing PTN Lubricating Oil Analysis AMP, including enhancement to: a) Monitor for and manage the aging effects associated with in-scope components that are exposed to an environment of lubricating oil. The PTN Lubricating Oil Analysis AMP's in-scope components include piping, piping components, heat exchanger tubes, and reactor coolant pump elements exposed to lubricating oil. The PTN Lubricating Oil Analysis AMP also manages any other plant components subject to lubricating oil environments and listed in applicable Aging Management Reviews (AMR). b) Maintain contaminants in the in-scope lubricating oil systems within acceptable limits through periodic sampling and testing of lubricating oil for moisture and corrosion particles in accordance with industry standards. All lubricating oil analysis results are to be reviewed and trended to determine if alert levels or limits have been reached or exceeded, as well as, if there are any unusual or adverse trends associated with the oil sample. c) Sampling and testing of old (used) oil is to be performed following periodic oil changes or on a schedule consistent with equipment manufacturer's recommendations or industry standards (e.g., ASTM D6224-02). Plant specific operating experience (OE) may also be used to adjust the recommended schedule for periodic sampling and testing, when justified by prior sampling results. d) Compare the particulate count of the samples with acceptance criteria for particulates. The acceptance criteria for water and particle concentration within the oil must not exceed limits based on equipment manufacturer's recommendations or industry standards. If an acceptance criteria limit is reached or exceeded, actions to address the condition are to be taken. Corrective actions may include increased monitoring, corrective maintenance, further laboratory analysis, and engineering evaluation of the specified lubricating oil system. e) Phase-separated water in any amount is not acceptable. If phase-separated water is identified in the sample, then corrective actions are to be initiated to identify the source and correct the issue (e.g., repair/replace component or modify operating conditions).	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232

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31	Monitoring of Neutron-Absorbing Materials other than Boraflex (17.2.2.27)	XI.M40	Continue the existing (previously only credited for Metamic® inserts) PTN Monitoring of Neutron-Absorbing Materials other than Boraflex AMP, including enhancement to: a) Inspect and test Metamic® inserts, throughout the SPEO, on a frequency dependent on the condition of the neutron-absorbing material and determined and justified with PTN- specific OE. For each Metamic® insert, the maximum interval between each inspection and between each coupon test is not to exceed 10 years, regardless of OE; b) Compare observations and measurements from the periodic inspections and coupon testing to baseline information or prior measurements and analyses for trending analysis, projecting future degradation, and projecting the future subcriticality margin of the SFP. This trending will also consider differences in exposure conditions, venting, spent fuel rack differences, etc. for each Metamic® insert or coupon. c) Initiate corrective actions (e.g., add neutron-absorbing capacity with an alternate material, or apply other available options) to maintain the subcriticality margin if the results from measurements and analysis indicate that the 5 percent subcriticality margin cannot be maintained because of current or projected degradation of the neutron-absorbing material. d) Manage aging effects associated with the Boral® panels in the SFP cask area by monitoring for loss of material and changes in dimension that could result in loss of neutron-absorbing capability of the Boral® panels. Monitor parameters associated with the physical condition of the Boral® panels and include in- situ gap formation, geometric changes as observed from coupons or in situ, and decreased boron-10 areal density, etc. The parameters monitored are directly related to determination of the loss of material or loss of neutron absorption capability of the Boral® panels. These parameters are monitored using coupon and/or direct in-situ testing of the Boral® panels to identify their associated loss of material and degradation of neutron absorbing capacity. The frequency of the inspection and testing depends on the condition of the neutron-absorbing material and is determined with site-specific OE; however, the maximum interval between these inspections is not to exceed 10 years, regardless of OE.	Complete the initial Boral® testing and inspections no later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032 Submit the license amendment no later than 18 months prior to the SPEO, i.e.: PTN3: 1/19/2031 PTN4: 10/10/2031	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-166 10/16/2018 FPL Response to NRC RAI No. B.2.3.27-1 ML18296A024 L-2018-223 12/14/2018 FPL Supplemental Response to NRC RAI No. B.2.3.27-2 ML18352A855 L-2019-019 01/31/2019 FPL Supplemental Response to NRC RAI No. B.2.3.27-2 ML19035A195

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31 (Cont'd)			Compare the Boral® inspection and testing measurements to baseline values for trending analysis and projecting future panel degradation and SFP subcriticality margins. The degradation trending must be based on samples that adequately represent the entire Boral® panel population, and the trending must consider differences in sample exposure conditions, differences in spent fuel cask racks, and possibly other considerations. The new Boral® panel surveillance acceptance criteria for the obtained inspection, testing, and analysis measurements must ensure that the 5 percent subcriticality margin for the SFP will be maintained, otherwise corrective actions need to be implemented. e) Submit a license amendment to revise SR 4.9.14.2 to reference UFSAR Section 17.2.2.27.		
32	Buried and Underground Piping and Tanks (17.2.2.28)	XI.M41	Implement the new PTN Buried and Underground Piping and Tanks AMP. Install cathodic protection systems, and perform effectiveness reviews in accordance with Table XI.M41-2 in NUREG-2191, Section XI.M41. Perform soil testing following the guidance of Item E.b.iii of Table XI.M41-2 (including a minimum soil resistivity value of 10,000 ohm-cm) to determine if the soil is corrosive. If after five years of operation the cathodic protection system does not meet the effectiveness acceptance criteria defined by NUREG-2191, Tables XI.M41-2 and -3 (-850 mV relative to a CSE, instant off, for at least 80% of the time, and in operation for at least 85% of the time), the number of inspections will be as follows: • If soil testing has determined the soil is not corrosive per Item E.b.iii of Table XI.M41-2 of NUREG-2191 (including a minimum soil resistivity value of 10,000), FPL commits to performing two additional buried steel piping inspections beyond the number required by Preventive Action Category F resulting in a total of thirteen inspections being completed six months prior to the SPEO. • If soil testing has determined the soil is corrosive per Item E.b.iii of Table XI.M41-2 of NUREG-2191, FPL commits to performing five additional buried steel piping inspections beyond the number required by Preventive Action Category F resulting in a total of sixteen inspections being completed six months prior to the SPEO.	Implement AMP and start inspections no earlier than 10 years prior to the SPEO. Install cathodic protection systems and perform soil testing no later than nine years prior to the SPEO. Complete pre-SPEO inspections no later than 6 months or the last RFO prior to SPEO. Corresponding dates are as follows: PTN3: 7/19/2022 - 1/19/2032 PTN4: 4/10/2023 - 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-166 10/16/2018 FPL Response to NRC RAI No. B.2.3.28-1 ML18296A024 L-2019-106 5/21/2019 NRC RAI No. 8.2.3.28-1 b Updated Response ML19143A092 L-2019-114 6/4/2019 FPL Response to NRC RAI No. B.2.3.28-1 b ML19157A028

