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17.0 AGING MANAGEMENT PROGRAMS AND TIME-LIMITED AGING ANALYSIS ACTIVITIES

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17.1 INTRODUCTION

The application for a renewed operating license is required by 10 CFR 54.21(d) to include a Final Safety Analysis Report (FSAR) supplement. This chapter comprises the Updated Final Safety Analysis Report (UFSAR) supplement of the Turkey Point (PTN) Subsequent License Renewal Application (SLRA) and includes the following sections:

- Section 17.1.1 contains a listing of the PTN aging management programs (AMPs) for subsequent license renewal (SLR) in the order of NUREG-2191 programs, that is NUREG-2191 Chapter X, NUREG-2191 Chapter XI, and a site-specific PTN AMP, including the status of the programs at the time the SLRA was submitted.

- Section 17.1.2 contains a listing of the time-limited aging analysis (TLAA) summaries.

- Section 17.1.3 contains a discussion stating the relationship between the Florida Power & Light Company (FPL) Quality Assurance (QA) Program at PTN and the AMPs' corrective actions, confirmation process, and administrative controls elements.

- Section 17.1.4 contains a summary of the PTN Operating Experience (OE) Program.

- Section 17.2 contains a summary of the PTN programs used for managing the effects of aging. These AMPs are associated with either NUREG-2191 Chapter X, Chapter XI, or are PTN site-specific.

- Section 17.3 contains a summary of the TLAAs applicable to the subsequent period of extended operation (SPEO).

- Section 17.4 contains the PTN SLR Commitment List and the AMPs' planned implementation schedule.

The integrated plant assessment for SLR identified new and existing AMPs necessary to provide reasonable assurance that systems, structures, and components (SSCs) within the scope of SLR will continue to perform their intended functions consistent with the Current Licensing Basis (CLB) for the SPEO. The SPEO is defined as 20 years from the current renewed operating license expiration date.

17.1.1 AGING MANAGEMENT PROGRAMS

AMPs for PTN SLR are listed in Table 17.1-1 and described in Section 17.2. The AMPs are listed chronologically as they appear in NUREG-2191, with the Chapter X AMPs first, followed by the Chapter XI AMPs, and ending with the only PTN site-specific AMPs, Pressurizer Surge Line Fatigue and Polymer High-Voltage Insulators. The PTN AMPs are categorized as either existing AMPs or new AMPs for SLR. The existing PTN AMPs are renamed and enhanced as necessary to more closely align with AMPs described in NUREG-2191.

Table 17.1-1 below reflects the status of the PTN AMPs at the time of the SLRA submittal. Regulatory commitments, which include AMP enhancements and implementation schedules for PTN AMPs are identified in the PTN SLR Commitment List within Section 17.4.

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17.1.2 TIME-LIMITED AGING ANALYSES

The TLAA summaries applicable to PTN during the SPEO are identified in Table 17.1-2 and described in the sections subordinate to Section 17.3.

17.1.3 QUALITY ASSURANCE PROGRAM AND ADMINISTRATIVE CONTROLS

The FPL Quality Assurance (QA) Program for PTN 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. Generically, the three elements are applicable as follows.

The corrective action, confirmation process, and administrative controls of the FPL QA Program are applicable to all AMPs and activities during the SPEO. The FPL QA Program procedures, review and approval processes, and administrative controls are implemented, as described in the FPL Topical QA Report, in accordance with the requirements of 10 CFR Part 50, Appendix B. The FPL QA Program applies to all structures and components (SCs) that credited for in a PTN AMP. Corrective actions and administrative (document) control for both safety-related and nonsafety-related SCs are accomplished in accordance with the established PTN corrective action program and document control program, and are applicable to all AMPs and activities during the SPEO. The confirmation process is part of the corrective action program and includes reviews to assure adequacy of corrective actions, tracking and reporting of open corrective actions, and review of corrective action effectiveness. Any follow-up inspections required by the confirmation process are documented in accordance with the corrective action program.

17.1.4 OPERATING EXPERIENCE PROGRAM

The PTN OE Program captures the OE from site-specific and industry sources and is systematically reviewed on an ongoing basis in accordance with the FPL QA Program. This OE program also meets the provisions of NUREG-0737, "Clarification of TMI Action Plan Requirements," Item I.C.5, "Procedures for Feedback of Operating Experience to Plant Staff."

The PTN OE Program interfaces with and relies on active participation in the Institute of Nuclear Power Operations (INPO) OE program, as endorsed by the U.S. Nuclear Regulatory Commission (NRC). In accordance with these programs, all incoming OE items are screened to determine whether they may involve age-related degradation or aging management impacts. Research and development is also reviewed. Items so identified are further evaluated, and the AMPs are either enhanced, or new AMPs are developed, as appropriate, when it is determined through these evaluations that the effects of aging may not be adequately managed. Training on age-related degradation and aging management is provided to those personnel responsible for implementing the AMPs and to those who may submit, screen, assign, evaluate, or otherwise process site-specific and industry OE. Site-specific OE associated with aging management and age-related degradation is reported to the industry in accordance with guidelines established in the PTN OE Program.

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Table 17.1-1

List of PTN Aging Management Programs

NUREG-2191 Section	Aging Management Program	Existing AMP or New AMP
X.M1	Fatigue Monitoring (Section 17.2.1.1)	Existing
X.M2	Neutron Fluence Monitoring (Section 17.2.1.2)	Existing
X.S1	Concrete Containment Unbonded Tendon Prestress (Section 17.2.1.3)	Existing
X.E1	Environmental Qualification of Electric Equipment (Section 17.2.1.4)	Existing
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (Section 17.2.2.1)	Existing
XI.M2	Water Chemistry (Section 17.2.2.2)	Existing
XI.M3	Reactor Head Closure Stud Bolting (Section 17.2.2.3)	Existing
XI.M4	BWR Vessel ID Attachment Welds Not Applicable (PTN U3 and U4 are PWRs)	N/A
XI.M5	Not Applicable (Deleted from NUREG-2191)	N/A
XI.M6	Not Applicable (Deleted from NUREG-2191)	N/A
XI.M7	BWR Stress Corrosion Cracking Not Applicable (PTN U3 and U4 are PWRs)	N/A
XI.M8	BWR Penetrations Not Applicable (PTN U3 and U4 are PWRs)	N/A
XI.M9	BWR Vessel Internals Not Applicable (PTN U3 and U4 are PWRs)	N/A
XI.M10	Boric Acid Corrosion (Section 17.2.2.4)	Existing
XI.M11B	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (Section 17.2.2.5)	Existing
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (Section 17.2.2.6)	New
XI.M16A	Reactor Vessel Internals (Section 17.2.2.7)	Existing
XI.M17	Flow-Accelerated Corrosion (Section 17.2.2.8)	Existing

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Table 17.1-1 (Continued)

List of PTN Aging Management Programs

NUREG-2191 Section	Aging Management Program	Existing AMP or New AMP
XI.M18	Bolting Integrity (Section 17.2.2.9)	Existing
XI.M19	Steam Generators (Section 17.2.2.10)	Existing
XI.M20	Open-Cycle Cooling Water System (Section 17.2.2.11)	Existing
XI.M21A	Closed Treated Water Systems (Section 17.2.2.12)	Existing
XI.M22	Boraflex Monitoring Not Applicable (PTN U3 and U4 do not credit Boraflex as a neutron absorber in their criticality analyses.)	N/A
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (Section 17.2.2.13)	Existing
XI.M24	Compressed Air Monitoring (Section 17.2.2.14)	Existing
XI.M25	BWR Reactor Water Cleanup System Not Applicable (PTN U3 and U4 are PWRs)	N/A
XI.M26	Fire Protection (Section 17.2.2.15)	Existing
XI.M27	Fire Water System (Section 17.2.2.16)	Existing
XI.M29	Outdoor and Large Atmospheric Metallic Storage Tanks (Section 17.2.2.17)	Existing
XI.M30	Fuel Oil Chemistry (Section 17.2.2.18)	Existing
XI.M31	Reactor Vessel Material Surveillance (Section 17.2.2.19)	Existing
XI.M32	One-Time Inspection (Section 17.2.2.20)	New
XI.M33	Selective Leaching (Section 17.2.2.21)	New
XI.M35	ASME Code Class 1 Small-Bore Piping (Section 17.2.2.22)	Existing
XI.M36	External Surfaces Monitoring of Mechanical Components (Section 17.2.2.23)	Existing
XI.M37	Flux Thimble Tube Inspection (Section 17.2.2.24)	Existing
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (Section 17.2.2.25)	New

Table 17.1-1 (Continued)

List of PTN Aging Management Programs

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NUREG-2191 Section	Aging Management Program	Existing AMP or New AMP
XI.M39	Lubricating Oil Analysis (Section 17.2.2.26)	Existing
XI.M40	Monitoring of Neutron-Absorbing Materials other than Boraflex (Section 17.2.2.27)	Existing
XI.M41	Buried and Underground Piping and Tanks (Section 17.2.2.28)	New
XI.M42	Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks (Section 17.2.2.29)	New
XI.S1	ASME Section XI, Subsection IWE (Section 17.2.2.30)	Existing
XI.S2	ASME Section XI, Subsection IWL (Section 17.2.2.31)	Existing
XI.S3	ASME Section XI, Subsection IWF (Section 17.2.2.32)	Existing
XI.S4	10 CFR Part 50, Appendix J (Section 17.2.2.33)	Existing
XI.S5	Masonry Walls (Section 17.2.2.34)	Existing
XI.S6	Structures Monitoring (Section 17.2.2.35)	Existing
XI.S7	Inspection of Water-Control Structures Associated with Nuclear Power Plants (Section 17.2.2.36)	New
XI.S8	Protective Coating Monitoring and Maintenance (Section 17.2.2.37)	Existing
XI.E1	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements (Section 17.2.2.38)	Existing
XI.E2	Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements used in Instrumentation Circuits (Section 17.2.2.39)	New
XI.E3A	Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements (Section 17.2.2.40)	New

Table 17.1-1 (Continued)

List of PTN Aging Management Programs

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NUREG-2191 Section	Aging Management Program	Existing AMP or New AMP
XI.E3B	Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 EQ Requirements (Section 17.2.2.41)	New
XI.E3C	Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements (Section 17.2.2.42)	New
XI.E4	Metal Enclosed Bus Not Applicable (PTN U3 and U4 do not have any components within this program scope.)	N/A
XI.E5	Fuse Holders Not Applicable (PTN U3 and U4 do not have any components within this program scope.)	N/A
XI.E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements (Section 17.2.2.43)	New
XI.E7	High-Voltage Insulators (Section 17.2.2.44)	New
N/A – PTN Site-Specific Program	Pressurizer Surge Line Fatigue (Section 17.2.3.1)	Existing
N/A – PTN Site-Specific Program	Polymer High-Voltage Insulators (Section 17.2.3.2)	New

Table 17.1-2

List of Time-Limited Aging Analyses

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Category (Section)	#	Time-Limited Aging Analyses Name	Section
Reactor Vessel Neutron Embrittlement (17.3.2)	1	Neutron Fluence Projections	17.3.2.1
	2	Pressurized Thermal Shock	17.3.2.2
	3	Upper-Shelf Energy	17.3.2.3
	4	Adjusted Reference Temperature	17.3.2.4
	5	Pressure-Temperature Limits and Low Temperature Overpressure (LTOP) Setpoints	17.3.2.5
Metal Fatigue (17.3.3)	6	ASME Boiler and Pressure Vessel Code, Section III, Class 1 Components	17.3.3.1
	7	ANSI B31.1 and ASME Boiler and Pressure Vessel Code, Section III, Class 3 Piping	17.3.3.2
	8	Environmentally Assisted Fatigue	17.3.3.3
	9	Reactor Vessel Underclad Cracking	17.3.3.4
	10	Reactor Coolant Pump Flywheel	17.3.3.5
Environmental Qualification of Electrical Equipment (17.3.4)	11	Environmental Qualification of Electrical Equipment	17.3.4
Concrete Containment Unbonded Tendon Prestress (17.3.5)	12	Concrete Containment Unbonded Tendon Prestress	17.3.5
Containment Liner Plate and Penetrations Fatigue Analysis (17.3.6)	13	Containment Liner Plate and Penetrations Fatigue Analysis	17.3.6
Other Site-Specific TLAAs (17.3.7)	14	Bottom-Mounted Instrumentation Thimble Tube Wear	17.3.7.1
	15	Emergency Containment Cooler Tube Wear	17.3.7.2
	16	Leak-Before-Break for Reactor Coolant System Piping	17.3.7.3
	17	Leak-Before-Break Class 1 Auxiliary Piping	17.3.7.4
	18	Code Case N-481 Reactor Coolant Pump Integrity Analysis	17.3.7.5
	19	Crane Load Cycle Limit	17.3.7.6

17.2 AGING MANAGEMENT PROGRAMS

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17.2.1 NUREG-2191 CHAPTER X AGING MANAGEMENT PROGRAMS

This section provides UFSAR summaries of the SLR AMPs associated with TLAAs.

17.2.1.1 FATIGUE MONITORING

The existing PTN Fatigue Monitoring AMP provides an acceptable basis for managing fatigue of components that are subject to the fatigue or cycle-based loading TLAAs that remain valid in accordance with 10 CFR 54.21(c)(1)(iii). This AMP also assures that the corrective action specified in the program is taken if the actual number of cycles approaches 80 percent of the analyzed values. Fatigue of components is managed by monitoring and tracking the number of occurrences and severity of design basis transients to ensure they remain within the limits of the fatigue analyses, which in turn ensure that the analyses remain valid. Cycle-based fatigue analyses for which this AMP is used include, but are not limited to, the following: (a) cumulative usage factor (CUF) analyses or their equivalent performed in accordance with the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) requirements for specific mechanical or structural components; (b) fatigue analysis calculations for assessing environmentally-assisted fatigue (CUF_{en}); (c) implicit fatigue analyses, as defined in the American National Standards Institute (ANSI) B31.1 design code or ASME Code Section III rules for Class 2 and 3 components; (d) fatigue flaw growth analyses that are based on cyclical loading assumptions; and (e) fracture mechanics analyses that are based on cycle-based loading assumptions.

This AMP also relies on the PTN Water Chemistry AMP to provide monitoring of appropriate environmental parameters for calculating environmental fatigue multipliers (F_{en} values).

17.2.1.2 NEUTRON FLUENCE MONITORING

The PTN Neutron Fluence Monitoring AMP, previously the fluence and uncertainty calculation portion of the PTN Reactor Vessel Integrity Program, is an existing program that ensures the continued validity of the neutron fluence analyses and related TLAAs. In so doing, this AMP also provides an acceptable basis for managing aging effects attributable to neutron fluence irradiation in accordance with 10 CFR 54.21(c)(1)(iii). This AMP monitors neutron fluence for reactor pressure vessel (RPV) and reactor vessel internals (RVI) components to verify the continued acceptability of existing irradiation embrittlement (IE) and related analyses. This AMP includes periodic updates to ensure and demonstrate that RPV IE and related analyses remain within applicable limits defined in the CLB.

Neutron fluence is considered to be a TLAA and is a time-limited input to a number of RPV IE analyses that are TLAAs for SLR. AMP results are compared to the neutron fluence parameter inputs used in the IE analyses. This includes: (a) pressurized thermal shock (PTS) analyses required by 10 CFR 50.61; (b) upper-shelf energy (USE) and the associated equivalent margins analysis (EMA) required by Section IV.A.1 of 10 CFR Part 50, Appendix G; and (c) pressure-temperature (P-T) limits and low-temperature over-pressure protection (LTOP) limits.

Guidance on acceptable methods and assumptions for determining reactor vessel neutron fluence is described in NRC Regulatory Guide (RG) 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence," which originated as Draft Regulatory Guide (DG)-1053. The methods developed and approved using the guidance contained in RG 1.190 are specifically intended to determine neutron fluence in the cylindrical region of the RPV surrounding the effective height of the active fuel.

This AMP evaluates the RPV surveillance capsule dosimetry data and updates the fluence projections in the cylindrical RPV locations, as needed. The Westinghouse Commercial Atomic Power (WCAP)-14040-A methodology, which complies with RG 1.190, is used for PTN fluence determinations in the cylindrical RPV region that surrounds the effective height of the active fuel, the RPV beltline. Calculational methods, benchmarking, qualification, and surveillance data are monitored to maintain the adequacy and ascribed uncertainty of RPV beltline neutron fluence calculations and thereby the associated RPV IE analyses: C31

(a) This approved methodology uses geometrical and material input data, and equilibrium fuel cycle operational data, to determine characteristics of the neutron flux in the core.

(b) Additionally, these data are used to determine the neutron transport to the vessel and into the reactor cavity.

(c) Capsule surveillance data is used for qualification of the neutron fluence calculation.

(d) The same WCAP-14040-A methodology was used for the fluence calculations performed in support of the PTN Unit 3 and Unit 4 extended power uprates (EPUs).

The PTN calculations of neutron fluence also factor into other analyses or evaluations that assess irradiation-related aging effects. Examples include: (a) determination of the (extended) RPV beltline, for which neutron fluence is projected to exceed 1×10^{17} neutrons/square centimeter (n/cm^2) (E > 1 MeV), as defined in Regulatory Issue Summary (RIS) 2014-11; (b) susceptibility of RVI components to neutron radiation damage mechanisms; and (c) dosimetry data obtained from the PTN Reactor Vessel Material Surveillance AMP. Estimates of neutron fluence for RPV regions significantly above and below the active fuel region of the core, and for RVI components, use the RG 1.190 adherent methodology as the base to provide conservative estimates and will include additional justification, consistent with related industry efforts, as necessary.

This AMP monitors in-vessel capsules and evaluates the dosimetry data, as needed. Reactor vessel surveillance capsule dosimetry data obtained in accordance with 10 CFR Part 50, Appendix H, requirements through the PTN Reactor Vessel Material Surveillance AMP provide inputs to and may impact the neutron fluence monitoring results tracked by this AMP.

17.2.1.3 CONCRETE CONTAINMENT UNBONDED TENDON PRESTRESS

The PTN Concrete Containment Unbonded Tendon Prestress AMP is an existing AMP that is part of the PTN Inservice Inspection (ISI) Program that is based on ASME Section XI, Subsection IWL, criteria, as supplemented by the requirements of 10 CFR 50.55a(b)(2)(viii). This AMP monitors and manages the loss of tendon prestress in the concrete containment prestressing system for the SPEO.

Loss of containment tendon prestressing forces is a TLAA evaluated in accordance with 10 CFR 54.21(c)(1)(iii). The PTN Concrete Containment Unbonded Tendon Prestress AMP, as part of the PTN ASME Section XI, Subsection IWL AMP, manages loss of containment tendon prestressing forces in the current period of extended operation (PEO). This TLAA AMP consists of the assessment of measured tendon prestressing forces from examinations performed through the PTN ASME Section XI, Subsection IWL AMP. The adequacy of the prestressing force for each tendon group based on type (i.e., hoop, vertical, and dome) and other considerations (e.g., geometric dimensions, whether affected by repair/replacement, etc.) establishes (a) acceptance criteria in accordance with Subsection IWL and (b) trend lines constructed based on the guidance provided in NRC IN 99-10, "Degradation of Prestressing Tendon Systems in Prestressed Concrete Containments." The calculation of prestressing losses and predicted forces for each tendon group is in accordance with the guidelines of the NRC RG 1.35.1, "Determining Prestressing Forces or Inspection of Prestressed Concrete Containments." C31

The loss of concrete containment tendon prestressing forces is detected by comparing the measured data against the predicted force values from the respective containment tendon loss of prestress TLAA. Loss of prestressing forces are also detected by comparing the tendon force trend lines, constructed from surveillance measurements, against predicted force values. In addition to PTN Unit 3 and Unit 4 ASME Section XI, Subsection IWL examination requirements, all measured prestressing forces, up to the current examination, are plotted against time. This examination includes common (historical/control) tendons, and randomly sampled tendons from each group plus random sampling of tendons affected by the reactor vessel closure head (RVCH) replacements for each unit. The predicted forces, minimum required value (MRV), and trend-line curves are developed for each tendon group examined for the SPEO. The trend line represents the general variation of prestressing forces with time based on the actual measured forces in individual tendons of the specific tendon group. The trend line for each tendon group is constructed by regression analysis of measured prestressing forces in individual tendons of that group obtained from previous examinations. The lift-off are measured every five years (i.e., 1, 3, 5, 10, 15, 20, 25, 30, 35, 40, 45, etc.) on alternating units. The trend lines from the tendon loss of prestress TLAA will be updated after each scheduled examination using methods consistent with RG 1.35.1.

The prestressing force trend line for each tendon group shall not cross the appropriate MRV line prior to the next scheduled examination. In addition, the constructed trend line shall not cross the appropriate predicted force line for any of the tendon groups. In case any of the two precedent criteria fail, the cause shall be determined, evaluated and corrected in a timely manner. If acceptance criteria are not met, then either systematic re-tensioning of tendons or a reanalysis of the concrete containment is warranted so that the design adequacy of the containment is demonstrated.

17.2.1.4 ENVIRONMENTAL QUALIFICATION OF ELECTRIC EQUIPMENT

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The existing PTN Environmental Qualification (EQ) of Electric Equipment AMP, previously the PTN EQ Program, implements the EQ requirements in 10 CFR Part 50, Appendix A, Criterion 4, and 10 CFR 50.49, and manages the effects of thermal, radiation, and cyclic aging through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. This AMP provides the requirements for the EQ of electrical equipment important to safety that could be exposed to harsh environment accident conditions as required by 10 CFR 50.49 and RG 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants." This AMP is established per the requirements of 10 CFR 50.49 to demonstrate that certain electrical components located in harsh plant environments (i.e., those areas of the plant that could be subject to the harsh environmental effects of a loss of coolant accident (LOCA), high-energy line breaks (HELBs), or a main steam line break (MSLB) inside or outside the containment, from elevated temperatures or high radiation or steam, or their combination) are qualified to perform their safety function in those harsh environments after the effects of inservice (operational) aging. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of EQ, and that the equipment be demonstrated to function in the harsh environment, following aging.

Equipment covered by this AMP has been evaluated to determine if the existing EQ aging analyses can be projected to the end of the SPEO by reanalysis or additional analysis. When analysis cannot justify a qualified life in excess of the SLR period, then the component parts are replaced, refurbished, or requalified prior to exceeding the qualified life as required by 10 CFR 50.49. Aging evaluations for EQ equipment that specify a qualification of at least 60 years are TLAAs for SLR. The PTN EQ of Electrical Equipment AMP is implemented in accordance with 10 CFR 54.21(c)(1)(iii).

17.2.2 NUREG-2191 CHAPTER XI AGING MANAGEMENT PROGRAMS

This section provides UFSAR summaries of the NUREG-2191 Chapter XI programs credited for managing the effects of aging.

17.2.2.1 ASME SECTION XI INSERVICE INSPECTION, SUBSECTIONS IWB, IWC, AND IWD

The PTN ASME Section XI ISI, Subsections IWB, IWC, and IWD AMP is an existing AMP that identifies and corrects degradation in Class 1, 2, and 3 pressure-retaining components and piping. The AMP manages the aging effects of loss of material, and cracking. The AMP provides inspection and examination of accessible components, including welds, pump casings, valve bodies, and pressure-retaining bolting. In accordance with 10 CFR 50.55a, ISI program plans documenting the examination and testing of Class 1, 2 and 3 components are prepared in accordance with the rules and requirements of ASME Section XI. The PTN ASME Section XI ISI, Subsections IWB, IWC, and IWD AMP describes the long-term inspection program for Class 1, 2 and 3 components.

The PTN ASME Section XI ISI, Subsections IWB, IWC, and IWD, AMP is updated at the end of the 120-month interval to the latest approved edition of the ASME Section XI Code identified by 10 CFR 50.55a 12 months prior to the end of the 120-month interval. All examinations and inspections performed in accordance with the program plan are documented by records and reports, which are submitted to the NRC as required by IWA-6000.

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17.2.2.2 WATER CHEMISTRY

The PTN Water Chemistry AMP is an existing AMP, formerly a portion of the PTN Chemistry Control Program, that mitigates aging effects of loss of material due to corrosion, cracking due to stress corrosion cracking (SCC) and related mechanisms, and reduction of heat transfer due to fouling in components exposed to treated water. The PTN Water Chemistry AMP controls treated water for impurities (e.g., chloride, fluoride, and sulfate) that accelerate corrosion, and is generally effective in removing impurities from intermediate and high flow areas. This AMP includes periodic monitoring and control of the treated water in order to minimize loss of material or cracking based on the industry guidelines contained in Electric Power Research Institute (EPRI) 3002000505, “PWR Primary Water Chemistry Guidelines,” Revision 7, and EPRI 1016555, “PWR Secondary Water Chemistry Guidelines,” Revision 7. The PTN Water Chemistry AMP is augmented by the PTN One-Time Inspection AMP, to verify the AMP effectiveness in managing corrosion-susceptible components (i.e., components located in areas exposed to low or stagnant flow).

17.2.2.3 REACTOR HEAD CLOSURE STUD BOLTING

The PTN Reactor Head Closure Stud Bolting AMP is an existing AMP, formerly part of the ASME Section XI, Subsections IWB, IWC and IWD, portion of the PTN ISI Program. This AMP provides ISI in accordance with the requirements of ASME, Section XI, Subsection IWB, Table IWB-2500-1 and (b) preventative measures to mitigate cracking. This AMP is in accordance with the regulatory position delineated in NRC RG 1.65, "Materials and Inspections for Reactor Vessel Closure Studs." The scope of this AMP includes:

- Closure head nuts
- Closure studs
- Threads in the RPV flange
- Closure washers and bushings

17.2.2.4 BORIC ACID CORROSION

The PTN Boric Acid Corrosion AMP is an existing AMP, previously the PTN Boric Acid Wastage Surveillance Program, that manages the aging effects of loss of material and mechanical closure integrity due to aggressive chemical attack resulting from borated water leaks. This AMP addresses the reactor coolant system (RCS) and SCs containing, or exposed to, borated water.

This AMP utilizes systematic inspections, leakage evaluations, and corrective actions for all components subject to AMR that may be adversely affected by some form of borated water leakage. This ensures that boric acid corrosion does not lead to degradation of pressure boundary, leakage boundary or structural integrity of components, supports, or structures, including electrical equipment in proximity to borated water systems. The effects of boric acid corrosion on reactor coolant pressure boundary materials in the vicinity of nickel alloy components are also addressed by the PTN Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP, which is associated with NUREG-2191 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)." Additionally, this AMP relies in part on the response to, and includes commitments to, NRC Generic Letter (GL) 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants," to identify, evaluate, and correct borated water leaks that could cause corrosion damage. This AMP includes provisions to initiate evaluations and assessments when leakage is discovered by activities not associated with the program. This AMP also follows the guidance described in Section 7 of Westinghouse Commercial Atomic Power (WCAP)-15988-NP, Revision 2, "Generic Guidance for an Effective Boric Inspection Program for Pressurized Water Reactors." C31

17.2.2.5 CRACKING OF NICKEL-ALLOY COMPONENTS AND LOSS OF MATERIAL DUE TO BORIC ACID-INDUCED CORROSION IN REACTOR COOLANT PRESSURE BOUNDARY COMPONENTS

The PTN Cracking of Nickel-Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components AMP is an existing AMP, previously the PTN Reactor Vessel Head Alloy 600 Penetration Inspection Program, that manages the aging effect of primary water stress corrosion cracking (PWSCC) for pertinent nickel alloy materials (Alloy 600/82/182) in the RCS pressure boundary. This AMP also addresses the OE of degradation due to PWSCC of components or welds constructed from those nickel alloys and exposed to primary coolant at elevated temperature. The scope of this AMP includes the following groups of components and materials:

(a) Nickel alloy components and welds identified in ASME Code Cases N-729 and N-722, as incorporated by reference in 10 CFR 50.55a, and;

(b) Components that are susceptible to corrosion by boric acid and may be impacted by leakage of boric acid from nearby or adjacent nickel alloy components previously described.

Visual examination of the Unit 3 and Unit 4 reactor vessel head external surfaces during outages and through the PTN Boric Acid Corrosion AMP are utilized to manage cracking. Future inspections of the reactor vessel heads are in accordance with ASME Code Case N-729-1, which has been included in the augmented ISI program, including the conditions listed in 10 CFR 50.55a. PTN will continue to participate in industry programs to ensure that PWSCC is managed for the SPEO.

17.2.2.6 THERMAL AGING EMBRITTLEMENT OF CAST AUSTENITIC STAINLESS STEEL C31

The PTN Thermal Aging Embrittlement of Cast Austenitic Stainless Steel AMP is a new AMP for the SPEO. This AMP augments the ASME Section XI inspections of RCS and connected components with service conditions above 250°C (482°F), in order to detect the effects of loss of fracture toughness due to thermal aging embrittlement of cast austenitic stainless steel (CASS) piping components, including pump casings. CASS valve bodies are not included in the program. This AMP includes determination of the potential significance of thermal aging embrittlement of CASS components based on casting method, molybdenum content, and percent ferrite. For components where thermal aging embrittlement is potentially significant, aging management is accomplished through either:

(a) Qualified visual inspections, such as enhanced visual examination (EVT-1);

(b) A qualified ultrasonic testing (UT) methodology, or;

(c) A component-specific flaw tolerance evaluation in accordance with the ASME Code Section XI.

For pump casings, as an alternative to the screening and other actions described above, no further actions are needed. The original flaw tolerance evaluation performed as part of Pressurized Water Reactor Owners Group (PWROG) Code Case N-481 implementation is revised to be applicable for 80 years, as described in Section 17.3.7.5. The evaluation documents that the Code Case N-481 reactor coolant pump (RCP) integrity analysis has been projected to the end of the SPEO, in accordance with the requirements of 10 CFR 54.21(c)(1)(ii).

Based on the results of the assessment documented in the letter dated May 19, 2000, from Christopher Grimes, NRC, to Douglas Walters, Nuclear Energy Institute (NEI), screening for significance of thermal aging embrittlement is not required for valve bodies and the existing ASME Code Section XI inspection requirements are adequate for valve bodies.

17.2.2.7 REACTOR VESSEL INTERNALS

The PTN Reactor Vessel Internals AMP is an existing AMP, based on the inspection and evaluation guidelines of EPRI Technical Report No. 1022863 (MRP-227-A). However, the inspection and evaluation guidelines in MRP-227-A were written for an operating period of 60 years. The MRP-227-A guidelines are supplemented through a gap analysis that identifies enhancements to the program that are needed to address an 80-year operating period. The inspection and evaluation guidelines of MRP-227-A, as modified by the gap analysis for the additional 20-year plant life, provided by FPLCORP020-REPT-078, "Aging Management Program Basis Document—Reactor Vessel Internals," are used to manage the applicable age-related degradation mechanisms, and listed as follows:

(a) Cracking, including SCC, irradiation-assisted stress corrosion cracking (IASCC), and cracking due to fatigue/cyclic loading;

(b) Loss of material induced by wear;

(c) Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement (IE);

(d) Changes in dimensions due to void swelling (VS) or distortion; and

(e) Loss of preload due to thermal and irradiation-enhanced stress relaxation and creep. C31

17.2.2.8 FLOW-ACCELERATED CORROSION

The PTN Flow-Accelerated Corrosion AMP is an existing AMP that manages loss of material (wall thinning) caused by flow-accelerated corrosion (FAC). This AMP predicts, detects, monitors, and mitigates FAC wear in high-energy carbon steel piping associated with the main steam and turbine generators, and feedwater and blowdown systems, and is based on industry guidelines (Nuclear Safety Analysis Center document, NSAC-202L-R3, EPRI 1011231, and EPRI TR-112657) and industry OE. This AMP also includes analysis and baseline inspections; determination, evaluation, and corrective actions for affected components; and follow-up inspections.

The AMP is based on commitments made in FPL letter, L-89-265, which was in response to the NRC GL 89-08. This AMP relies on implementation of the EPRI guidelines in NSAC-202L-R3, "Recommendations for an Effective Flow Accelerated Corrosion Program (1011838)," and use of the predictive analytical software, CHECWORKS™.

The AMP includes:

(a) Identifying all FAC-susceptible piping systems and components;

(b) Developing FAC predictive models to reflect component geometries, materials, and operating parameters;

(c) Performing analyses of FAC models and, with consideration of OE, selecting a sample of components for inspections;

(d) Inspecting components;

(e) Evaluating inspection data to determine the need for inspection sample expansion, repairs, or replacements, and to schedule future inspections; and

(f) Incorporating inspection data to refine FAC models.

For SLR, the PTN FAC AMP will also manage wall thinning caused by erosion mechanisms in limited situations where periodic monitoring is used in lieu of eliminating the cause, typically a design or operational deficiency, in components that contain treated water (including borated water) or steam. These limited situations are based on site OE and will be monitored similar to other FAC locations that are not modeled.

17.2.2.9 BOLTING INTEGRITY

The PTN Bolting Integrity AMP is an existing AMP related to existing activities, which include the PTN Systems and Structures Monitoring Program and the PTN ASME Section XI Inservice Inspection Program (which covers safety related bolting). This AMP manages loss of preload, cracking, and loss of material for closure bolting for safety-related and nonsafety-related pressure-retaining components using preventive and inspection activities. This AMP also manages submerged pressure-retaining bolting and closure bolting for piping systems that contain air or gas for which leakage is difficult to detect. This AMP does not include the reactor head closure studs or structural bolting, which are addressed by separate AMPs. This AMP relies on industry standards for comprehensive bolting maintenance as delineated in NUREG-1339, EPRI NP-5769, EPRI Report 1015336, and EPRI Report 1015337.