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33	Internal Coatings/ Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (17.2.2.29)	XI.M42	Implement the new PTN Internal Coatings/Linings for In- Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP.	Implement AMP and start inspections no earlier than 10 years prior to the SPEO. Complete pre-SPEO inspections no later than 6 months or the last RFO prior to SPEO. Corresponding dates are as follows: PTN3: 7/19/2022 - 1/19/2032 PTN4: 4/10/2023 - 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
34	ASME Section XI, Subsection IWE (17.2.2.30)	XI.S1	Continue the existing PTN ASME Section XI, Subsection IWE AMP, including enhancement to: a) Include preventive actions, consistent with industry guidance, to provide reasonable assurance that bolting integrity is maintained for structural bolting, and if high strength bolting is used, the appropriate guidance in Section 2 of Research Council for Structural Connections publication “Specification for Structural Joints Using High-Strength Bolts” is to be considered. b) Implement a one-time volumetric inspection of metal liner surfaces for both units that samples randomly selected as well as focused (such as cavity sump pit) locations susceptible to loss of thickness due to corrosion from the concrete side if triggered by site-specific OE identified through code inspections or other maintenance/testing activities performed in either unit since June 6, 2002. This sampling is conducted to demonstrate, with 95% confidence, that 95% of the accessible portion of the liner is not experiencing greater than 10% wall loss. c) Implement a one-time surface or enhanced visual examination of the stainless steel fuel transfer tube (including penetration sleeve and expansion joints) on each unit, and a representative sample of penetrations (two) associated with high-temperature stainless steel piping systems in frequent use on each unit. Additionally, if stress corrosion cracking (SCC) is detected as a result of the supplemental one-time inspections, additional inspections will be conducted in accordance with the site’s corrective action process. This will include 1 additional penetration with dissimilar metal welds associated with	Complete one-time inspection of containment liner locations in both units if degradation from inaccessible (concrete) side is identified, in either unit, within 2 outages of such identification prior to or during the SPEO and Complete pre-SPEO one-time inspections, for SCC, and other enhancements no later than 6 months or the last RFO prior to SPEO. Corresponding dates are as follows: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-175 10/17/2018 FPL Response to NRC RAI No. 3.5.2.1.2-1 ML18292A642 L-2018-193 11/2/2018 FPL Response to NRC RAI No. B.2.3.30-1 RAI No. B.2.3.30-2 RAI No. 3.5.1.9-1 ML18311A299 L-2018-223 12/14/2018 FPL Revised Response to NRC RAI No. 3.5.1.9-1 RAI No. 3.5.2.1.2-1

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
34 (Cont'd)			greater than 140 °F stainless steel piping systems for each unit SCC is no longer detected. Periodic inspection of the stainless steel transfer tube and/or subject penetrations with dissimilar metal welds will be added to the PTN ASME Section XI, Subsection IWE AMP if necessary depending on the inspection results. d) Update inspection procedure/plan to clarify the acceptance criterion for examination of accessible air chase system test connections in each unit at the containment floor-level, and that loose or degraded test connections, if discovered, will be opened prior to repair for internal inspection of the test connection and channel/angle to confirm no water intrusion to the air chase. e) Perform periodic supplemental surface examinations on the same frequency as other IWE inspections to detect cracking due to cyclic loading of non-piping penetrations (hatches, electrical penetrations, etc.), dissimilar metal welds, and fuel transfer tube expansion joints.		RAI No. B.2.3.30-1 RAI No. B.2.3.30-2 ML18352A885 L-2019-012 2/13/2019 FPL Response to Follow-on NRC RAI No. 3.5.2.1.2-1 a ML19050A420
35	ASME Section XI, Subsection IWL (17.2.2.31)	XI.S2	Continue the existing PTN ASME Section XI, Subsection IWL AMP, including enhancement to: a) Calculate the predicted tendon forces in accordance with NRC RG 1.35.1, which provides an acceptable methodology for use through the SPEO. b) Ensure that existing periodic inspections and water removal for the tendon inspection pits (buttress pits) and tendon galleries continue at appropriate intervals through the SPEO. c) Include a supplemental visual for: • a wire of a representative (random) vertical tendon for each unit at location of greatest and/or frequent grease leakage; • a wire of a representative (random) dome or other tendon for each unit at location of greatest and/or frequent water inleakage; • a wire of a (random) lower horizontal tendon for each unit at location of highest susceptibility to water intrusion in tendon inspection pits. d) Complete the supplemental inspection e) Confirm no unacceptable grease leakage or water intrusion for the previously inspected (random) tendons. f) Revise the AMP governing procedure, or develop a new implementing procedure, to direct the trending and evaluation of related operating	No later than: PTN3: The 50th year surveillance PTN4: The 55th year surveillance	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-191 11/28/2018 FPL Response to NRC RAI No. 8.2.3.31-1 ML18334A182 L-2019-087 5/6/2019 FPL Response to NRC RAI No. B.2.2.3-1a ML19128A149