The preventive actions associated with this AMP include proper selection of bolting material; the use of appropriate lubricants and sealants in accordance with the guidelines of EPRI Report 1015336 and EPRI Report 1015337, along with additional recommendations from NUREG-1339; consideration of actual yield strength when procuring bolting material (e.g., ensuring any replacement or new pressure-retaining bolting has an actual yield strength of less than 150 ksi); lubricant selection (e.g., not allowing the use of molybdenum disulfide); proper torqueing of bolts, checking for uniformity of the gasket compression after assembly; and application of an appropriate preload based on guidance in EPRI documents, manufacturer recommendations, or engineering evaluation. These actions preclude loss of preload, loss of material, and cracking. C31

This AMP supplements the inspection activities required by ASME Code Section XI for ASME Code Class 1, 2 and 3 bolting. For ASME Code Class 1, 2, and 3, and non-ASME Code class bolts, periodic system walkdowns and inspections (at least once per refueling cycle) ensure identification of indications of loss of preload (leakage), cracking, and loss of material before leakage becomes excessive. Visual inspection methods are effective in detecting the applicable aging effects, and the frequency of inspection is adequate to ensure that actions are taken to prevent significant age-related degradation. Identified leaking bolted connections will be monitored at an increased frequency in accordance with the PTN corrective action program (CAP). This AMP supplements the inspection activities required by ASME Code Section XI for ASME Code Class 1, 2 and 3 bolting. Pressure-retaining bolted connections are inspected at least once per refueling cycle as part of ASME Code Section XI leakage tests. For inaccessible components, accessible components with similar materials and environments will be inspected. Inspections within the scope of the ASME Code follow procedures consistent with the ASME Code. Non-ASME Code inspections follow site procedures that include inspection parameters for items such as lighting and distance offset that provide an adequate examination. For ASME Code Class 1, 2, and 3, and non-ASME Code class bolts, periodic system walkdowns and inspections (at least once per refueling cycle) ensure identification of indications of loss of preload (leakage), cracking, and loss of material before leakage becomes excessive. Visual inspection methods are effective in detecting the applicable aging effects, and the frequency of inspection is adequate to ensure that actions are taken to prevent significant age-related degradation. Identified leaking bolted connections will be monitored at an increased frequency in accordance with the PTN corrective action program. The inspection includes a representative sample of 20 percent of the population of bolt heads and threads (defined as bolts with the same material and environment combination) or a maximum of 25 bolts per population at each unit.

Submerged closure bolting that precludes detection of joint leakage is inspected visually for loss of material during maintenance activities. Bolt heads are inspected when made accessible and bolt threads are inspected when joints are disassembled. In each 10-year period during SPEO, a representative sample of bolt heads and threads is inspected. If opportunistic maintenance activities do not provide access to 20 percent of the population (for a material/environment combination) up to a maximum of 25 bolt heads and threads over a 10-year period, then the integrity of the bolted joint will be evaluated on a case-by-case basis using methods, such as periodic pump vibration measurements taken and trended or sump pump operator walkdowns performed to demonstrate that the pumps are appropriately maintaining sump levels.

Because leakage is difficult to detect for bolted joints that contain air or gas, the associated closure bolting will be evaluated on a case-by-case basis using one of the following methods:

- Inspections are performed consistent with that of submerged closure bolting; C31

- A visual inspection for discoloration is conducted (applies when leakage of the environment inside the piping systems would discolor the external surfaces);

- Monitoring and trending of pressure decay is performed when the bolted connection is located within an isolated boundary

- Soap bubble testing is performed; or

- Thermography testing is performed (applies when the temperature of the fluid is higher than ambient conditions).

For component joints that are not normally pressurized, the aging effects associated with closure bolting will be managed by checking the torque to the extent that the closure bolting is not loose.

Indications of aging are evaluated in accordance with Section XI of the ASME Code. Leaking joints do not meet acceptance criteria. When alternative inspections or testing is necessary, site-specific acceptance criteria will be used.

17.2.2.10 STEAM GENERATORS

The PTN Steam Generators AMP is an existing AMP, previously the PTN Steam Generator Integrity Program, which ensures steam generator integrity is maintained under normal operating, transient, and postulated accident conditions. This AMP manages the aging of steam generator tubes, plugs, divider plates, interior surfaces of channel heads, tubesheets (primary side), and secondary side components that are contained within the steam generator (i.e., secondary side internals). However, the tube-to-tubesheet welds of the PTN steam generators are exempt from inspection and monitoring per the NRC Safety Evaluation Report (SER) (Turkey Point Nuclear Generating Station Unit Nos. 3 and 4-Issuance of Amendments Regarding Permanent Alternative Repair Criteria for Steam Generator Tubes, Accession Number ML12292A342, November 5, 2012) for permanent Alternate Repair Criteria (H*) for steam generator tubes.

The aging of steam generator pressure vessel welds is managed by other AMPs, such as the PTN ASME Section XI ISI, Subsections IWB, IWC, and IWD, AMP (Section 17.2.2.1) and the PTN Water Chemistry AMP (Section 17.2.2.2).

The establishment of a steam generator program for ensuring steam generator tube integrity is required by the PTN Technical Specifications (TS), Sections 3/4.4.5 and 6.8.4.j. Additionally, Admin Control 6.8.4.j requires tube integrity to be maintained to specific performance criteria, condition monitoring requirements, inspection scope and frequency, acceptance criteria for the plugging or repair of flawed tubes, acceptable tube repair methods, and leakage monitoring requirements. The nondestructive examination (NDE) techniques used to inspect steam generator components covered by this AMP are intended to identify components (e.g., tubes, plugs) with degradation that may need to be removed from service (e.g., tubes), repaired, or replaced, as appropriate.

The AMP is modeled after NEI 97-06, "Steam Generator Program Guidelines." As such, this AMP incorporates of the following industry guidelines: EPRI-1013706, "PWR Steam Generator Examination Guidelines," EPRI-1022832, "PWR Primary-to-Secondary Leak Guidelines," EPRI 1014986, "Pressurized Water Reactor Primary Water Chemistry Guidelines," EPRI 1016555, "Pressurized Water Reactor Secondary Water Chemistry Guidelines," EPRI-3002007571, "Steam Generator Integrity Assessment Guidelines," and EPRI 1025132, "Steam Generator In-Situ Pressure Test Guidelines." C31

The AMP performs volumetric examination on steam generator tubes in accordance with the requirements in the PTN TS to detect aging effects, if they should occur. This AMP also performs general visual inspections of the steam generator heads (internal surfaces) looking for evidence of cracking or loss of material (e.g., rust stains) at least every 72 effective full power months or every third refueling outage, whichever results in more frequent inspections. The AMP also includes foreign material exclusion as a means to inhibit wear degradation, and secondary side maintenance activities, such as sludge lancing, for removing deposits that may contribute to component degradation.

17.2.2.11 OPEN CYCLE COOLING WATER SYSTEM

The PTN Open-Cycle Cooling Water (OCCW) System AMP is an existing AMP, previously the PTN Intake Cooling Water (ICW) System Inspection Program, that relies, in part, on implementing the PTN response to the recommendations of NRC GL 89-13, "Service Water System Problems Affecting Safety-Related Equipment," to provide reasonable assurance that the effects of aging on the OCCW system (or ICW system at PTN), are managed for the SPEO.

The Open-Cycle Cooling Water (OCCW) System AMP will include the following SSC scope:

(a) Portions of the ICW pump casings that are exposed to a raw water environment;

(b) Piping and piping components from the ICW pump discharge flanges to the inlet flanges of the component cooling water (CCW) heat exchangers; and

(c) Piping and piping components from the ICW pump discharge flanges to the turbine plant cooling water (TPCW) baskets strainers.

NRC GL 89-13 defines the OCCW system as a system or systems that transfer heat from safety-related SSCs to the ultimate heat sink (UHS). This AMP is comprised of the aging management aspects of the PTN response to NRC GL 89-13, including:

(a) A program of surveillance and control techniques to significantly reduce the incidence of flow blockage problems as a result of biofouling;

(b) A program to verify heat transfer capabilities of all safety-related heat exchangers cooled by the OCCW system, and;

(c) A program for routine inspection and maintenance to provide reasonable assurance that loss of material, corrosion, erosion, protective coating failure, cracking, fouling, and biofouling cannot degrade the performance of safety-related systems serviced by the OCCW system.

This AMP manages aging effects, which include loss of material due to various corrosion mechanisms, SCC, and biological fouling of components in raw water systems, such as the PTN ICW system, by using a combination of preventive, condition monitoring, and performance monitoring activities. These activities include: C31

(a) Surveillance and control techniques to in the OCCW system or SCs serviced by the OCCW system;

(b) Inspection of components for signs of loss of material, corrosion, erosion, cracking, fouling, and biofouling, and;

(c) Testing of the heat transfer capability of heat exchangers that remove heat from components important to safety.

The PTN OCCW System AMP also manages the loss of coating integrity for internal coatings of piping within the scope of this AMP. This AMP includes the guidance provided in the "scope of program" elements of the PTN Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP to manage loss of coating integrity.

17.2.2.12 CLOSED TREATED WATER SYSTEM

The PTN Closed Treated Water Systems AMP is an existing AMP, formerly a portion of the PTN Chemistry Control Program and the PTN Systems and Structures Monitoring Program. This AMP manages the aging effects of loss of material due to corrosion, cracking due to SCC, and reduction of heat transfer due to fouling of the internal surfaces of piping, piping components, piping elements and heat exchanger components fabricated from any material and exposed to treated water. The aging effects are minimized or prevented by controlling the chemical species that cause the underlying mechanism(s) that result in these aging effects. This AMP is a mitigation program that also includes a condition monitoring program to verify the effectiveness of the mitigation activities. The AMP consists of:

(a) Water treatment, including the use of corrosion inhibitors, to modify the chemical composition of the water such that the function of the equipment is maintained and such that the effects of corrosion are minimized;

(b) Chemical and microbiological testing of the water to demonstrate that the water treatment program maintains the water chemistry and microbiological organisms within acceptable guidelines and;

(c) Component inspections/testing to determine the presence or extent of component degradation, and corrective actions as required based on these inspections.

This AMP uses the 2013 version of EPRI TR-3002000590, "Closed Cooling Water Chemistry Guideline," as applicable, and includes microbiological testing. EPRI TR-3002000590 is used rather than the NUREG-2191 recommended standard, EPRI 1007820, because EPRI TR-3002000590 supersedes EPRI 1007820. The newer EPRI guideline document encompasses new technology and captures lessons learned and industry OE.

17.2.2.13 INSPECTION OF OVERHEAD HEAVY LOAD AND LIGHT LOAD (RELATED TO REFUELING) HANDLING SYSTEMS

C31

The PTN Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems AMP is an existing AMP (formerly part of the PTN Systems and Structures Monitoring Program). This AMP evaluates the effectiveness of maintenance monitoring activities for cranes and hoists that are within the scope of SLR. This AMP also addresses the inspection and monitoring of crane-related SCs to provide reasonable assurance that the handling system does not affect the intended function of nearby safety-related equipment. This AMP includes periodic visual inspections to detect loss of material due to corrosion, deformation, wear, cracking, fouling, loss of seal, and change in material properties, and indications of loss of preload for load handling bridges, structural members, structural components, and bolted connections. This AMP also includes corrective actions as required based on these inspections. This AMP relies on the guidance in NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," ASME B30.2, “Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist),” ASME B30.11, “Monorails and Underhung Cranes,” and other appropriate standards in the ASME B30 series. These cranes also comply with the maintenance rule requirements provided in 10 CFR 50.65.

17.2.2.14 COMPRESSED AIR MONITORING

The PTN Compressed Air Monitoring AMP is an existing AMP, that was formerly encompassed by the plant instrument air monitoring activities. This AMP manages loss of material due to corrosion in compressed air systems and supplied components within the scope of SLR through (a) preventive monitoring for water (moisture) and other contaminants, and (b) opportunistic inspection of component internal surfaces for indications of corrosion. This AMP ensures that compressed air system conditions remain as designed, such that moisture is not collecting in compressed air systems or supplied components and that air quality is retained so that loss of material due to corrosion is not occurring in the “dry air”. Moisture sensors at the outlet of the air dryers continuously monitor inline dew point. Opportunistic internal visual inspections of critical components and other components are performed for signs of loss of material due to corrosion. The PTN Compressed Air Monitoring AMP is based on commitments made in response to NRC GL 88-14, and incorporates industry guidance (such as INPO SOER 88-01, ASME OM-2012, ANSI/ISA 7.0.1, and EPRI TR-101847), as warranted.

17.2.2.15 FIRE PROTECTION

The PTN Fire Protection AMP is an existing AMP, formerly a portion of the PTN Fire Protection Program. This AMP manages aging effects (loss of material, cracking, and loss of seal) associated with fire barriers and non-water suppression systems (halon systems). The PTN Fire Protection AMP includes fire barrier inspections. The fire barrier inspection portion of this AMP requires periodic visual inspection of fire barrier penetration seals, fire barrier walls, ceilings, floors, fire damper assemblies, as well as periodic visual inspection and functional tests of fire-rated doors so that their operability is maintained. The PTN Fire Protection AMP also includes periodic inspection and testing of the halon fire suppression systems. See UFSAR Section 9.6.1 for additional information on the PTN Fire Protection Program.

With respect to preventive actions, PTN has adopted the National Fire Protection Association (NFPA) 805 fire protection program to meet the requirements of 10 CFR 50.48(c) and ensure that regulatory requirements are met for fire prevention, fire detection, fire suppression, and fire containment and alternative shutdown capability for each fire area containing SSCs important to safety.

Inspection results are acceptable if there are no signs of degradation that could result in the loss of the fire protection capability due to loss of material. The acceptance criteria include: C31

(a) No visual indications (outside of those allowed by approved penetration seal configurations) of cracking, separation of seals from walls and components, separation of layers of material, or ruptures or punctures of seals;

(b) No significant indications of cracking and loss of material of fire barrier walls, ceilings, floors, and in other fire barrier materials;

(c) No visual indications of missing parts, holes, and wear; and

(d) No deficiencies in the functional tests of fire doors (i.e., the door swings easily, freely, and achieves positive latching).

Periodic inspections and hydro testing of the halon fire suppression system are performed to demonstrate that it is functional, and the surface condition of the halon system components is inspected for corrosion, nozzle obstructions, and other damage.

Visual inspection of at least 10 percent of each type of sealed penetration is performed at a frequency of every 18 months, which is in accordance with the NRC-approved fire protection program. Visual inspections on fire-rated assemblies (fire barrier walls, ceilings, floors, and other fire barrier materials including structural steel fire proofing) are conducted at a frequency of at least once every three years. Periodic visual inspections and functional tests are conducted on fire doors and their closing mechanism and latches are verified functional at least once per 12 months. Visual inspection on the fire damper assemblies are conducted at a frequency of once every three years.

The results of inspections and functional testing of the in-scope fire protection equipment are collected, analyzed, and summarized by engineers in health reports. The system and program health reporting procedures identifies adverse trends and prescribes preemptive corrective actions to prevent further degradation or future failures. When performance degrades to unacceptable levels, the PTN CAP is utilized to drive improvement. During the inspection of penetration seals, if any sign of abnormal degradation is detected within the sample, the inspection sample size is expanded, in accordance with the approved PTN fire protection program, to include an additional 10 percent of each type of sealed penetration.

17.2.2.16 FIRE WATER SYSTEM

The PTN Fire Water System AMP is an existing AMP, formerly a portion of the PTN Fire Protection Program. This AMP is a condition monitoring program that manages aging effects associated with water-based fire protection system (FPS) components. This AMP manages loss of material, cracking, and flow blockage due to fouling by conducting periodic visual inspections, tests, and flushes performed in accordance with the 2011 Edition of NFPA 25. Testing or replacement of sprinklers that have been in place for 50 years is performed in accordance with NFPA 25. In addition to NFPA codes and standards, portions of the water-based FPS that are: (a) normally dry but periodically subjected to flow and (b) cannot be drained or allow water to collect are subjected to augmented testing beyond that specified in NFPA 25, including:

(a) periodic system full flow tests at the design pressure and flow rate or internal visual inspections and (b) piping volumetric wall-thickness examinations.

The water-based FPS is normally maintained at required operating pressure and is monitored such that loss of system pressure is immediately detected and corrective actions are initiated. Piping wall thickness measurements are conducted when visual inspections detect surface irregularities indicative of unexpected levels of degradation. When the presence of organic or inorganic material is detected, and is sufficient enough to obstruct piping or sprinklers, then the material is removed, the source of the material is identified, and the source is corrected. Inspections and tests follow site procedures that include inspection parameters for items such as lighting, distance offset, presence of protective coatings, and cleaning processes for an adequate examination. See UFSAR Section 9.6 for more information on the PTN Fire Protection Program. C31

17.2.2.17 OUTDOOR AND LARGE ATMOSPHERIC METALLIC STORAGE TANKS

The PTN Outdoor and Large Atmospheric Metallic Storage Tanks AMP is an existing condition monitoring AMP that manages loss of material. One-time inspections were performed by the PTN Field Erected Tanks Internal Inspection Program for original license renewal. Other plant documents control inspections or activities of the various outdoor storage tanks in the scope of the AMP. The condensate storage tanks (CSTs), common demineralized water storage tank (DWST), refueling water storage tanks (RWSTs), and Unit 3 emergency diesel generator (EDG) fuel oil storage tank (FOST), and the primary water storage tanks (PWSTs) comprise the scope of this AMP.