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
35 (Cont'd)			experience and inspections, and documentation of same, to confirm the inspection frequency is adequate to detect aging in a timely manner or determine the appropriate inspection frequency to ensure tendons can perform their intended function through the SPEO. g) A new common dome tendon for Unit 3 (1D50 or 2D9), which was liftoff tested during the 20th year surveillance and has not been de-tensioned, will be selected and liftoff tested during the 50th year surveillance and subsequent surveillances through the end of the SPEO. Unit 3 dome tendon 3D8 will continue to be tested for trending purposes. h) Update the pertinent AMP procedure to calculate the predicted tendon forces in accordance with NRC RG 1.35.1 (Reference B.3.19), "Determining Prestressing Forces for Inspection of Prestressed Concrete Containments," which provides an acceptable methodology for use through the SPEO. j) Clarify the acceptance criterion for the supplemental inspection is that each wire is free of any active corrosion. j) Clarify the acceptance criteria for the follow-up inspection is no unacceptable grease leakage or water intrusion. k) Update the pertinent AMP procedure to address corrective actions for supplemental inspections should active corrosion be identified. Such a condition would be evaluated to characterize the corrosion, determine the cause, the location, depth, and extent of the corrosion. Specific corrective actions would depend upon the cause, extent of condition, and grease properties and are consistent with those which would be evaluated during periodic required IWL examinations. l) For subsequent tendon surveillance testing, common Unit 3 hoop tendon 51H18 will not be designated 15H18.		
36	ASME Section XI, Subsection IWF (17.2.2.32)	XI.S3	Continue the existing PTN ASME Section XI, Subsection IWF AMP, including enhancement to: a) Store high strength bolts in accordance with Section 2 of Research Council for Structural Connections publication “Specification for Structural Joints Using High-Strength Bolts”. b) Perform a one-time inspection, within 5 years prior to entering the SPEO, of an additional 5 percent of the sample size specified in Table IWF-2500-1 for Class 1, 2, and 3 piping supports, which are not exempt from examination, that is focused on supports selected from the remaining IWF population that are considered most susceptible to age-related degradation.	At 5 years prior to the SPEO, start one-time inspections. Complete pre-SPEO inspections and enhancements no later than 6 months or the last refueling outage prior to SPEO. Corresponding dates are as follows: PTN3: 7/19/2027 - 1/19/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2019-012 02/13/2019 FPL Response to NRC RAI No. B.2.3.32-2 3.5.1.100-1a ML19050A420

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
36 (Cont'd)			c) Include physical (tactile) examination of elastomeric vibration isolation elements to detect hardening if the vibration isolation function is suspect due to aging. d) identify the population of ASME Class 1, ,2, 3 and MC high-strength structural bolting greater than 1 inch in nominal diameter within the boundaries of IWF-1300. e) Perform volumetric examination, comparable to Table IWB-2500-1, Examination Category B-G-1, at least once per interval for 20% of the identified high strength bolting within the boundaries of IWF-1300 up to a maximum of 25 bolts per unit. Alternatively, replacement and inspection of the removed bolting using a technique capable of detecting cracking may be performed in place of the volumetric examination. f) Revise procedures to note that lubricants cannot contain Molybdenum Disulfide, or other lubricants containing sulfur, in order to inhibit SCC. g} Increase or modify the component support inspection population when a component is repaired to as-new condition by including another support that is representative of the remaining population of supports that were not repaired. h) If necessary based on related Structures Monitoring AMP evaluation results (of stainless steel cracking in the uncontrolled indoor and outdoor air at PTN), develop an augmented examination plan in accordance with IWF-2430 for a representative sample of stainless steel ASME Class 1, 2, 3 or MC supports as a separate part of the ASME Section XI, Subsection IWF AMP. i) Perform a visual inspection, enhanced to the extent possible in the location/configuration to address applicable aging effects and further enhanced to the extent possible based on technology available at the time, of all the RV supports (6 supports per unit) as part of the PTN ASME Section XI, Subsection IWF AMP before or during the last scheduled refueling outage prior to entry into the SPEO for each unit. Subsequently during the SPEO, the same visual inspections of all RV supports on each unit, further enhanced to the extent possible based on technology available at the time, will be performed on a frequency not to exceed five years as part of the PTN ASME Section XI, Subsection IWF AMP.	PTN4: 4/10/2028 - 10/10/2032	L-2019-048 03/15/2019 FPL Response to NRC RAI No. 3.5.2.2.2.6-9 ML19078A132 L-2019-087 5/6/2019 FPL Revised Response to NRC RAI No. 3.5.2.2.2.6-9 ML19128A149