This AMP includes thickness measurements of tank bottoms to detect degradation and ensure corrosion from the inaccessible undersides will not cause a loss of intended tank function. The AMP also includes periodic visual inspection of tank internal surfaces and external tank-to-concrete interface. Inspections are conducted in accordance with site/fleet procedures that include inspection parameters such as lighting, distance, offset, and surface condition.

The PTN Outdoor and Large Atmospheric Metallic Storage Tanks AMP also manages loss of material on the exterior and interior surfaces of metallic aboveground tanks founded on concrete. The tanks in the scope of the AMP are steel and are un-insulated. External surfaces, other than the tank-to-concrete interface, are accessible and inspected through the External Surfaces Monitoring of Mechanical Components AMP (Section 17.2.2.23) or Structures Monitoring AMP (Section 17.2.2.35). The Water Chemistry AMP (Section 17.2.2.2) and Fuel Oil Chemistry AMP (Section 17.2.2.18) are mitigative AMPs whose effectiveness is verified by the One-Time Inspection AMP (Section 17.2.2.20). Protective coatings/linings inside the tanks in the scope of the PTN Outdoor and Large Atmospheric Metallic Storage Tanks AMP are inspected for loss of lining integrity by the Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP (Section 17.2.2.29).

17.2.2.18 FUEL OIL CHEMISTRY

C31

The PTN Fuel Oil Chemistry AMP is an existing AMP that was formerly a portion of the PTN Chemistry Control Program. This AMP manages loss of material and fouling in piping and components exposed to an environment of diesel fuel oil by verifying the quality of fuel oil and controlling fuel oil contamination, as well as periodic draining, cleaning, and inspection of tanks. The scope of the PTN Fuel Oil Chemistry AMP includes the Unit 3 and 4 EDG FOSTs, the Unit 3 and 4 EDG day tanks, the Unit 3 EDG skid-mounted tanks, piping and other metal components subject to AMR that are exposed to an environment of diesel fuel oil. The scope of the AMP also includes piping, piping components, and fuel tanks associated with the diesel-driven fire pump and the diesel-driven standby steam generator feedwater (SSGF) pump that are exposed to an environment of diesel fuel. Acceptance criteria for fuel oil quality parameters are in accordance with the PTN TS, ASTM D 975, and NRC RG 1.137.

This AMP includes (a) surveillance and maintenance procedures to mitigate corrosion, and (b) measures to verify the effectiveness of the mitigative actions and confirm the insignificance of an aging effect. Fuel oil quality is maintained by monitoring and controlling fuel oil contamination in accordance with the PTN TS LCO 3/4.8.1. Exposure to fuel oil contaminants, such as water and microbiological organisms, is minimized by periodic draining or cleaning of tanks, and by verifying the quality of new oil before its introduction into the storage tanks. However, corrosion may occur at locations in which contaminants may accumulate, such as tank bottoms.

Accordingly, effectiveness is verified by the One-Time Inspection AMP (Section 17.2.2.20) to provide reasonable assurance that significant degradation is identified and adequately managed and that the component intended function is maintained during the SPEO.

17.2.2.19 REACTOR VESSEL MATERIAL SURVEILLANCE

The PTN Reactor Vessel Material Surveillance AMP is an existing AMP, formerly a portion of the PTN Reactor Vessel Integrity Program. This AMP includes withdrawal and testing of the X4 surveillance capsule, identified in UFSAR Table 4.4-2. This capsule is demonstrated as being within one to two times the peak reactor vessel neutron fluence of interest at 67 EFPY. This capsule will be within one to two times the peak reactor vessel neutron (72 EFPY) fluence at the end of the SPEO with a minimal adjustment to the approved withdrawal schedule. The surveillance program adheres to the requirements of 10 CFR Part 50, Appendix H, as well as the American Society for Testing Materials (ASTM) standards incorporated by reference in 10 CFR Part 50, Appendix H. The surveillance capsule withdrawal schedule is per Attachment 1 of the PTN Reactor Material Surveillance Program. Surveillance capsules are designed and located to permit insertion of replacement capsules.

C31

Title 10 of the Code of Federal Regulations (10 CFR) Part 50, Appendix H, requires implementation of a reactor vessel material surveillance program when the peak neutron fluence at the end of the design life of the vessel is projected to exceed 10^{17} n/cm^2 (E > 1 MeV). The purpose of the PTN Reactor Vessel Material Surveillance AMP is to monitor the changes in fracture toughness to the ferritic reactor vessel beltline materials. As described in RIS 2014-11, beltline materials are those ferritic reactor vessel materials with a projected neutron fluence greater than 10^{17} n/cm^2 (E > 1 MeV) at the end of the license period (for example, the SPEO), which are evaluated to identify the extent of neutron radiation embrittlement for the material. The surveillance capsules contain reactor vessel material specimens and are located near the inside vessel wall in the beltline region so that the specimens duplicate, as closely as possible, the neutron spectrum, temperature history, and maximum neutron fluence experienced at the reactor vessel's inner surface. Because of the location of the capsules between the reactor core and the reactor vessel wall, surveillance capsules typically receive neutron fluence exposures that are higher than the inner surface of the reactor vessel. This allows surveillance capsules to be withdrawn and tested prior to the inner surface receiving an equivalent neutron fluence so that the surveillance test results provide leading indication on the level of vessel embrittlement.

FPL was a member of the Babcock & Wilcox Owners Group (B&WOG) reactor vessel working group. The B&WOG designed an irradiation surveillance program (Master Integrated Reactor Vessel Program, MIRVP) in which member materials are irradiated at host plants. PTN materials are being irradiated in both reactor vessels (Units 3 and 4) at the site and in the MIRVP. The MIRVP Charpy values and direct fracture toughness (master curve) data are used as supplemental data. To date, this program has developed one set of Charpy values and two sets of irradiated "master curve" data relative to the PTN beltline materials. The PWROG is now the mechanism for the previous B&WOG reactor vessel working group activities. FPL is a member of the PWROG. Changes or updated to the MIRVP are submitted to the NRC for review and approval. However, the implementation of the MIRVP in this Reactor Vessel Material Surveillance AMP is only for supplemental data and is not a part of the NRC approved surveillance program. This AMP relies fully on onsite capsules.

The objective of the PTN Reactor Vessel Material Surveillance AMP is to provide sufficient material data and dosimetry to (a) monitor irradiation embrittlement (IE) to a neutron fluence level that is greater than the projected peak neutron fluence of interest projected to the end of the SPEO, and (b) provide adequate dosimetry monitoring during the SPEO. Dosimetry monitoring during the SPEO is performed as described in the PTN Neutron Fluence Monitoring AMP.

The PTN Reactor Vessel Material Surveillance AMP is a condition monitoring program that measures the increase in Charpy V-notch 30 foot-pound (ft-lb) transition temperature and the drop in the upper-shelf energy (USE) as a function of neutron fluence and irradiation temperature. The data from this surveillance program are used to monitor neutron IE of the reactor vessel, and are inputs to the neutron embrittlement TLAAs. The PTN Reactor Vessel Material Surveillance AMP is also used in conjunction with the proposed PTN Neutron Fluence Monitoring AMP.

All surveillance capsules, including those previously withdrawn from the reactor vessel, must meet the test procedures and reporting requirements of the applicable ASTM standards referenced in 10 CFR Part 50, Appendix H, to the extent practicable, for the configuration of the specimens in the capsule. Any changes to the surveillance capsule withdrawal schedule must be approved by the NRC prior to implementation, in accordance with 10 CFR Part 50, Appendix H, Paragraph III.B.3.

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17.2.2.20 ONE-TIME INSPECTION

The PTN One-Time Inspection AMP is a new AMP that consists of a one-time inspection of selected components to accomplish the following:

(a) Verify the system-wide effectiveness of an AMP that is designed to prevent or minimize aging to the extent that it will not cause the loss of intended function during the SPEO. The aging effects evaluated are loss of material, cracking, fouling, and long-term loss of material for steel components exposed to environments that do not include corrosion inhibitors as a preventive action.

(b) Confirm the insignificance of an aging effect for situations in which additional confirmation is appropriate using inspections that verify unacceptable degradation is not occurring.

(c) Trigger additional actions that ensure the intended functions of affected components are maintained during the SPEO.

The PTN One-Time Inspection AMP manages systems and components that credit the PTN Water Chemistry (Section 17.2.2.2), Fuel Oil Chemistry (Section 17.2.2.18), and Lubricating Oil Analysis (Section 17.2.2.26) AMPs.

Determination of the sample size is based on 20 percent of the components in each material-environment-aging effect group up to a maximum of 25 components per unit. The sample size of components will also be based on OE. Identification of inspection locations are based on the potential for the aging effect to occur. Examination techniques are established NDE methods with a demonstrated history of effectiveness in detecting the aging effect of concern, including visual, ultrasonic, and surface techniques. Acceptance criteria are based on applicable ASME or other appropriate standards, design basis information, or vendor-specified requirements and recommendations. The need for follow-up examinations are evaluated based on inspection results if age-related degradation is found that could jeopardize an intended function before the end of the SPEO. This AMP also performs an augmented inspection of the transition cone weld of the steam generators to verify the effectiveness of the water chemistry program.

The PTN One-Time Inspection AMP will not be used for SCs with known, age-related degradation mechanisms, or when the material-environment-aging effect group in the SPEO is not expected to be equivalent to that in the prior operating period. In these cases, periodic site-specific inspections are performed. Inspections not conducted in accordance with ASME Code Section XI requirements are conducted in accordance with site-specific procedures, including inspection parameters such as lighting, distance, offset, and surface conditions.

17.2.2.21 SELECTIVE LEACHING

The PTN Selective Leaching AMP is a new AMP. This AMP is a condition monitoring AMP that includes inspection for components that may be susceptible to loss of material due to selective leaching by demonstrating the absence of selective leaching (dealloying) of materials.

The AMP includes periodic inspections for components that are exposed to raw water, treated water, waste water, lubricating oil, or soil environments. The AMP also includes opportunistic inspections whenever components are opened, or whenever buried or submerged surfaces are exposed., Periodic inspections are conducted at an interval of no greater than every 10 years during the SPEO.

The scope of this AMP includes components made of gray cast iron, cast iron, ductile iron, and copper alloys (except for inhibited brass) that contain greater than 15 percent zinc or greater than 8 percent aluminum exposed to a raw water, treated water, waste water, lubricating oil, or soil environment. The AMP includes opportunistic and periodic visual inspections of selected components that are susceptible to selective leaching, coupled with mechanical examination techniques (e.g., chipping, scraping). Destructive examinations of components to determine the presence of and depth of dealloying through-wall thickness are also conducted. These techniques can determine whether loss of material due to selective leaching is occurring and whether selective leaching will affect the ability of the components to perform their intended function for the SPEO. Inspections are conducted in accordance with site-specific procedures, including inspection parameters such as lighting, distance, offset, and surface conditions. When the acceptance criteria are not met such that it is determined that the affected component should be replaced prior to the end of the SPEO, additional inspections are performed. C31

The periodic inspections for these populations at each unit comprises a percent sample or a maximum of 10 components. Gray cast iron, cast iron, and ductile iron components will be visually and mechanically inspected, and the rest will be visually inspected. In addition, for populations having 35 or more susceptible components, two destructive examinations will be performed for each material and environment population in each 10-year inspection interval at each unit. For each population with less than 35 susceptible components, one destructive examination will be performed.

When the acceptance criteria are not met such that it is determined that the affected component should be replaced prior to the end of the SPEO, additional inspections are performed if the cause of the aging effect for each applicable material and environment is not corrected by repair or replacement for all components constructed of the same material and exposed to the same environment. The number of additional inspections is equal to the number of failed inspections for each material and environment population, with a minimum of five additional visual and mechanical inspections when visual and mechanical inspection(s) did not meet acceptance criteria, or 20 percent of each applicable material and environment combination is inspected, whichever is less, and a minimum of one additional destructive examination when destruction examination(s) did not meet acceptance criteria.

17.2.2.22 ASME CODE CLASS 1 SMALL-BORE PIPING

The PTN ASME Code Class 1 Small-Bore Piping AMP is an existing AMP that was formerly the PTN Small Bore Class 1 Piping Inspection Program. This AMP is a condition monitoring AMP for detecting cracking in small-bore, ASME Code Class 1 piping. This AMP supplements the ISI specified by ASME Code, Section XI, for certain ASME Code Class 1 piping that is less than inches in nominal pipe size (NPS) and greater than or equal to 1 inch NPS. The scope of this AMP includes pipes, fittings, branch connections, and all full and partial penetration (socket) welds. This AMP includes measures to verify that degradation is not occurring, thereby confirming that there is no need to manage age related degradation.

Industry OE demonstrates that welds in ASME Code Class 1 small-bore piping are susceptible to stress corrosion cracking (SCC) and cracking due to thermal or vibratory fatigue loading. Such cracking is frequently initiated from the inside diameter of the piping; therefore, volumetric examinations are needed to detect cracks. However, ASME Code, Section XI, generally does not call for volumetric examinations of this class and size of piping. This AMP supplements the ASME Code, Section XI, examinations with volumetric examinations, or alternatively, destructive examinations, to detect cracks that may originate from the inside diameter of butt welds, socket welds, and their base metal materials. The examination schedule and extent is based on site-specific OE and whether actions have been implemented that would successfully mitigate the causes of any past cracking. C31

A one-time inspection to detect cracking resulting from thermal and mechanical loading, vibration, or intergranular stress corrosion of full penetration welds are performed by volumetric examination. A one-time inspection to detect cracking in socket welds are performed by either volumetric or destructive examination. These inspections will provide additional assurance that either aging of small-bore ASME Code Class 1 piping is not occurring or the aging is insignificant. Should evidence of cracking be revealed by the one-time inspections, a periodic inspection plan is implemented in accordance with NUREG-2191 Table XI.M35-1.

A volumetric inspection of a sample (sample size as specified in NUREG-2191, Table XI.M35-1) of small bore Class 1 piping and nozzles are performed to determine if cracking is an aging effect requiring management during the SPEO. Per NUREG-2191, Table XI.M35-1, PTN is a Category A plant because it has no history of age-related cracking. Per category A, the inspection will be a one-time inspection with a sample size of at least 3 percent, up to a maximum of 10 welds, of each weld type, for each operating unit using a methodology to select the most susceptible and risk-significant welds. For socket welds, destructive examination may be performed in lieu of volumetric examinations. Because more information can be obtained from a destructive examination than from nondestructive examination, credit will be taken for each weld destructively examined equivalent to having volumetrically examined two welds. If an acceptable volumetric technique cannot be used to perform a volumetric inspection, then a destructive examination is performed. For each socket weld that is destructively examined, credit may be taken as being equivalent to volumetrically examining two socket welds. Based on the results of these inspections, the need for additional inspections or programmatic corrective actions is then established. The inspections are performed prior to the SPEO for PTN Units 3 and 4.

17.2.2.23 EXTERNAL SURFACES MONITORING OF MECHANICAL COMPONENTS

The PTN External Surfaces Monitoring of Mechanical Components AMP is an existing AMP that was formerly a portion of the PTN Systems and Structures Monitoring Program and other site-specific programs. This AMP is a condition monitoring program that manages loss of material, cracking, hardening or loss of strength (of elastomeric components), loss of seal, reduced thermal insulation resistance, loss of preload for ducting closure bolting, reduction of heat transfer due to fouling (air to fluid heat exchangers), and reduction of thermal insulation resistance due to moisture intrusion. This AMP also inspects the integrity of coated surfaces as an effective method for managing the effects of corrosion on the metallic surfaces.

This AMP provides for periodic visual inspection and examination for degradation of accessible surfaces of specific SSCs, and corrective actions, as required, based on these inspections. Periodic visual inspections, not to exceed a refueling outage interval, of metallic, polymeric, and insulation jacketing (insulation when not jacketed) are conducted. Surface examinations or ASME Code Section XI VT-1 examinations are conducted to detect cracking of stainless steel (SS) and aluminum components. C31

For certain materials, such as flexible polymers, physical manipulation or pressurization to detect hardening or loss of strength or reduction in impact strength is used to augment the visual examinations conducted under this AMP. A sample of outdoor component surfaces that are insulated and a sample of indoor insulated components exposed to condensation (due to the in-scope component being operated below the dew point) are periodically inspected every 10 years during the SPEO. Inspections not conducted in accordance with ASME Code Section XI requirements are conducted in accordance with site-specific procedures, including inspection parameters such as lighting, distance, offset, and surface conditions. Acceptance criteria are such that the component will meet its intended function until the next inspection or the end of the SPEO. Qualitative acceptance criteria are clear enough to reasonably assure a singular decision is derived based on observed conditions.

17.2.2.24 FLUX THIMBLE TUBE INSPECTION

The PTN Flux Thimble Tube Inspection AMP is an existing AMP that was formerly the PTN Thimble Tube Inspection Program. This AMP is a condition monitoring program that is used to inspect for thinning of the flux thimble tube wall, which provides a path for the incore neutron flux monitoring system detectors and forms part of the RCS pressure boundary. This AMP manages the aging effect of material loss due to fretting wear.

The flux thimble tube inspection associated with this AMP encompasses all of the flux thimble tubes that form part of the RCS pressure boundary. This AMP monitors flux thimble tube wall thickness to detect loss of material from the flux thimble tubes during the SPEO. The flux thimble tubes are subject to loss of material at certain locations in the reactor vessel where flow-induced fretting causes wear at discontinuities in the path from the reactor vessel instrument nozzle to the fuel assembly instrument guide tube. Periodic Bobbin coil eddy current testing (ECT) is used to monitor for loss of material and wear of the flux thimble tubes during the SPEO. This inspection AMP implements the recommendations of NRC Bulletin 88 09, "Thimble Tube Thinning in Westinghouse Reactors."

17.2.2.25 INSPECTION OF INTERNAL SURFACES IN MISCELLANEOUS PIPING AND DUCTING COMPONENTS

The PTN Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP is a new condition monitoring program that manages the aging effects of loss of material, cracking, erosion, reduction of heat transfer due to fouling, flow blockage, and hardening or loss of strength of elastomeric and polymeric materials. Some of inspections and activities within the scope of this new AMP were previously performed by the PTN Systems and Structures Monitoring Program, the PTN Periodic Surveillance and Preventive Maintenance Program, and other site-specific programs.

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This AMP consists of visual inspections and, when appropriate, surface examinations of specific SSCs with accessible internal surfaces of piping, piping components, ducting, heat exchanger components, polymeric and elastomeric components, and other components exposed to potentially aggressive environments. These environments include air, air with borated water leakage, condensation, gas, diesel exhaust, fuel oil, lubricating oil, and any water-filled systems not managed by another AMP. For certain materials, such as flexible polymers, physical manipulation or pressurization to detect hardening or loss of strength is used to augment the visual examinations conducted under this AMP. This AMP also performs surface examinations or ASME Code Section XI VT-1 examinations to detect and manage cracking due to SCC in aluminum and SS components exposed to aqueous solutions and air environments containing halides.

These internal inspections are performed during the periodic system and component surveillances or during the performance of maintenance activities when the surfaces are made accessible for visual inspection. At a minimum, in each 10-year period during the SPEO, a representative sample of 20 percent of the population (defined as components having the same combination of material, environment, and aging effect) or a maximum of 19 components per unit is inspected for the in-scope aging effects. The maximum of 19 components per unit for inspection is used in lieu of 25 components per unit due to PTN being a two-unit plant with sufficiently similar operating conditions at each unit (e.g., flowrate, chemistry, temperature, and excursions), similar time in operation for each unit, similar water sources, and similar operating frequency.

Where practical, the inspections focus on the bounding or lead components most susceptible to aging because of time in service and the severity of operating conditions. Opportunistic inspections continue in each period despite meeting the sampling limit. For certain materials, such as flexible polymers, physical manipulation or pressurization to detect hardening or loss of strength is used to augment the visual examinations conducted under this AMP.

Inspections not conducted in accordance with ASME Code Section XI requirements are conducted in accordance with site-specific procedures, including inspection parameters for items such as lighting, distance offset, surface coverage, presence of protective coatings, and cleaning processes. Acceptance criteria are such that the component will meet its intended function until the next inspection or the end of the SPEO. Where practical, acceptance criteria are quantitative (e.g., minimum wall thickness, percent shrinkage allowed in an elastomeric seal). Where qualitative acceptance criteria are used, the criteria are clear enough to reasonably assure a singular decision is derived based on observed conditions. Corrective actions are performed as required based on the inspection results.

The PTN Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP will also perform periodic ultrasonic thickness measurements of the limiting emergency containment cooler tubes every 10 years or as determined by the calculated wear rate, whichever is more frequent. Based on the data collected during the inspections, the wear rates will be used to ensure the coolers can perform their intended function throughout the SPEO.

This AMP is not intended for use on components in which recurring internal corrosion is evident based on a search of site-specific OE conducted during the SLRA development. Except for elastomers and flexible polymeric components, aging effects associated with items within the scope of the Open-Cycle Cooling Water System AMP (Section 17.2.2.11), Closed Treated Water Systems AMP (Section 17.2.2.12), and Fire Water System AMP (Section 17.2.2.16) are not managed by the PTN Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP.

This AMP is also used to manage loss of material and long-term loss of material for the carbon steel containment spray headers that are exposed to treated borated water. This AMP periodically uses ultrasonic thickness measurements to determine which portions of carbon steel piping should be inspected more frequently or replaced to ensure the containment spray system is capable of performing its intended function. C31

17.2.2.26 LUBRICATING OIL ANALYSIS

The PTN Lubricating Oil Analysis AMP is an existing AMP, previously performed as part of the plants' predictive maintenance. This AMP provides reasonable assurance that the oil environment in the mechanical systems is maintained to the required quality, and the oil systems are maintained free of contaminants (primarily water and particulates), thereby preserving an environment that is not conducive to loss of material or reduction of heat transfer. Testing activities include sampling and analysis of lubricating oil for detrimental contaminants. The presence of water or particulates may also indicate in-leakage and corrosion product buildup.

17.2.2.27 MONITORING OF NEUTRON-ABSORBING MATERIALS OTHER THAN BORAFLEX

The PTN Monitoring of Neutron-Absorbing Materials other than Boraflex AMP, formerly the PTN Metamic® Insert Surveillance Program, is an existing condition monitoring program that is implemented to ensure that degradation of the neutron-absorbing material used in spent fuel pools, that could compromise the criticality analysis, will be detected. This AMP relies on periodic inspection, testing, monitoring, and analysis of the criticality design to ensure that the required 5 percent subcriticality margin is maintained during the SPEO.

Surveillance testing is only applicable to those inserts and coupons installed in the "lead unit" unless a condition is identified that warrants testing of the inserts on the "non-lead unit." The frequency inspection and testing depends on the condition of the neutron-absorbing material and is determined and justified with PTN-specific operating experience (OE), the maximum interval between each inspection and between each inspection or test is not to exceed 10 years, regardless of operating experience (OE).

The Metamic® insert surveillance procedure selects the Metamic® inserts that are to be inspected based on the following:

- Results from site receipt and pre-installation inspections (i.e., inserts shall be selected if they have more pre-existing conditions).
- Experience gained during installation (i.e., select inserts that experienced higher insertion or removal forces).
- Post-installation spatial distribution of inserts in Region II racks and within the individual storage rack modules (i.e., selecting inserts surrounded by fuel assemblies and located in areas not adjacent to pit walls).
- Spatial variations in cooling water flow within the Spent Fuel Pool, specifically considering the effects of the Spent Fuel Pool Cooling System suction and discharge piping.
- Storage arrangements and the characteristics of fuel assemblies proximate to each insert, especially heat generation rates.
- Noteworthy or unique aspects of Turkey Point fuel pool-related operating experience during the in-service interval, such as atypical water chemistry or impact by a foreign object.

- Relevant operating experience from other plants. C31

The Metamic® insert surveillance procedure then performs visual inspections, weight testing, dimensional measurements, and neutron attenuation testing. Visual inspections on the selected Metamic® inserts monitor for anomalies such as cracking, corrosion, pitting, voids, discoloration, and other surface defects. Weight testing on the selected number of Metamic® inserts determines if the inserts are still within their nominal weight range. The selected Metamic® insert panels also have their length, width, and height measured to ensure the dimensions remain within their nominal. Neutron attenuation testing is performed on the selected number of Metamic® coupons, which determines if any significant change in the boron-10 areal density occurred.

Boral® panels are monitored for loss of material and changes in dimension that could result in loss of neutron-absorbing capability of the Boral® panels. The parameters monitored are associated with the physical condition of the Boral® panels and include *in-situ* gap formation, geometric changes (such as blisters, pits, and bulges) 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.

The observations and measurements from the periodic inspections and coupon testing are compared to baseline information or prior measurements and analyses for trending analysis, projecting future degradation, and projecting the future subcriticality margin of the spent fuel pool (SFP). This trending of inspection and coupon testing measurements, for the purpose of projecting future Metamic® insert or Boral® panel degradation and SFP subcriticality margins, must use an adequate representation of the entire population and consider differences in each insert or panel’s exposure conditions and differences in the spent fuel racks.

To ensure that the 5 percent subcriticality margin in the SFP is maintained within the criticality analysis, the Metamic® inserts are subject to the following acceptance criteria:

A. Visual inspections of Metamic® inserts did NOT identify indications of corrosion/damage, bubbling, blistering, corrosion pitting, cracking, flaking, or other surface based defects.

B. Dimensional measurements of Metamic® inserts determined:

   - Length to be within of +/- 1.0 inches of initial factory acceptance measurements.
   - Width to be within of +/- 0.5 inches of initial factory acceptance measurements.
   - Thickness to be within of +0.010 I -0.004 inches of initial factory acceptance measurements.

C. Weight measurements of Metamic® inserts determined weight to be within +/- 10 percent of the initial factory acceptance measurements.

D. Neutron attenuation testing of Metamic® coupon did NOT identify a significant decrease in areal density.

   1) 'Significant' is defined as any unexpected decrease in areal density from the As-Fabricated condition outside the statistical inaccuracies of the testing methodology.

2) Technical Specifications (TS) specify that the minimum certified boron-10 areal density shall be greater than or equal to 0.015 grams of boron-10/cm².

E. The Metamic® insert surveillance procedure does not specify any functional criteria.

To ensure that the 5 percent subcriticality margin in the SFP is maintained within the criticality analysis, the Boral® panels are subject to the following acceptance criteria:

A. The Boral® panels' boron-10 areal density must remain greater than or equal to 0.0204 grams/cm².

B. The gap between the cask area rack and the adjacent Region I and Region II racks must remain greater than or equal to 2 inches.

C. The cask area racks' center-to-center lattice spacing is required to be as follows:

- North-south direction nominal value of 10.7 +/- 0.04 inches
- East-west direction nominal value of 10.1 inches +/- 0.04 inches

D. The Boral® panels' dimensions must remain within the manufacturer's recommended tolerances.

Any Metamic® insert or neutron attenuation testing coupon, which does not meet acceptance criteria, is to be documented in an action request (AR). That Metamic® insert is removed from service and additional surveillance is performed on an additional 5 Metamic® inserts, and if any of those fail, then a corrective action is generated.

Corrective actions are initiated if the results from measurements and analysis of the Boral® panels indicate that the 5 percent subcriticality margin cannot be maintained because of current or projected future degradation of the neutron-absorbing material. When required, to maintain the subcriticality margin, the possible corrective actions consist of providing additional neutron-absorbing capacity with an alternate material or applying other options which are available.

This AMP consists of inspecting the physical condition of the neutron-absorbing material, such as visual appearance, dimensional measurements, weight, geometric changes (e.g., formation of blisters, pits, and bulges), and boron areal density as observed from coupons or in situ. This AMP addresses the aging management of the PTN spent fuel pools' credited neutron absorbing materials, which include Metamic® inserts and Boral® panels.

17.2.2.28 BURIED AND UNDERGROUND PIPING AND TANKS

The PTN Buried and Underground Piping and Tanks AMP is a new AMP. This AMP is a condition monitoring program that manages the aging effects associated with the external surfaces of buried piping.

With respect to this AMP, the following terms are used:

- "Buried" piping and tanks are in direct contact with soil or concrete.

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- “Underground” piping and tanks are below grade and contained in a tunnel or vault, exposed to air, and located where inspection access is limited. C31

There are no buried or underground tanks at PTN.

This AMP manages the external surface condition of buried piping for loss of material and cracking for the external surfaces of buried piping fabricated of cast iron, concrete, carbon steel and SS through preventive measures (e.g., coatings, backfill, and compaction), mitigative measures (e.g., electrical isolation between piping and supports of dissimilar metals, etc.), and periodic inspection activities (e.g., direct visual inspection of external surfaces, protective coatings, wrappings and quality of backfill) during opportunistic or directed excavations. The number of inspections is based on the effectiveness of the preventive and mitigative actions.

Inspections are conducted by qualified individuals. Where the coatings, backfill or the condition of exposed piping does not meet acceptance criteria, such that 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 rate is extrapolated to the end of the SPEO, an increase in the sample size is conducted. Direct visual inspections are performed on the external surfaces, protective coatings, wrappings, quality of backfill and wall thickness measurements using NDE techniques. Additional inspections are performed on steel piping in lieu of fire main testing. The fire water system jockey pump activity (or a similar parameter) will be monitored for unusual trends. The table below provides additional information related to inspections. Preventative Action Category F has been initially selected for monitoring steel piping (which includes cast iron piping) during the initial monitoring period prior to the SPEO.

A cathodic protection system for buried steel and cementitious piping for systems within the scope of SLR will be installed no later than nine years prior to the SPEO. The intent is to satisfy conditions of Preventive Action Category C in NUREG-2191, Table XI.M41-2, for inspections of buried steel piping during the SPEO (four inspections during each ten-year period). As part of the cathodic protection system installation, FPL will also perform soil corrosivity testing per Item E.b.iii of Table XI.M41-2 of NUREG-2191. 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 to be performed 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 ohm-cm), FPL commits to performing two additional buried steel piping inspections beyond the number required by Preventive Action Category F. This would result 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. This would result in a total of sixteen inspections being completed six months prior to the SPEO.

Based on the cathodic protection survey results and OE gathered prior to the SPEO, the preventive action category and number of inspections may be changed depending on which set of preventive actions listed GALL-SLR Table XI.M41-2 are satisfied at the time. The currently planned number of inspections for each 10-year inspection period, commencing 10 years prior to the start of SPEO, are based on the inspection quantities noted in Table XI.M41-2, adjusted for a 2-Unit plant site as shown in the table below. Once cathodic protection is installed for steel piping, annual cathodic protection surveys are conducted. For steel components, the acceptance criteria for the effectiveness of the cathodic protection is -850 mV relative to a copper/copper sulfate reference electrode, instant off, for at least 80% of the time, and in operation for at least 85% of the time for five years. C31

Material	Parameter(s) Monitored	No. of Inspections	Notes
Steel	Loss of Material	11 to 16 (pre-SPEO) Per GALL-SLR XI.M41 requirements (during the SPEO)	GALL-SLR Report AMP XI.M41 Table XI.M41-2 quantity increased by 2 in lieu of fire main flow testing
Stainless Steel	Loss of Material Cracking	2 (underground environmental) 2 (buried environment)	Number of inspections are for prior and during the SPEO
Cementitious	Loss of Material Cracking	2	Number of inspections are for prior and during the SPEO

Loss of material is monitored by visual inspection of the exterior and wall thickness measurements of the piping. Wall thickness is determined by an NDE technique such as UT.

17.2.2.29 INTERNAL COATINGS/LININGS FOR IN-SCOPE PIPING, PIPING COMPONENTS, HEAT EXCHANGERS, AND TANKS

The PTN Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks AMP is a new AMP, although some of its activities and inspections were formerly a portion of the PTN Periodic Surveillance and Preventative Maintenance Program, the PTN Intake Cooling Water Inspection Program, the PTN Field Erected Tanks Internal Inspection Program, and other site-specific programs. This AMP is a condition monitoring program that manages degradation of internal coatings/linings exposed to raw water, treated water, treated borated water, waste water, lubricating oil or fuel oil that can lead to loss of material of base materials or downstream effects such as reduction in flow, reduction in pressure or reduction of heat transfer when coatings/linings become debris. Note that the applicable elements of this AMP are included in the Open-Cycle Cooling Water (OCCW) System AMP (Section 17.2.2.11) to manage loss of coating integrity for internal coatings of intake cooling water (ICW) system piping.

This AMP manages these aging effects for internal coatings by conducting periodic visual inspections of all coatings/linings applied to the internal surfaces of in-scope components where loss of coating or lining integrity could impact component or downstream component CLB intended function(s). Visual inspections are conducted on external surfaces when applicable. Where visual inspection of the coated/lined surfaces determines that the coating/lining is deficient or degraded, physical tests are performed, where physically possible, in conjunction with the visual inspection.

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For tanks and heat exchangers, all accessible surfaces are inspected. Piping inspections are sampling-based. The training and qualification of individuals involved in coating/lining inspections of non-cementitious coatings/linings are conducted in accordance with ASTM International Standards endorsed in NRC RG 1.54, "Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants," including guidance from the staff associated with a particular standard. For cementitious coatings, training and qualifications are based on an appropriate combination of education and experience related to inspecting concrete surfaces.