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
37	10 CFR Part 50, Appendix J (17.2.2.33)	XI.S4	Continue the existing PTN 10 CFR Part 50, Appendix J AMP, including enhancement to: a) Augment the existing program required by 10 CFR Part 50 Appendix J, by ensuring that all containment pressure-retaining components are managed for age- related degradation. b) Update the definitions for Type A, Type B, and Type C tests in the fleet and governing procedures to closer align with their respective definitions in 10 CFR Part 50, Appendix J, Section II.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
38	Masonry Walls (17.2.2.34)	XI.S5	Continue the existing PTN Masonry Walls AMP, including an enhancement to: a) Add the inspection of intake and yard structure masonry walls that are credited for flood protection.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
39	Structures Monitoring (17.2.2.35)	XI.S6	Continue the existing PTN Structures Monitoring AMP, including enhancement to: a) Add the following components and commodity groups to the list of inspected items: • Fan/filter intake hood (Auxiliary Building) • Pipe trench penetration and fire seals used for flood protection • Stop logs • Doors (Diesel Driven Fire Pump Enclosure) • Louvers (Diesel Driven Fire Pump Enclosure) • HVAC roof hoods (Emergency Diesel Generator Building) • Louvers (Emergency Diesel Generator Building) • U4 Diesel Oil Storage Tank liner • Electrical Enclosures (Intake Structure) • Structural Truck Bridge (Intake Structure) • New Fuel Storage Components • NaTB sump fluid pH control basket • Drains, drain plugs (stored in various locations) that are credited for external flood protection • Berm and paved ramp that are credited for external flood protection	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 4/10/2018 SLRA Rev. 1, ML18072A232 L-2018-193 11/2/2018 FPL Response to NRC RAI Nos. B.2.3.35-1, B.2.3.35-2, B.2.3.35-3, and 3.5.1.100-1 ML18311A299 L-2018-191 11/28/2018 FPL Response to NRC RAI No. B.2.3.35-5, RAI No. 3.5.1.47-1 ML18334A182

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
39 (Cont'd)			b) Revise storage requirements for high strength bolts in accordance with Section 2 of RSCS publication "Specification for Structural Joints Using High- Strength Bolts"; c) Revise inspection procedure to include monitoring for loss of material, missing or loose nuts/bolts, and other conditions that indicate loss of preload for structural bolting with acceptance criteria that these are not acceptable without engineering evaluation. d) Clarify that inspections of elastomers will include tactile manipulation and the acceptance criteria for inspections of structural sealants will ensure loss of material, cracking, and hardening will not result in loss of sealing. e) Revise inspections procedures to reference SEI/ASCE 11 and the American Institute of Steel Construction Manual, and to clarify that inspector qualification will be per ACI 349.3R. f) Develop a new implementing procedure or attachment to an existing implementing procedure to address aging management of inaccessible areas exposed to groundwater/soil and water-flowing. The document will include guidance to conduct a baseline visual inspection, pH analysis, and a chloride concentration test prior to the SPEO at a location close to the coastline/intake and a location in the main plant area for comparison. The baseline inspection results will be used to conduct a baseline evaluation that will determine the additional actions (if any) that are warranted. Additionally, the baseline evaluation results will set the subsequent inspection requirements and inspection intervals (not to exceed 5 years). Periodic inspections (focused) and evaluation updates (not to exceed 5 years) will be performed throughout the SPEO to ensure aging of inaccessible concrete is adequately managed. Opportunistic inspections may be used to replace or supplement the focused inspections if the inspection location is excavated for other reasons during the periodic inspection interval. g) Revise inspection procedures to include guidance on monitoring for indications of cracking and expansion due to reaction with aggregates in concrete structures. h) Update inspection procedure(s) to include monitoring volumes and chemistry, more frequent inspections, or destructive testing of affected concrete (to validate properties and determine pH), and analysis of the leakage pH and mineral, chloride, sulfate and iron content of the water		L-2018-223 12/14/2018 FPL Revised Response to NRC RAI No. 3.5.2.3.35-2, RAI No. 3.5.2.3.35-3 ML18352A885 L-2019-012 2/13/2019 FPL Response to NRG RAI No. B.2.3.35-3a 3.5.1.100-1 a ML19050A420

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
39 (Cont'd)			if leakage volumes permit, IF through-wall leakage or groundwater infiltration is identified. i) Revise inspection procedures to include guidance on inspection for cracking due to SCC for stainless steel and aluminum components. j) Revise governing AMP procedure to include stainless steel ASME Class 1, 2, 3 or MC support members, welds, bolted connections or anchorage in the engineering evaluation of acceptance criteria, expansion criteria, and examination frequency if cracking due to SCC in the uncontrolled indoor and outdoor at PTN is detected for stainless steel mechanical or non-ASME structural components.		
40	Inspection of Water-Control Structures Associated with Nuclear Power Plants (17.2.2.36)	XI.S7	Implement the new PTN Inspection of Water-Control Structures Associated with Nuclear Power Plants AMP. The following items shall be included in the new AMP. a) Store high strength bolts in accordance with Section 2 of Research Council for Structural Connections publication "Specification for Structural Joints Using High-Strength Bolts"; b) Monitor structural bolting for loss of material, loose bolts, missing or loose nuts, and other conditions that indicate loss of preload. Loose bolts and nuts are not acceptable unless accepted by engineering evaluation; c) Monitor for increases in porosity, permeability, and conditions at junctions with abutments and embankments; d) Include monitoring for siltation or undesirable vegetation, with respect to cooling canal inspections, so that the cooling canal function does not become impaired; e) Include the Reinforced Concrete Shield Wall for the Discharge Structure in the list of components inspected in the pertinent implementing procedure. f) Perform a baseline survey of the cooling canal system 6 months prior to the SPEO. Additional surveys will be conducted at least once every 10 years with the first survey being the baseline survey performed prior to the SPEO.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2018-176 10/17/2018 FPL Response to NRC On-Site Audit Follow Up Item 1: XI.S7 AMP ML18292A641 L-2018-191 11/28/2018 FPL Response to NRC RAI No. 3.5.1-51 ML18334A182

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
41	Protective Coating Monitoring and Maintenance (17.2.2.37)	XI.S8	Continue the existing PTN Protective Coating Monitoring and Maintenance AMP, including enhancement to: a) Perform aging management surveillance in accordance with the guidance of Regulatory Position C4 of RG 1.54 Revision 2 and ASTM D 5163-08 (rather than ASTM D 5163-96). Use inspection and documentation parameters listed in ASTM D 5163-08 subparagraph 10.2.1 through 10.2.6, 10.3, and 10.4. Use observation and testing methods listed in ASTM D 5163-08 subparagraphs 10.2.3 and 10.2.4; b) Perform inspections using individuals trained in the applicable reference standards of ASTM D5498. c) Implement any changes into the PTN Protective Coatings Monitoring and Maintenance AMP that may result from the resolution of the Generic Safety Issue (GSI) 191 ECCS strainer blockage issue, or if there is no impact, then inform the NRC.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
42	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements (17.2.2.38)	XI.E1	Continue the existing PTN Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements AMP, including enhancement to: a) Expand program scope to include areas outside of Containment that contain in-scope cables and connections. b) Identify adverse localized environments utilizing the guidance in NUREG-2191, Section XI.E1 and EPRI TR-109619, "Guideline for the Management of Adverse Localized Equipment Environments." Palo Alto, California: Electric Power Research Institute, June 1999. c) Inspect for adverse localized environments for each of the most limiting cable and connection electrical insulation plant environments (e.g., caused by temperature, radiation, or moisture). d) Review site-specific OE for previously identified and mitigated adverse localized environments cumulative aging effects applicable to in-scope cable and connection electrical insulation during the original PEO. Evaluate to confirm that the dispositioned corrective actions continue to support in-scope cable and connection intended functions during the SPEO. e) Ensure personnel involved with field implementation are qualified on cable aging inspection techniques. f) Utilize sampling methodology consistent with guidance of Section XI.E1 of NUREG-2191, if cable testing is deemed necessary.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032 Required pre-SPEO inspections that require plant outage are completed no later than the last RFO prior to the SPEO.	L-2018-082 SLRA Rev. 1, ML18072A232

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
43	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits (17.2.2.39)	XI.E2	Implement the new PTN Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements Used in Instrumentation Circuits AMP.	Implement AMP and complete initial inspections no later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
44	Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements (17.2.2.40)	XI.E3A	Implement the new PTN Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements AMP.	Implement AMP and complete initial inspections no later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
45	Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 EQ Requirements (17.2.2.41)	XI.E3B	Implement the new PTN Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 EQ Requirements AMP.	Implement AMP and complete initial inspections no later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
46	Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements (17.2.2.42)	XI.E3C	Implement the new PTN Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements AMP.	Implement AMP and complete initial inspections no later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
47	Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements (17.2.2.43)	XI.E6	Implement the new PTN Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements AMP.	Implement AMP and complete initial inspections no later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
48	High-Voltage Insulators (17.2.2.44)	XI.E7	Implement the new PTN High-Voltage Insulators AMP.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032 Required pre-SPEO inspections that require plant outage are completed no later than the last RFO prior to the SPEO.	L-2018-082 SLRA Rev. 1, ML18072A232
49	Pressurizer Surge Line Fatigue (17.2.3.1)	N/A – PTN site- Specific Program	Continue existing PTN Pressurizer Surge Line Fatigue AMP.	Ongoing	L-2018-082 SLRA Rev. 1, ML18072A232
50	Quality Assurance Program (17.1.3)	Appendix A	Continue the existing FPL QA Program at PTN.	Ongoing	L-2018-082 SLRA Rev. 1, ML18072A232

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
51	Operating Experience Program (17.1.4)	Appendix B	Continue the existing PTN OE Program, including enhancement to: a) Update program procedures to specify SLR-ISGs and GALL-SLR revisions as required OE review items; b) Update program procedures to develop an OE trend code and specify a requirement to perform OE trending. c) Create a procedure for evaluating OE for the aging management related criteria included in the following items: • Systems, structures, and components; • Materials, • Environments, • Aging effects, • Aging mechanisms, • AMPs, and; • The activities, criteria, and evaluations integral to the elements of the AMPs. d) Update AMP owner training procedure to perform training on a periodic basis. e) Update the OE program procedure to specify a frequency for the AMP and OE assessments to not exceed once every five years.	No later than the date that the renewed operating license is issued.	L-2018-082 SLRA Rev. 1, ML18072A232 L-2019-037 03/06/2019 FPL Clarification Regarding AMP Effectiveness Reviews ML19070A113
52	Non-Containment Structure Aging Management Review	N/A	Continue monitoring of spent fuel pool water level and leakage from leak chase channels.	Ongoing	L-2018-082 SLRA Rev. 1, ML18072A232
53	Containment Structure and Internal Structural Components Aging Management Review	N/A	Follow the ongoing industry efforts that are clarifying the effects of irradiation on concrete and corresponding aging management recommendations, including: a) Ensure their applicability to the PTN Unit 3 and Unit 4 primary shield wall and associated reactor vessel supports; b) Update design calculations, as appropriate, and; c) Develop an informed site-specific program, if needed.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
54	Nonsafety-related SSCs that are not Directly Connected to Safety-Related SSCs but have the Potential to Affect Safety-Related SSCs Through Spatial Interactions Screening Document	N/A	Minimize the potential for indoor abandoned equipment outside containment to leak or spray on safety-related equipment by performing the following: a) Update plant procedures to require the periodic venting and draining of indoor abandoned equipment located outside containment that is directly connected to in-service systems; b) Verify that abandoned equipment that is no longer directly connected to in-service systems is vented and drained.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232
55	Polymer High-Voltage Insulators (17.2.3.2)	N/A	Implement the new site-specific Polymer High-Voltage Insulators AMP.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032 Required pre-SPEO inspections that require plant outage are completed no later than the last RFO prior to the SPEO.	L-2018-166 10/16/2018 FPL Response to NRC RAI No. B.2.3.44-1 ML18296A024
56	Not applicable	Not applicable	Replace a portion of the existing PTN Units 3 and 4 containment spray system carbon steel piping inside containment with stainless steel piping. The scope of the project involves the replacement of the carbon steel piping from the stainless steel to carbon steel bimetallic weld for the four containment spray piping headers (3A, 3B, 4A and 4B) at penetrations P-19A and P-19B to a plant elevation of 65 feet inside containment.	Prior to: PTN3: 12/01/2024 PTN4: 12/01/2024	L-2019-019 01/31/2019 FPL Response to NRC RAI No. B.2.3.20-2 ML19035A195
57	Materials used in Structural Supports within the Scope of Subsequent License Renewal	N/A	Structural supports within the scope of SLR at PTN that utilize epoxy adhesive material will be restored to the original design, or equivalent, using structural materials evaluated for aging in the SLRA.	No later than 6 months prior to the SPEO, i.e.: PTN3: 1/19/2032 PTN4: 10/10/2032	L-2019-103 5/9/2019 Use of Adhesive Anchoring Systems in Structural Supports ML19035A195