Peeling and delamination are not acceptable. Blisters are not acceptable unless a coating specialist has determined them to be surrounded by sound material with size and frequency not increasing. Minor cracks in cementitious coatings are acceptable provided there is no evidence of debonding. All other degraded conditions are evaluated by a coatings specialist qualified in accordance with an ASTM International standard endorsed in NRC RG 1.54. For coated/lined surfaces determined to not meet the acceptance criteria, physical testing is performed where physically possible (i.e., sufficient room to conduct testing) in conjunction with repair or replacement of the coating/lining.

17.2.2.30 ASME SECTION XI, SUBSECTION IWE

The PTN ASME Section XI, Subsection IWE, AMP is an existing AMP that was formerly the PTN ASME Section XI, Subsection IWE, Inservice Inspection Program. This condition monitoring AMP is in accordance with ASME Code Section XI, Subsection IWE, and consistent with 10 CFR 50.55a, "Codes and Standards," with supplemental recommendations. This AMP includes periodic visual, surface, and volumetric examinations, where applicable, of the metallic liner of Class CC pressure-retaining components and their integral attachments. This AMP also provides inspection and examination of containment surfaces, moisture barriers, pressure retaining bolting, and pressure retaining components for signs of degradation, damage, and irregularities, including discernable liner plate bulges. In conjunction with 10 CFR Part 50 Appendix J AMP (Section 17.2.2.33), this AMP manages loss of material, loss of leak tightness, loss of sealing, and loss of preload, as well as cracking (of dissimilar metal welds associated with penetration sleeves and fuel transfer tube). Observed conditions that have the potential for impacting an intended function are evaluated for acceptability in accordance with ASME requirements and corrected in accordance with the corrective action program.

Coated areas are examined for distress of the underlying metal shell or liner. Acceptability of inaccessible areas of the concrete containment steel liner is evaluated when conditions found in accessible areas indicate the presence of, or could result in, flaws or degradation in inaccessible areas. Inspection results are compared with prior recorded results in acceptance of components for continued service. In the case of significant conditions adverse to quality, measures are implemented to ensure that the cause of the condition is determined and that corrective action is taken to preclude recurrence. The examination of containment, Class MC and Class CC components, is in accordance with ASME Section XI, Subsection IWE, 2001 edition 2003 addenda, as mandated and modified by 10 CFR 50.55a.

If triggered by site-specific OE, this AMP also includes a one-time supplemental volumetric examination by sampling both randomly selected and focused liner locations (such as a reactor cavity sump pit) susceptible to corrosion that are inaccessible from one side. This sampling is conducted to demonstrate, with 95% confidence, that 95% of the accessible portion of the liner is not experiencing greater than 10% loss of wall thickness. This AMP also includes a one-time supplemental surface or enhanced visual examination of a stainless steel transfer tube and of dissimilar metal welds for a representative penetration associated with a high-temperature stainless steel piping system in frequent use. C31

This AMP also includes a supplemental one-time inspection of the stainless steel fuel transfer tube on each unit, and a representative sample of penetrations with dissimilar metal welds associated with high-temperature stainless steel piping systems. These one-time inspections will be included as an enhancement to the ASME Section XI, Subsection IWE AMP to provide confirmation that no additional examinations/evaluations are required. Consistent with the guidance of NUREG-2191, a representative sample size is 20 percent of the population at each unit. As a result, two of the penetrations with dissimilar metal welds associated with high-temperature stainless steel piping systems will be inspected on each unit. Additionally, if 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.

PTN has no pressure-retaining piping components subject to cyclic loading without CLB fatigue analysis; therefore, a supplemental surface examination to detect cracking for such pressure-retaining piping components is not required. Cracking due to cyclic loading of the containment liner and non-piping penetrations are managed by the PTN IWE AMP.

The PTN ASME Section XI, Subsection IWE AMP will also be updated to clarify a) the acceptance criterion for the accessible air chase system test connections of "no loose or degraded connections" and b) that if a loose or degraded test connection is discovered, it 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.

17.2.2.31 ASME SECTION XI, SUBSECTION IWL

The PTN ASME XI, Subsection IWL, AMP is an existing AMP that was formerly the PTN ASME Section XI, Subsection IWL, ISI Program. The inspections associated with this AMP assess the quality and structural performance of the containment structure post-tensioning system components. The current program complies with ASME Code Section XI, Subsection IWL, 2007 Edition through 2008 Addenda (Reference B.3.122), supplemented with the applicable requirements of 10 CFR 50.55a(b)(2). This program is consistent with provisions in 10 CFR 50.55a that specify the use of the ASME Code edition in effect 12 months prior to the start of the inspection interval. PTN will use the ASME Code edition consistent with the provisions of 10 CFR 50.55a during the SPEO. In accordance with 10 CFR 50.55a(g)(4)(ii), the ISI program is updated each successive 120-month inspection interval to comply with the requirements of the latest edition of the ASME Code specified twelve months before the start of the inspection interval.

This AMP manages the aging effects of loss of material and confirms the results of the containment tendon loss of prestress TLAA. This AMP includes inspection of tendon and anchorage hardware surfaces and measurement of tendon force and elongation. This AMP also includes inspection of containment reinforced concrete above ground for evidence of concrete degradation. This AMP consists of:

(a) Periodic visual inspection of accessible concrete surfaces for the reinforced and prestressed concrete containment structure; C31

(b) Periodic visual inspection and sample tendon-testing of un-bonded post-tensioning system components for signs of degradation, assessment of damage, and corrective actions and;

(c) Testing of the tendon corrosion protection medium and free water.

Measured tendon lift-off forces in select common (historical/control) or random sample tendons are compared to predicted tendon forces calculated in accordance with NRC RG 1.35.1, "Determining Prestressing Forces for Inspection of Prestressed Concrete Containments." The Subsection IWL requirements are supplemented to include quantitative acceptance criteria for the evaluation of concrete surfaces based on the "Evaluation Criteria" provided in Chapter 5 of American Concrete Institute (ACI) 349.3R, "Evaluation of Existing Nuclear Safety-Related Concrete Structures." Inspection results are compared with prior recorded results in acceptance of components for continued service.

The PTN ASME Section XI, Subsection IWL AMP is further supplemented by a separate visual inspection of a wire from representative (random) vertical, dome or other (i.e., non-random or horizontal) and lower horizontal tendon for each unit based on related operating experience regarding excessive and/or frequent grease leakage, water inleakage, and water intrusion in tendon inspection pits/galleries, respectively. This supplemental visual inspection will be performed in accordance with existing tendon inspection procedures and in the 55th year interval (approximately five years prior to the SPEO) for one unit and 60th year interval for the other unit. A follow-on supplemental inspection will be performed in the 60th year interval (at the beginning of the SPEO) for one unit and 65th year interval for the other unit to confirm no unacceptable grease leakage or water intrusion from the previously inspected (random) tendons with the results trended to provide further objective evidence that possible tendon degradation is detected in a timely manner using the current inspection frequency or establish the appropriate intervals for future inspections. The PTN ASME Section XI, Subsection IWL AMP is also enhanced to credit existing periodic tendon inspection pits/galleries water removal activities as preventive actions.

Inaccessible containment concrete surfaces, such as foundations below groundwater, are managed by the PTN Structures Monitoring AMP.

17.2.2.32 ASME SECTION XI, SUBSECTION IWF

The PTN ASME Section XI, Subsection IWF AMP is an existing condition monitoring program that consists of periodic visual examination of ASME Section XI Class 1, 2, and 3 piping and component support members for signs of degradation such as loss of material, cracking, and loss of mechanical function. Bolting for Class 1, 2, and 3, piping and component supports is also included and inspected for loss of material and for loss of preload. Associated sliding surfaces, and vibration isolation elements are also inspected.

The PTN ASME Section XI, Subsection IWF AMP provides inspection and acceptance criteria and meets the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, 2007 edition with addenda through 2008, and 10 CFR 50.55a(b)(2) for Class 1, 2, 3 piping and components and their associated supports. The primary inspection method employed is visual examination. Non-destructive examination (NDE) indications are evaluated against the acceptance standards of ASME Code Section XI.

Examinations that reveal indications are evaluated. Examinations that reveal flaws or relevant conditions that exceed the referenced acceptance standard, are expanded to include additional examinations during the current outage. The scope of inspection for supports is based on sampling of the total support population. The sample size varies depending on the ASME Class. The largest sample size is specified for the most critical supports (ASME Class 1). The sample size decreases for the less critical supports (ASME Class 2 and 3). Tactile inspections of elastomeric vibration isolation elements to detect hardening if the vibration isolation function is suspect is also included. 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. C31

The requirements of ASME Section XI, Subsection IWF are supplemented to include the following:

- Identification of high-strength (maximum yield strength greater than or equal to 150 ksi) bolting greater than one inch nominal diameter within the boundaries of IWF-1300 and subsequent volumetric examination of 20% of the high-strength bolting at least once per interval for cracking; or replacement and inspection of the removed high-strength bolting (which may not be reused per plant procedure) using a technique capable of detecting cracking

  AND

- A one-time inspection within 5 years prior to the SPEO of an additional 5 percent of piping supports from the remaining IWF population that are considered most susceptible to age-related degradation.

The requirements of ASME Section XI, Subsection IWF are also supplemented to include a visual inspection, enhanced to the extent possible in the location/configuration to manage applicable aging effects, 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 the RV supports for 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.

17.2.2.33 10 CFR PART 50, APPENDIX J

The PTN 10 CFR Part 50, Appendix J, AMP is an existing AMP that was formerly the PTN Containment Leak Rate Testing Program, although it was not previously credited for license renewal. This AMP is a performance monitoring program that monitors leakage rates through the containment pressure boundary, including the containment shell or liner, associated welds, penetrations, isolation valves, fittings, and other access openings, in order to detect degradation of the containment pressure boundary. Corrective actions are taken if leakage rates exceed acceptance criteria. This program is implemented in accordance with 10 CFR Part 50 Appendix J, RG 1.163, NEI 94-01, and is subject to the requirements of 10 CFR Part 54. Additionally, 10 CFR 50, Appendix J, requires a general visual inspection of the accessible interior and exterior surfaces of the containment structures and components to be performed prior to any Type A test and at periodic intervals between tests based on the performance of the containment system.

17.2.2.34 MASONRY WALLS

C31

The PTN Masonry Walls AMP is an existing AMP, formerly a portion of the PTN Systems and Structures Monitoring Program, currently implemented as part of the PTN Structures Monitoring AMP. This condition monitoring AMP is based on NRC Inspection and Enforcement (IE) Bulletin 80-11, "Masonry Wall Design," and monitoring proposed by NRC Information Notice (IN) 87-67, "Lessons Learned from Regional Inspections of Licensee Actions in Response to IE 80-11," for managing shrinkage, separation, gaps, loss of material and cracking of masonry walls such that the evaluation basis is not invalidated and intended functions are maintained.

This AMP consists of periodic visual inspection of masonry walls within the scope of SLR to detect loss of material and cracking of masonry units and mortar. Masonry walls that are fire barriers are also managed by the Fire Protection program.

17.2.2.35 STRUCTURES MONITORING

The PTN Structures Monitoring AMP is an existing condition monitoring program that consists primarily of periodic visual inspections of plant SCs for evidence of deterioration or degradation, such as described in the American Concrete Institute (ACI) Standards 349.3R, ACI 201.1R, and Structural Engineering Institute/American Society of Civil Engineers Standard (SEI/ASCE) 11. Quantitative acceptance criteria for concrete inspections are based on ACI 349.3R. Inspections and evaluations are performed using criteria derived from industry codes and standards contained in the plant CLB including but not limited to ACI 349.3R, ACI 318, SEI/ASCE 11, and the American Institute of Steel Construction (AISC) specifications. Inspections and evaluations are performed at an interval no greater than 5 years with identified degraded conditions receiving more frequent inspection, as warranted, until repaired. The AMP includes preventive actions to ensure structural bolting integrity. Results from periodic inspections are trended.

Due the presence of aggressive groundwater chemistry (Chlorides > 500 parts per million (ppm)), the AMP includes a site-specific enhancement to conduct a baseline visual inspection, pH analysis, a chloride concentration test, and evaluation to address the degradation of concrete due to exposure of aggressive chemical attack in groundwater/soil or leaching and carbonation in water-flowing. The baseline evaluation will consider site-specific OE and the baseline inspection results and will determine the additional actions (if any) that are warranted. 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.

17.2.2.36 INSPECTION OF WATER-CONTROL STRUCTURES ASSOCIATED WITH NUCLEAR POWER PLANTS

The PTN Inspection of Water Control Structures Associated with Nuclear Power Plants AMP is a new AMP, formerly a portion of the PTN Systems and Structures Monitoring Program. The AMP manages age-related degradation due to environmental conditions and the effects of natural phenomena that may affect water-control structures through periodic monitoring and maintenance activities. Although PTN has not formally committed to implement RG 1.127, this AMP addresses inspection of water-control structures, commensurate with RG 1.127.

The structures within the scope of the AMP are associated with emergency cooling systems and include the Intake Structure, Discharge Structure, and Cooling Canals. Structural steel and bolting associated with these structures is within the scope of the program inspections. The AMP performs periodic monitoring of water-control structures at least every five years so that the consequences of age-related deterioration and degradation can be prevented or mitigated in a timely manner. The AMP also includes structural steel and structural bolting associated with water-control structures, and miscellaneous steel. Results that exceed the acceptance criteria for applicable parameters monitored or inspected are documented and a list of current deficiencies is maintained for trending and corrective action. Periodic inspections are adequate to detect degradation of water-control structures before a loss of an intended function. Qualifications of inspection and evaluation personnel for reinforced concrete water control structures are in accordance with ACI 349.3R. C31

Submerged concrete structures may be inspected during periods of low tide, when dewatered or by using divers. Areas covered by silt, vegetation, or marine growth are not considered inaccessible, and are cleaned and inspected in accordance with the standard inspection frequency.

17.2.2.37 PROTECTIVE COATING MONITORING AND MAINTENANCE

The PTN Protective Coating Monitoring and Maintenance AMP is an existing AMP that was formerly the PTN Service Level 1 Coatings Program, although it was not previously credited for license renewal. The PTN Protective Coating Monitoring and Maintenance AMP provides guidelines for establishing an inservice coatings monitoring program for Service Level I coating systems in accordance with ASTM D 5163. The AMP will use the aging management detection methods, inspection frequency, monitoring and trending, and acceptance criteria defined in ASTM D 5163-08, "Standard Guide for Establishing a Program for Condition Assessment of Coating Service Level I Coating Systems in Nuclear Power Plants."

Degraded coatings in the containment are assessed periodically to ensure post-accident operability of the Emergency Core Cooling System (ECCS). Proper maintenance of protective coatings inside containment is essential to the operability of post-accident safety systems that rely on water recycled through the containment sump/drain system. Degradation of coatings can lead to clogging of ECCS suction strainers, which reduces flow through the system and could cause unacceptable head loss for the pumps. This AMP ensures that a monitoring and maintenance program is comparable to NRC RG 1.54, Revision 2, for the SPEO.

This AMP consists of guidance for inspection and maintenance of protective coatings. Maintenance of Service Level I coatings applied to carbon steel and concrete surfaces inside containment (e.g., steel liner, steel containment shell, structural steel, supports, penetrations, and concrete walls and floors) serve to prevent or minimize loss of material due to corrosion of carbon steel components and aids in decontamination.

17.2.2.38 ELECTRICAL INSULATION FOR ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 EQ REQUIREMENTS

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The PTN Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements AMP is an existing AMP, formerly a portion of the PTN Containment Cable Inspection Program. This AMP applies to accessible non-EQ electrical cable and connection electrical insulation material within the scope of SLR subjected to an adverse localized environment (e.g., heat, radiation, or moisture). Adverse localized environments are identified through the use of an integrated approach, which includes, but is not limited to, a review of relevant site-specific and industry OE, field walkdown data, etc. Accessible non-EQ insulated cable and connections within the scope of SLR installed in adverse localized environments are visually inspected for cable and connection jacket surface anomalies indicating signs of reduced electrical insulation resistance. The first inspection for SLR is to be completed no earlier than 10 years prior to the SPEO and no later than six months prior to entering the SPEO. Recurring inspections are to be performed at least once every 10 years thereafter.

If visual inspections identify cable jacket and connection insulation surface anomalies, then testing may be performed. Testing may include thermography and other proven condition monitoring test methods applicable to the cable and connection insulation. A sample population of cable and connection insulation is utilized if testing is performed. If testing is deemed necessary, a sample of 20 percent of each cable and connection type with a maximum sample size of 25 is tested. When acceptance criteria are not met, a determination is made as to whether the surveillance, inspection, or tests, including frequency intervals, need to be modified.

Electrical insulation material for cables and connectors previously identified and dispositioned during the first period of extended operation as subjected to an adverse localized environment are evaluated for cumulative aging effects during the SPEO.