APPENDIX 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 Florida Power & Light Company (FPL). This appendix also lists other correspondence under Turkey Point Nuclear Generating Unit Nos. 3 & 4 (Turkey Point) Docket Nos. 50-250 and 50-251 related to the staff's review of the Turkey Point subsequent license renewal application.

Table B-1 Chronology

Date	ADAMS Accession No.	Subject
1/30/2018	ML18037A812	Florida Power & Light Company, Turkey Point Units 3 and 4, Docket Nos. 50-250 and 50-251, Turkey Point Units 3 and 4 Subsequent License Renewal Application (L-2018-004) **(Portions of this document are proprietary and withheld from public)**
2/9/2018	ML18044A653	Turkey Point Units 3 & 4 License Renewal Application – Supplement 1 (L-2018-039) **(Portions of this document are proprietary and withheld from public)**
2/16/2018	ML18053A123	Turkey Point Units 3 and 4 Subsequent License Renewal Application – Supplement 2 (L-2018-053) **(Portions of this document are proprietary and withheld from public)**
3/1/2018	ML18072A224	Turkey Point Units 3 and 4, Subsequent License Renewal Application – Supplement 3 (L-2018-059) **(Portions of this document are proprietary and withheld from public)**
3/22/2018	ML18085A035	NRC Press Release No. 18-009: NRC Makes Available First Subsequent License Renewal Application from Turkey Point Nuclear Power Plant
4/3/2018	ML18038A691	Request for Withholding Information from Public Disclosure (EPID No. L-2018-RNW-0002)
4/10/2018	ML18113A132	Turkey Point Units 3 and 4 Subsequent License Renewal Application – Revision 1 (L-2018-082) **(Portions of this document are proprietary and withheld from public)**
4/12/2018	ML18074A252	Turkey Point Nuclear Generating Unit Nos. 3 and 4 - Status of Subsequent License Renewal Application (EPID No. L-2018-RNW-0002)
4/13/2018	ML17338A141	Receipt and Availability of the Subsequent License Renewal Application for the Turkey Point Nuclear Generating Unit Nos. 3 and 4 (EPID No. L-2018-RNW-0002)
4/20/2018	ML18087A474	Change in Determination for Withholding Information from Public Disclosure (EPID No. L-2018-RNW-0002)
4/25/2018	ML17360A054	Turkey Point Nuclear Generating Unit Nos. 3 and 4, Subsequent License Renewal Application Online Reference Portal (EPID No. L-2018-RNW-002)
4/26/2018	ML18003A050	Turkey Point Nuclear Generating Unit Nos. 3 and 4 - Determination of Acceptability and Sufficiency for Docketing, Proposed Review Schedule, and Opportunity for a Hearing Regarding the Florida Power & Light Company's Application for Subsequent Renewal (EPID No. L-2018-RNW-0002)
4/26/2018	ML18086A705	Turkey Point Nuclear Generating Unit Nos. 3 and 4 - Plan for the Operating Experience Audit Regarding the Subsequent License Renewal Application Review (EPID No. L-2018-RNW-0002)
5/3/2018	ML18124A078	NRC Press Release No. 18-014: NRC Accepts Application for Subsequent License Renewal of Turkey Point Reactors
5/22/2018	ML18145A064	NRC Press Release No. 18-019: Corrected - NRC To Hold Meetings on Environmental Review for Turkey Point Subsequent License Renewal