17.2.2.39 ELECTRICAL INSULATION FOR ELECTRICAL CABLES AND CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 EQ REQUIREMENTS USED IN INSTRUMENTATION CIRCUITS

The PTN Electrical Insulation for Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements used in Instrumentation Circuits AMP is a new AMP. This AMP manages the aging effects of the applicable cables and connections in the following systems or sub-systems:

- Nuclear Instrumentation: excore source, intermediate, and power range
- Process Radiation Monitoring:
    - Containment air particulate monitors
    - Containment gas monitors
    - Control room HVAC emergency monitor (common)
    - Control room normal air intake monitor (common)

This AMP provides reasonable assurance that non-EQ cables and connections used in high-voltage, low-level current signal applications that are sensitive to reduction in electrical insulation resistance will perform their intended function consistent with the CLB through the SPEO.

In this AMP, either of two methods can be used to identify the existence of electrical insulation aging effects for cables and connections. In the first method, calibration results or findings of surveillance testing programs are evaluated to identify the existence of aging effects based on acceptance criteria related to instrumentation circuit performance. In this method, the first reviews are completed prior to the SPEO and at least every 10 years thereafter. In the second method, direct testing of the cable system is performed when the calibration or surveillance program does not include the cabling system in the testing circuit, or as an alternative to the review of calibration results or findings of surveillance testing programs. In the second method, the test frequency of the cable system is determined based on engineering evaluation, but the test frequency is at least once every 10 years with the first test is to be completed prior to the SPEO. C31

17.2.2.40 ELECTRICAL INSULATION FOR INACCESSIBLE MEDIUM-VOLTAGE POWER CABLES NOT SUBJECT TO 10 CFR 50.49 EQ REQUIREMENTS

The PTN Electrical Insulation for Inaccessible Medium-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements AMP is a new AMP. The purpose of this AMP is to provide reasonable assurance that the intended functions of inaccessible medium-voltage power cables (operating voltages of 2 kV to 35 kV) that are not subject to the EQ requirements of 10 CFR 50.49 are maintained consistent with the CLB through the SPEO. This AMP applies to underground (e.g., installed in buried conduit, embedded raceway, cable trenches, cable troughs, duct banks, vaults, manholes, or direct-buried installations) non-EQ medium-voltage power cables within the scope of SLR exposed to wetting or submergence (i.e., significant moisture). Significant moisture is defined as exposure to moisture that lasts more than three days (i.e., long-term wetting or submergence over a continuous period), which if left unmanaged, could potentially lead to a loss of intended function. Cable wetting or submergence that occurs for a limited time as drainage from either automatic or passive drains is not considered significant moisture for this AMP.

In-scope inaccessible medium-voltage power cables exposed to significant moisture are tested to determine the condition of the electrical insulation. One or more tests may be required based on cable application, construction, and electrical insulation material to determine the age degradation of the cable. The first tests for license renewal are to be completed no later than 6 months prior to the SPEO with subsequent tests performed at least once every six years thereafter. 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 the one-time test/inspection results as well as industry and plant-specific operating experience.

This is a condition monitoring program. However, this AMP includes periodic actions to prevent inaccessible medium-voltage power cables from being exposed to significant moisture. Periodic actions to mitigate inaccessible medium-voltage cable exposure to significant moisture include inspection for water accumulation in cable manholes and conduits, and removing water, as needed. Inspections are performed periodically based on water accumulation over time. The periodic inspection occurs at least once annually with the first inspection for SLR completed prior to the SPEO. Inspection frequencies are adjusted based on inspection results, including site-specific OE, but with a minimum inspection frequency of at least once annually. Inspections are also performed after event-driven occurrences, such as heavy rain or flooding. The periodic inspection includes documentation that either automatic or passive drainage systems, or manual pumping of manholes or vaults, are effective in preventing inaccessible cable exposure to significant moisture.

17.2.2.41 ELECTRICAL INSULATION FOR INACCESSIBLE INSTRUMENT AND CONTROL CABLES NOT SUBJECT TO 10 CFR 50.49 EQ REQUIREMENTS

C31

The PTN Electrical Insulation for Inaccessible Instrument and Control Cables Not Subject to 10 CFR 50.49 EQ Requirements AMP is a new AMP. The purpose of this AMP is to provide reasonable assurance that the intended functions of inaccessible or underground instrument and control (I&C) cables that are not subject to the EQ requirements of 10 CFR 50.49 are maintained consistent with the CLB through the SPEO. This AMP applies to underground (e.g., installed in buried conduit, embedded raceway, cable trenches, cable troughs, duct banks, vaults, manholes, or direct buried installations) I&C cables, including those designed for continuous wetting or submergence, within the scope of SLR exposed to significant moisture. Significant moisture is defined as exposure to moisture that lasts more than three days (i.e., long-term wetting or submergence over a continuous period), which if left unmanaged, could potentially lead to a loss of intended function. Cable wetting or submergence that results from event-driven occurrences and is mitigated by either automatic or passive drains is not considered significant moisture for the purposes of this AMP.

This is a condition monitoring program. However, this AMP includes periodic actions to prevent inaccessible I&C cables from being exposed to significant moisture. Periodic actions taken to mitigate I&C cable exposure to significant moisture include inspection for water accumulation in cable manholes, vaults, conduits, and removing or draining water, as needed. Inspections are performed periodically based on water accumulation over time. The periodic inspection occurs at least once annually with the first inspection for SLR completed prior to the SPEO. Inspections are also performed after event-driven occurrences, such as heavy rain or flooding. The periodic inspection includes documentation that either automatic or passive drainage systems, or manual pumping of manholes or vaults, is effective in preventing inaccessible cable exposure to significant moisture.

In addition to inspecting for water accumulation, I&C cables accessible from manholes, vaults, or other underground raceways are periodically visually inspected for cable jacket surface abnormalities, such as embrittlement, discoloration, cracking, melting, swelling, or surface contamination due to the aging mechanism and effects of significant moisture. The cable insulation visual inspection portion of the AMP uses the cable jacket material as representative of the aging effects experienced by the instrumentation and control cable electrical insulation. Inspection frequencies are adjusted based on inspection results, including site-specific OE. The visual inspection of I&C cables occurs at least once every six years and may be coordinated with the periodic inspection for water accumulation. Inaccessible and underground I&C cables found to be exposed to significant moisture are evaluated to determine whether testing is required. If required, initial testing is performed once by utilizing sampling to determine the condition of the electrical insulation. The following factors are considered in the development of the electrical insulation sample: temperature, voltage, cable type, and construction including the electrical insulation composition. A sample of 20 percent with a maximum sample of 25 constitutes a representative cable sample size. One or more tests may be required due to cable type, application, and electrical insulation to determine the age degradation of the cable. Inaccessible and underground I&C cables designed for continuous wetting or submergence are also included in this AMP as a one-time inspection and test. The need for additional tests and inspections is determined by the test/inspection results, as well as industry and site-specific OE.

Testing of installed inservice inaccessible and underground I&C cables as part of an existing maintenance, calibration or surveillance program, testing of coupons, abandoned or removed cables, or inaccessible medium- or low-voltage power cables subjected to the same or bounding environment, inservice application, cable routing, construction, manufacturing and insulation material may be credited in lieu of or in combination with testing of installed inservice inaccessible I&C cables when testing is required in this AMP. C31

17.2.2.42 ELECTRICAL INSULATION FOR INACCESSIBLE LOW-VOLTAGE POWER CABLES NOT SUBJECT TO 10 CFR 50.49 EQ REQUIREMENTS

The PTN Electrical Insulation for Inaccessible Low-Voltage Power Cables Not Subject to 10 CFR 50.49 EQ Requirements AMP is a new AMP. The purpose of this AMP is to provide reasonable assurance that the intended functions of inaccessible or underground low-voltage ac and dc power cables (i.e., typical operating voltage of less than 1,000 V, but no greater than 2 kV) that are not subject to the requirements of 10 CFR 50.49 are maintained consistent with the CLB through the SPEO. This AMP applies to underground (e.g., installed in buried conduit, embedded raceway, cable trenches, cable troughs, duct banks, vaults, manholes, or direct buried installations) low-voltage power cables, including those designed for continuous wetting or submergence, within the scope of SLR exposed to significant moisture. Significant moisture is defined as exposure to moisture that lasts more than three days (i.e., long-term wetting or submergence over a continuous period), which if left unmanaged, could potentially lead to a loss of intended function. Cable wetting or submergence that results from event driven occurrences and is mitigated by either automatic or passive drains is not considered significant moisture for the purposes of this AMP.

This is a condition monitoring program. However, this AMP also includes periodic actions to prevent inaccessible low-voltage cables from being exposed to significant moisture. Periodic actions taken to mitigate inaccessible low-voltage cable exposure to significant moisture include inspection for water accumulation in cable manholes and conduits, and removing or draining water, as needed. Inspections are performed periodically based on water accumulation over time. The periodic inspection occurs at least once annually with the first inspection for SLR completed prior to the SPEO. Inspections are also performed after event-driven occurrences, such as heavy rain or flooding. The periodic inspection includes documentation that either automatic or passive drainage systems, or manual pumping of manholes or vaults, is effective in preventing inaccessible cable exposure to significant moisture.

In addition to inspecting for water accumulation, low-voltage power cables accessible from manholes, vaults, or other underground raceways are periodically visually inspected for jacket surface abnormalities, such as embrittlement, discoloration, cracking, melting, swelling, or surface contamination due to the aging mechanism and effects of significant moisture. The cable insulation visual inspection portion of the AMP uses the cable jacket material as representative of the aging effects experienced by the low-voltage power cable electrical insulation. Inspection frequencies are adjusted based on inspection results, including site-specific OE. The visual inspection of low-voltage power cables occurs at least once every six years and may be coordinated with the periodic inspection for water accumulation. Inaccessible and underground low-voltage power cables found to be exposed to significant moisture are evaluated to determine whether testing is required. If required, initial testing is performed once by utilizing sampling to determine the condition of the electrical insulation. The following factors are considered in the development of the electrical insulation sample: temperature, voltage, cable type, and construction including the electrical insulation composition. A sample of 20 percent with a maximum sample of 25 constitutes a representative cable sample size. One or more tests may be required due to cable type, application, and electrical insulation to determine the age degradation of the cable. Inaccessible and underground low-voltage power cables designed for continuous wetting or submergence are also included in this AMP as a one-time inspection and test. The need for additional tests and inspections is determined by the test/inspection results, as well as industry and site-specific OE. C31

Testing of installed inservice inaccessible and underground low-voltage power cables as part of an existing maintenance, calibration or surveillance program, testing of coupons, abandoned or removed cables, or inaccessible medium-voltage power cables or instrumentation and control cables subjected to the same or bounding environment, inservice application, cable routing, manufacturing and insulation material may be credited in lieu of or in combination with testing of installed inservice inaccessible low-voltage power cables when testing is required in this AMP.

17.2.2.43 ELECTRICAL CABLE CONNECTIONS NOT SUBJECT TO 10 CFR 50.49 EQ REQUIREMENTS

The PTN Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements AMP is a new AMP. The purpose of this AMP is to provide reasonable assurance that the intended functions of the metallic parts of electrical cable connections that are not subject to the EQ requirements of 10 CFR 50.49 and susceptible to age-related degradation resulting in increased resistance are maintained consistent with the CLB through the SPEO. This AMP applies to electrical connections within the scope of SLR and manages increased resistance of connection due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, or oxidation of the metallic portions of electrical cable connections within the scope of SLR. This program does not apply to the high-voltage (> 35 kV) switchyard connections.

This AMP is a condition monitoring program that consists of a one-time test on a representative sample of each type of non-EQ electrical connections prior to the SPEO to confirm the absence of age-related degradation. Testing may include thermography, contact resistance testing, or other appropriate testing methods without removing the connection insulation. The results are evaluated to determine the need for subsequent testing on a 10-year basis. The following factors are considered for sampling: voltage level (medium- and low-voltage), circuit loading (high load), connection type, and location (high temperature, high humidity, vibration, etc.). Twenty percent of a connector type population with a maximum sample of 25 constitutes a representative connector sample size. Otherwise, a technical justification of the methodology and sample size used for selecting the components under testing is documented. C31

As an alternative to measurement testing for accessible cable connections that are covered with heat shrink tape, sleeving, insulating boots, etc., a visual inspection of the insulation materials may be used to detect aging effects and surface anomalies, such as embrittlement, cracking, chipping, melting, discoloration, swelling or surface contamination. The basis for performing only the alternative periodic visual inspection to monitor age-related degradation of cable connections is documented. If this alternative visual inspection is used to check cable connections, the first inspection is completed prior to the SPEO with subsequent inspections performed at least once every five years thereafter.

17.2.2.44 HIGH-VOLTAGE INSULATORS

The PTN High-Voltage Insulators AMP is a new AMP. The purpose of this AMP is to provide reasonable assurance that the intended functions of high-voltage insulators within the scope of SLR are maintained consistent with the CLB through the SPEO. This AMP was developed specifically to age manage porcelain high-voltage insulators susceptible to aging degradation due to local environmental conditions. Periodic visual inspections along with periodic insulator coating and cleaning are performed to manage high-voltage insulator aging effects throughout the SPEO.

The scope of this AMP is limited to the PTN Unit 4 porcelain high-voltage insulators in the power path utilized for restoration of off-site power following a Station Blackout event. This is a condition monitoring program. The high-voltage insulators within the scope of this AMP are visually inspected to detect reduced insulation resistance aging effects, including cracks, foreign debris, salt, dust, and industrial effluent contamination. Metallic parts are visually inspected to detect loss of material due to mechanical wear or corrosion. Visual inspections may be supplemented with infrared thermography inspections to detect high-voltage insulator reduced insulation resistance.

17.2.3 SITE-SPECIFIC AGING MANAGEMENT PROGRAMS

This section provides the UFSAR summary of the PTN single site-specific program credited for managing the effects of aging. This PTN site-specific program is associated with pressurizer surge line fatigue.

17.2.3.1 PRESSURIZER SURGE LINE FATIGUE

The PTN Pressurizer Surge Line Fatigue AMP is an existing AMP that was formerly the PTN Pressurizer Surge Line Welds Inspection Program. This AMP for fatigue assessment is based on the approach documented in the ASME Code Section XI Rules for In-service Inspection of Nuclear Power Plant Components, Non-Mandatory Appendix L Operating Plant Fatigue Assessment. This AMP incorporates:

(1) TLAAs that consider fatigue design, and;

(2) An aging management inspection program that has been approved by the NRC. C31

The fatigue design of the pressurizer surge line is based on: 1) the original transient design limits and 2) reactor water environmental effects using the most recent data from laboratory simulation of the reactor coolant environment. To address the initial 40-year operating period, Idaho National Engineering Laboratories evaluated fatigue-sensitive component locations in plants designed by all four U.S. nuclear steam supply system (NSSS) vendors, as reported in NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components," March 1995. This evaluation included calculation of fatigue usage factors for critical fatigue sensitive component locations of early vintage Westinghouse PWRs, utilizing the interim fatigue curves provided in NUREG/CR-5999, "Interim Fatigue Design Curves for Carbon, Low-Alloy, and Austenitic Stainless Steels in LWR Environments," August 1993. The results were then utilized to scale up the PTN site-specific usage factors for the same locations to account for environmental effects.

Thus, the results are directly relevant to the design code used for PTN Unit 3 and Unit 4, and the transient cycles considered in the evaluation match or bound the PTN design. Fatigue monitoring by FPL will ensure that these limits are not exceeded. In this manner, the original transient design limits for fatigue are confirmed to remain valid for the current 40-year operating period, the initial 20-year PEO, and the 20-year SPEO of PTN Unit 3 and Unit 4.

FPL has previously inspected all surge line welds on both units during the fourth ISI interval, prior to entering the PEO. The results of these inspections were utilized to assess fatigue of the surge lines. In addition to these inspections, environmentally assisted fatigue of the surge lines welds is addressed using the following approach:

(1) FPL elected to manage the effects of environmentally assisted fatigue of the pressurizer surge line welds by an aging management inspection program approved by the NRC.

(2) The aging management of the surge line is accomplished by a combination of flaw tolerance analysis and ISI. The aging effect managed with these inspections is cracking due to environmentally assisted fatigue. The technical justification and inspection frequency are supported by the flaw tolerance analysis based on the methodology noted in ASME Section XI, Nonmandatory Appendix L, "Operating Plant Fatigue Assessment." Based on postulated flaw tolerance analysis, and using the guidelines of ASME Code Section XI, Appendix L, Table L-3420-1, the periodic inspection schedule is determined to be 10 years.

(3) All pressurizer surge line welds listed in scope of the AMP is examined in accordance with ASME Section XI, IWB for Class 1 welds. Inservice examinations for the surge line welds include both surface and volumetric examinations. In each 10-year ISI interval during the SPEO, all surge line welds are inspected in accordance with the PTN ISI AMPs under Augmented and other programs.

17.2.3.2 POLYMER HIGH-VOLTAGE INSULATORS C31

The PTN Polymer High-Voltage Insulators AMP is a new AMP. The purpose of this AMP is to provide reasonable assurance that the intended functions of polymer high-voltage insulators within the scope of SLR are maintained consistent with the CLB through the SPEO. This AMP was developed specifically to age manage polymer high-voltage insulators susceptible to aging degradation due to local environmental conditions. Periodic visual inspections are performed to manage polymer high-voltage insulator aging effects throughout the SPEO.