Date	ADAMS Accession No.	Subject
6/12/2018	ML18160A012	Turkey Point Nuclear Generating Units 3 and 4 - Plan for the In-Office Regulatory Audit Regarding the Subsequent License Renewal Application Review (EPID No. L-2018-RNW-0002)
7/5/2018	ML18173A087	Turkey Point Nuclear Generating Units 3 and 4 - Plan for the Irradiated Concrete Technical Issue Regulatory Audit Regarding the Subsequent License Renewal Application Review (EPID No. L-2018-RNW-0002)
7/23/2018	ML18183A445	Turkey Point Nuclear Generating Units 3 and 4 - Report for the Operating Experience Review Audit Regarding the Subsequent License Renewal Application Review (EPID No. L-2018-RNW-0002)
8/6/2018	ML18218A198	Requests for Additional Information for the Safety Review of the Turkey Point Subsequent License Renewal Application – Set 1 (EPID No. L-2018-RNW-0002)
8/10/2018	ML18226A098	Turkey Point Units 3 and 4 Subsequent License Renewal Application Owner's Group Topical Reports – Equivalency of Revision 0 and Revision 1 Documents (L-2018-151) **(Portions of this document are proprietary and withheld from public)**
8/21/2018	ML18232A576	Turkey Point Nuclear Generating Unit Nos. 3 and 4 - Plan for On-Site Regulatory Audit Regarding the Subsequent License Renewal Application Review (EPID No. L-2018-RNW-0002)
8/24/2018	ML18232A512	Requests for Additional Information for the Safety Review of the Turkey Point Subsequent License Renewal Application - Set 2 (EPID No. L-2018-RNW-0002)
8/31/2018	ML18248A257	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Requests for Additional Information (RAI) Set 1 Responses (L-2018-152)
8/31/2018	ML18243A301	Meeting with FPL to discuss the potential subsequent license renewal wear issues of CRDM thermal sleeves at Turkey Point based on recent operating experience (held 9/10/2018)
9/10/2018	ML18253A242	Requests for Confirmation of Information for the Safety Review of the Turkey Point Subsequent License Renewal Application (EPID No. L-2018-RNW-0002).
9/14/2018	ML18261A028	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Requests for Additional Information (RAI) Set 2 Responses (L-2018-154)
9/17/2018	ML18243A005	Requests for Additional Information for the Safety Review of the Turkey Point Subsequent License Renewal Application – Set 3 (EPID No. L-2018-RNW-0002)
9/17/2018	ML18260A241	Requests for Additional Information for the Safety Review of the Turkey Point Subsequent License Renewal Application – Set 5 (EPID No. L-2018-RNW-0002)
9/26/2018	ML18262A078	Summary of Meeting with FPL to discuss the potential subsequent license renewal wear issues of CRDM thermal sleeve flanges at Turkey Point based on recent operating experience [held 9/10/2018] (EPID No. L2018-RNW-0002)
9/27/2018	ML18269A208	Requests for Additional Information for the Safety Review of the Turkey Point Subsequent License Renewal Application – Set 4 (EPID No. L-2018-RNW-0002)
10/4/2018	ML18269A226	Request for Additional Information for the Safety Review of the Turkey Point Subsequent License Renewal Application – Set 6 (EPID No. L-2018-RNW-0002)
10/5/2018	ML18283A308	Turkey Point Units 3 and 4 Subsequent License Renewal Application Revision to SLRA Section 3.5.2.2.2.6, Reduction of Strength and Mechanical Properties of Concrete Due to Irradiation (L-2018-187)

Date	ADAMS Accession No.	Subject
10/9/2018	ML18284A335	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Requests for Confirmation of Information (RCI) Responses (L-2018-177)
10/15/2018	ML18230B482	Turkey Point Nuclear Generating Unit Nos. 3 and 4 - Report for the In-Office Regulatory Audit Regarding the Subsequent License Renewal Application Review (EPID No. L-2018-RNW-0002)
10/16/2018	ML18296A024	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Requests for Additional Information (RAI) Set 3 Responses (L-2018-166) **(Portions of this document are proprietary and withheld from public)**
10/17/2018	ML18292A642	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Requests for Additional Information (RAI) Set 5 Responses (L-2018-175)
10/17/2018	ML18292A641	Turkey Point Units 3 and 4 Subsequent License Renewal Application Responses to the August 2018 NRC On-Site Regulatory Audit Follow-Up Items (L-2018-176)
10/24/2018	ML18299A214	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Requests for Additional Information (RAI) Set 4 Responses (L-2018-174) **(Portions of this document are proprietary and withheld from public)**
10/31/2018	ML18292A665	Requests for Additional Information for the Safety Review of the Turkey Point Subsequent License Renewal Application – Set 7 (EPID No. L-2018-RNW-0002)
11/2/2018	ML18311A299	Turkey Point Units 3 and 4 Safety Review Requests for Additional Information (RAI) Set 6 Responses (L-2018-193) **(Portions of this document are proprietary and withheld from public)**
11/19/2018	ML18330A060	Turkey Point Units 3 and 4 Subsequent License Renewal Application NUREG/CR-6909 Revision 1 Methodology Update SLRA Revisions (L-2018-212) **(Portions of this document are proprietary and withheld from public)**
11/28/2018	ML18334A182	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Requests for Additional Information (RAI) Set 7 Responses and Sets 1 and 5 Supplemental Responses (L-2018-191)
12/12/2018	ML18348A580	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review – November 13, 2018 Public Meeting Discussion Topic Responses (L-2018-222)
12/14/2018	ML18352A885	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review – November 15, 2018 Public Meeting Action Item Responses (L-2018-223)
12/21/2018	ML18362A146	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Request for Additional Information (RAI) Set 5 Response 4.3.5-2 Revision (L-2018-234)
1/15/2019	ML18341A003	Requests for Additional Information for the Safety Review of the Turkey Point Subsequent License Renewal Application – Set 8 (EPID No. L-2018-RNW-0002)
1/25/2019	ML18341A024	Turkey Point Nuclear Generating Units 3 and 4 - Report for the Onsite Regulatory Audit Regarding the Subsequent License Renewal Application Review (EPID No. L-2018-RNW-0002)
1/31/2019	ML19035A195	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review – December 20, 2018 Public Meeting Action Item Responses (L-2019-019)
2/1/2019	ML19032A396	Revision 1 - Requests for Additional Information for the Safety Review of the Turkey Point Subsequent License Renewal Application – Set 8 (EPID No. L-2018-RNW-0002)

Date	ADAMS Accession No.	Subject
2/1/2019	ML19032A536	Turkey Point Nuclear Generating Units 3 and 4 - Report for the Irradiated Concrete Audit Regarding the Subsequent License Renewal Application Review (EPID No. L-2018-RNW-0002)
2/6/2019	ML19037A376	Requests for Additional Information for the Safety Review of the Turkey Point Subsequent License Renewal Application - Set 9 (EPID No. L-2018-RNW-0002)
2/13/2019	ML19050A420	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Revision 0 Requests for Additional Information (RAI) Set 8 Responses (L-2019-012) **(Portions of this document are proprietary and withheld from public)**
2/22/2019	ML19053A612	Response Date Extension for RAIs Set 8, Revision 1, for the Safety Review of the Turkey Point Subsequent License Renewal Application (EPID No. L-2018-RNW-0002)
3/1/2019	ML19064A824	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Revision 1 Requests for Additional Information (RAI) Set 8 First Submittal Responses (L-2019-033)
3/6/2019	ML19070A113	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Requests for Additional Information (RAI) Set 9 Responses (L-2019-037) **(Portions of this document are proprietary and withheld from public)**
3/14/2019	ML19052A007	U.S. Nuclear Regulatory Commission Approval of Florida Power & Light Company Request for Withholding Information from Public Disclosure (EPID No. L-2018-RNW-0002)
3/15/2019	ML19078A132	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Revision 1 Requests for Additional Information (RAI) Second Submittal Set 8 Responses (L-2019-048)
3/21/2019	ML19084A050	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Revision 1 Requests for Additional Information (RAI) Third Submittal Set 8 Response (L-2019-067)
3/28/2019	ML19084A008	U.S. Nuclear Regulatory Commission Approval of Florida Power & Light Company Request for Withholding Information from Public Disclosure (EPID No. L-2018-RNW-0002)
3/28/2019	ML19087A204	Requests for Additional Information for the Safety Review of the Turkey Point Subsequent License Renewal Application – Set 10 (EPID No. L-2018-RNW-0002)
4/1/2019	ML19093A060	Turkey Point Units 3 and 4 Subsequent License Renewal Application First Annual Update (L-2019-072)
4/10/2019	ML19102A065	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Requests for Additional Information (RAI) Set 10 Response (L-2019-071)
4/11/2019	ML19101A322	Requests for Additional Information for the Safety review of the Turkey Point Subsequent License Renewal Application – Set 11 (EPID No. L 2018-RNW-0002
4/26/2019	ML19115A224	Turkey Point Nuclear Generating Units 3 and 4 – Transmittal of Portions of the Draft Safety Evaluation for the Subsequent License Renewal Amendment (EPID No. L-2018-RNW-0002)
5/6/2019	ML19128A149	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Request for Additional Information (RAI) Set 11 Response (L-2019-087)
5/9/2019	ML19133A061	Turkey Point Units 3 and 4 Subsequent License Renewal Application Use of Adhesive Anchoring Systems in Structural Supports (L-2019-103)

Date	ADAMS Accession No.	Subject
5/21/2019	ML19078A010	Safety Evaluation Report with Open Items Related to the Subsequent License Renewal of Turkey Point Nuclear Generating Unit Nos. 3 and 4 (EPID L-2018-RNW-0002)
5/21/2019	ML19143A092	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Requests for Additional Information (RAI) Set 10 RAI No. B.2.3.28-1b Revised Response
6/4/2019	ML19157A028	Turkey Point Units 3 and 4 Subsequent License Renewal Application Safety Review Requests for Additional Information (RAI) Set 10 RAI No. B.2.3.28-1b Updated Response
6/18/2019	ML19162A353	Request for Withholding Information from Public Disclosure Associated with the Submittal of Supplements to Turkey Point Nuclear Generating, Unit Nos. 3 & 4 Subsequent License Renewal Application (EPID No. L-2018-RNW-0002)
6/18/2019	ML19162A054	Request for Withholding Information from Public Disclosure Associated with the Submittal of Supplements to Turkey Point Nuclear Generating, Unit Nos. 3 & 4 Subsequent License Renewal Application (EPID No. L-2018-RNW-0002)
6/18/2019	ML19162A050	Request for Withholding Information from Public Disclosure Associated with the Submittal of Supplements to Turkey Point Nuclear Generating Units Nos. 3 and 4 Subsequent License Renewal Application ON (EPID No. L2018-RNW-0002)
6/18/2019	ML19155A154	Request for Withholding Information from Public Disclosure Associated with the Submittal of Turkey Point Nuclear Generating, Unit Nos. 3 & 4, Subsequent License Renewal Application UREG/CR 6909 Revision 1 Methodology Update SLRA Revisions .....

APPENDIX C
PRINCIPAL CONTRIBUTORS

This appendix lists the principal contributors for the development of this safety evaluation report and their areas of responsibility.

Table C-1 Principal Contributors

Name	Responsibility
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APPENDIX D
REFERENCES

This appendix lists the references used throughout this safety evaluation report (SER) for review of the Turkey Point Nuclear Generating Unit Nos. 3 & 4 subsequent license renewal application.

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