The scope of this AMP is limited to the PTN Unit 3 polymer high-voltage insulators in the power path utilized for restoration of off-site power following a Station Blackout event. This is a condition monitoring program. The polymer high-voltage insulators within the scope of this AMP are visually inspected to detect reduced insulation resistance aging effects, foreign debris, salt, dust, and industrial effluent contamination. Metallic parts are visually inspected to detect loss of material due to mechanical wear or corrosion. Visual inspections may be supplemented with infrared thermography inspections and corona scans to detect polymer high-voltage insulator reduced insulation resistance.

17.3 TIME-LIMITED AGING ANALYSIS

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With respect to plant TLAAs, 10 CFR 54.21(c) requires the following information:

(c) An evaluation of time-limited aging analyses.

(1) A list of time-limited aging analyses, as defined in § 54.3, must be provided. The applicant shall demonstrate that--

(i) The analyses remain valid for the period of extended operation;

(ii) The analyses have been projected to the end of the period of extended operation; or

(iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

This section discusses the evaluation results for each of the site-specific TLAAs performed for SLR. The evaluations have demonstrated that the analyses remain valid for the SPEO; that the analyses have been projected to the end of the SPEO; or that the effects of aging on the intended function(s) will be adequately managed for the SPEO. The TLAAs, as defined in 10 CFR 54.3, are listed in Section 17.3.1 through, and including, Section 17.3.7.6 and are evaluated per the requirements of 10 CFR 54.21(c).

17.3.1 IDENTIFICATION OF TIME-LIMITED AGING ANALYSES EXEMPTIONS

10 CFR 54.21(c)(2) states the following with respect to TLAA exemptions:

> A list must be provided of plant-specific exemptions granted pursuant to 10 CFR 50.12 and in effect that are based on time-limited aging analyses as defined in 10 CFR 54.3. The applicant shall provide an evaluation that justifies the continuation of these exemptions for the period of extended operation.

A search of docketed licensing correspondence, the operating license, and the UFSAR was performed to identify the active exemptions currently in effect pursuant to 10 CFR 50.12. These exemptions were then reviewed to determine whether the exemption was based on a TLAA. No 10 CFR 50.12 exemptions involving a TLAA, as defined in 10 CFR 54.3, were identified for PTN Units 3 and 4. This addresses the 10 CFR 54.21(c)(2) exemptions list requirement.

17.3.2 REACTOR VESSEL NEUTRON EMBRITTLEMENT

10 CFR 50.60 requires that all light-water reactors meet the fracture toughness, P T limits, and materials surveillance program requirements for the reactor coolant pressure boundary as set forth in 10 CFR 50, Appendices G and H. The PTN Reactor Vessel Material Surveillance AMP is described in Section 17.2.2.19.

The ferritic materials of the reactor vessel are subject to embrittlement due to high energy (E > 1.0 MeV) neutron exposure. Neutron embrittlement means the material has lower toughness (i.e., will absorb less strain energy during a crack or rupture), thus allowing a crack to propagate more easily under thermal and pressure loading. Neutron embrittlement analyses are used to account for the reduction in fracture toughness associated with the cumulative neutron fluence (total number of neutrons that intersect a square centimeter of component area during the life of the plant). This group of TLAAs concerns the effect of IE on the belt-line regions of the PTN Units 3 and 4 reactor vessels, and how this mechanism affects analyses that provide operating limits or address regulatory requirements. C31

Neutron fluence is used to calculate parameters for embrittlement analyses that are part of the CLB and support safety determinations, and since these analyses are calculated based on plant life, they have been identified as TLAAs, as defined in 10 CFR 54.21(c). Therefore, the following TLAAs were evaluated for the increased neutron fluence associated with 80 years of operations:

- Neutron fluence projections (Section 17.3.2.1)
- Pressurized thermal shock (PTS) (Section 17.3.2.2)
- Upper-shelf energy (USE) (Section 17.3.2.3)
- Adjusted reference temperature (Section 17.3.2.4)
- Pressure-temperature (P-T) limits and low temperature overpressure setpoints (Section 17.3.2.5)

17.3.2.1 NEUTRON FLUENCE PROJECTIONS

The fluence projections used as inputs to the current 60-year neutron embrittlement analyses were developed using discrete ordinates transport fluence methodology. At the time the projections were prepared, 48 effective full power years (EFPY) was 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.

Updated fluence projections were developed for 80 years of plant operation, based upon 72 EFPY for use as inputs to updated neutron embrittlement analyses for the SPEO. They were also used to determine whether any additional materials will be exposed to fluence greater than 1.0 x 10^{17} n/cm^2 (E > 1.0 MeV) through the SPEO, which would be in the extended beltline. The 72 EFPY fluence projections were developed using methodologies that follow the guidance of NRC RG 1.190, “Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence.” These methodologies have been approved by the NRC and are described in detail in WCAP-14040-A and WCAP-16083-NP-A. The 72 EFPY fluence projections have been determined for reactor vessel beltline and extended beltline materials, which include all reactor vessel forgings and welds that are predicted to be exposed to 1.0 x 10^{17} neutrons/cm^2 (n/cm^2) or more during 80 years of operation. Therefore, these TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

Additionally, the PTN Neutron Fluence Monitoring AMP ensures the continued validity and adequacy of projected neutron fluence analyses and related neutron fluence-based TLAAs as described in Section 17.2.1.2.

17.3.2.2 PRESSURIZED THERMAL SHOCK

C31

The requirements in 10 CFR 50.61 provide rules for protection against PTS events for PWRs. Licensees are required to perform an assessment of the projected values of the PTS reference temperature (RT_{PTS}), whenever a significant change occurs in projected values of RT_{PTS}, or upon request for a change in the expiration date for the operation of the facility. Section 10 CFR 50.61(b)(2) establishes screening criteria for RT_{PTS} at 270°F for plates, forgings, and axial welds, and 300°F for circumferential welds. The PTS analysis has been determined to be a TLAA. For PWRs, 10 CFR 50.61 requires the reference temperature RT_{PTS} for RPV beltline materials to be less than the PTS screening criteria at the expiration date of the operating license unless otherwise approved by the NRC. The reference temperature has been determined to be less than the PTS screening criteria at the end of SPEO, unless alternate requirements have been invoked in accordance with 10 CFR 50.61(b) and approved by the NRC.

The methods for calculating RT_{PTS} values are given in 10 CFR 50.61 and are consistent with the methods in NRC RG 1.99, "Radiation Embrittlement of Reactor Vessel Materials," with exception that PTN Units 3 and 4 received the following exemptions from Appendix G to 10 CFR Part 50 and 10 CFR 50.61.

The exemption from Appendix G to 10 CFR Part 50 is to replace the required use of the existing Charpy V-notch and drop-weight-based methodology with the use of an alternate methodology described in the Framatome ANP Topical Reports BAW-2308, Revisions 1-A and 2-A, “Initial RT_{NDT} of Linde 80 Weld Materials,” that incorporates the use of fracture toughness test data for evaluating the integrity of the Linde 80 weld materials present in the PTN Units 3 and 4 RPV beltline regions. The alternate methodology employs direct fracture toughness testing per the Master Curve methodology based on use of ASTM Standard Method E 1921 (1997 and 2002 editions) and ASME Code Case N-629. The exemption is required since Appendix G to 10 CFR Part 50 requires that for the pre-service or unirradiated condition, the nil-ductility reference temperature (RT_{NDT}) be evaluated by Charpy V-notch impact tests and drop weight tests according to the procedures in the ASME Code, Section III, Paragraph NB-2331.

The exemption from 10 CFR 50.61 is to use an alternate methodology described in the Framatome Advanced Nuclear Power Topical Report, BAW-2308, Revisions 1-A and 2-A, “Initial RT_{NDT} of Linde 80 Weld Materials.” BAW-2308 allows the use of direct fracture toughness test data for evaluating the integrity of the Linde 80 weld materials present in the PTN Units 3 and 4 reactor vessels beltline regions, based on the use of ASTM E 1921 (1997 and 2002 editions) and ASME Code Case N-629. The exemption is required because the methodology for evaluating reactor vessels material fracture toughness in 10 CFR 50.61 requires that the pre-service or unirradiated condition be evaluated using Charpy V-notch impact tests and drop weight tests according to the procedures in the ASME Code, Section III, Paragraph NB-2331.

An exemption from a portion of the requirements of Appendix G to 10 CFR Part 50 and 10 CFR 50.61 is required to allow for an alternative methodology, that is based on using of fracture toughness test data, to determine the initial, unirradiated properties that are used for evaluating the integrity of the PTN reactor vessels’ circumferential beltline welds. This exemption addresses only those parts of the regulations (i.e., 10 CFR 50.61 and 10 CFR Part 50, Appendix G) that discuss the definition or use of unirradiated nil-ductility reference temperature ($RT_{NDT(U)}$), and its associated uncertainty, σ_Δ. All other requirements of 10 CFR 50.61 and 10 CFR Part 50, Appendix G, are unchanged by this exemption.

These methods were used to calculate the RT_{PTS} for the PTN reactor vessel limiting materials at the end of the SPEO, 72 EFPY. The calculated RT_{PTS} values at 72 EFPY for the PTN reactor vessels are less than the 10 CFR 50.61(b)(2) screening criteria of 270°F for intermediate and lower shells, and less than 300°F for the circumferential welds. Based upon the revised calculations, additional measures will not be required for the PTN reactor vessels during the SPEO. Therefore, these TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(ii). C31

17.3.2.3 UPPER SHELF ENERGY

Appendix G of 10 CFR Part 50, Paragraph IV.A.1.a, states that reactor vessel beltline materials must have Charpy USE of no less than 75 ft-lb initially and must maintain Charpy USE throughout the life of the vessel of no less than 50 ft-lb, unless it is demonstrated in a manner approved by the Director, Office of Nuclear Reactor Regulation, that lower values of Charpy USE will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code.

Per NRC RG 1.99, Revision 2, “Radiation Embrittlement of Reactor Vessel Materials,” the Charpy USE should be assumed to decrease as a function of fluence according to RG 1.99, Figure 2, when credible surveillance data is not available. If credible surveillance data is available, the decrease in USE may be obtained by plotting the reduced plant surveillance data on Figure 2 of RG 1.99 and fitting the data with a line drawn parallel to the existing lines as the upper bound of all of the data.

All PTN Unit 3 reactor vessel materials maintain a USE value greater than 50 ft-lbs through 72 EFPY except for the IS-to-LS and US-to-IS circumferential welds.

All PTN Unit 4 reactor vessel materials maintain a USE value greater than 50 ft-lbs through 72 EFPY except for the IS-to-LS and US-to-IS circumferential welds.

For the PTN Units 3 and 4 reactor vessel materials that do not maintain a USE value above 50 ft-lbs through 72 EFPY, an EMA was performed. The analysis was performed on the circumferential weld with the lowest projected USE value, which was the IS-to-LS circumferential weld for both Units. The analysis concludes that the PTN Units 3 and 4 IS-to-LS circumferential welds satisfy the acceptance criteria of Appendix K of Section XI of the ASME Code for projected low USE at 72 EFPY. Since the IS-to-LS circumferential weld is the bounding material for each Unit, all PTN Units 3 and 4 reactor vessel materials have been demonstrated to meet the requirements of 10 CFR 50, Appendix G, with regards to low USE.

The USE values for the PTN reactor vessel beltline and extended beltline materials are projected to remain above 50 ft-lb at 72 EFPY of neutron exposure through the SPEO. The projections demonstrated that the requirements of 10 CFR Part 50, Appendix G, will continue to be met through the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

17.3.2.4 ADJUSTED REFERENCE TEMPERATURE

The adjusted reference temperature (ART) of the limiting beltline material is used to adjust the beltline P-T limit curves to account for irradiation effects. NRC RG 1.99, Revision 2, “Radiation Embrittlement of Reactor Vessel Materials,” provides the methodology for determining the ART of the limiting material. The initial nil-ductility reference temperature, RT_{NDT}, is the temperature at which a non-irradiated metal (ferritic steel) changes in fracture characteristics from ductile to brittle behavior. RT_{NDT} is evaluated according to the procedures in the ASME Code Section III, Paragraph NB-2331. Neutron embrittlement increases the RT_{NDT} beyond its initial value.

10 CFR Part 50, Appendix G, defines the fracture toughness requirements for the life of the vessel. The shift in the initial RT_{NDT} (ΔRT_{NDT}) is evaluated as the difference in the 30 ft-lb index temperatures from the average Charpy curves measured before and after irradiation. This increase (ΔRT_{NDT}) means that higher temperatures are required for the material to continue to act in a ductile manner. The ART is defined as: C31

$$\text{Initial } RT_{NDT} + (\Delta RT_{NDT}) + \text{Margin}$$

Since the ΔRT_{NDT} value is a function of 48 EFPY fluence, associated with the 60-year licensed operating period, these ART calculations meet the criteria of 10 CFR 54.3(a) and have been identified as TLAAs requiring evaluation for 80 years.

The 72 EFPY fluence values were determined for PTN Units 3 and 4 for the RPV beltline and extended beltline components. These 72 EFPY fluence values, postulated flaw depth at a location one quarter of the vessel wall thickness from the clad/base metal interface (¼T), were used to compute ART values for the PTN RPV beltline and extended beltline materials in accordance with NRC RG 1.99, Revision 2, requirements. The projections demonstrate that the ART values in the limiting material for each unit will remain below the NRC RG 1.99, Revision 2, Section 3, acceptance criteria of 200°F through the SPEO. Therefore, these TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

17.3.2.5 PRESSURE-TEMPERATURE LIMITS AND LOW TEMPERATURE OVERPRESSURE SETPOINTS

Appendix G of 10 CFR Part 50 requires that the reactor vessel be maintained within established P-T limits, including heatup and cooldown operations. These limits specify the maximum allowable pressure as a function of reactor coolant temperature. As the reactor vessel is exposed to increased neutron irradiation, its fracture toughness is reduced. The P-T limits must account for the anticipated reactor vessel fluence.

The current P-T limits are based upon 48 EFPY 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 the P-T limits 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.

In accordance with NUREG-2192, Section 4.2.2.1.4, the P-T limits for the SPEO need not be submitted as part of the SLRA since P-T limits are required to be updated through the 10 CFR 50.90 licensing process when necessary for P-T limits that are located in the PTN Technical Specifications (TS). The 10 CFR 50.90 process will ensure that the P-T limits for the SPEO will be updated prior to expiration of the P-T limits for the current period of operation.

The current PTN Units 3 and 4 heatup and cooldown curves are 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 extended power uprate (EPU) fluence. The PTN Units 3 and 4 reactor vessel P-T limit curves are contained in plant TS Section 3/4.4.9. Prior to exceeding 48 EFPY, new P-T limit curves will be generated to cover plant operation beyond 48 EFPY. The P-T limit curves will be developed using NRC-approved analytical methods. 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. Additionally, PTN TS 3/4.4.9.3 specify the power-operated relief valve (PORV) lift settings to mitigate the consequences of low temperature overpressure events. Each time the P-T limit curves are revised, the LTOP PORV setpoints must be reevaluated. Therefore, LTOP limits are considered part of the calculation of P-T curves. C31

The Reactor Vessel Material Surveillance AMP 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 for PTN Units 3 and 4. The P-T limit curves and LTOPs PORV setpoints will be updated and a plant TS change request will be submitted for approval prior to exceeding the current 48 EFPY limits. These TLAAs are dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

17.3.3 METAL FATIGUE

Fatigue is an age-related degradation mechanism caused by cyclic stressing of a component by either mechanical or thermal stresses. The thermal and mechanical fatigue analyses of plant mechanical components have been identified as TLAAs for PTN. Specific components have been designed considering transient cycle assumptions, as listed in vendor specifications and the PTN UFSAR. Fatigue analyses are considered TLAAs for Class 1 and non-Class 1 mechanical components requiring evaluation for the SPEO in accordance with 10 CFR 54.21(c). Evaluation of these TLAAs per 10 CFR 54.21(c)(1) determines whether:

i. The analyses remain valid for the SPEO;

ii. The analyses have been projected to the end of the SPEO, or;

iii. The effects of aging on the intended function(s) will be adequately managed for the SPEO.

The following evaluations are documented in the following sections:

- Class 1 component fatigue analyses are in Section 17.3.3.1.
- Fatigue analysis of non-Class 1 mechanical components is in Section 17.3.3.2.
- Environmentally assisted fatigue analysis is in Section 17.3.3.3.
- Reactor vessel underclad cracking analysis is in Section 17.3.3.4.
- RCP flywheel analysis is in Section 17.3.3.5.

C31

17.3.3.1 ASME BOILER AND PRESSURE VESSEL CODE, SECTION III, CLASS 1 COMPONENTS

The reactor vessels, RVI, pressurizers, steam generators, RCPs, and pressurizer surge lines have been designed in accordance with the requirements of the ASME Code Section III, Class 1. The ASME Code Section III, Class 1 requires a design analysis to address fatigue and establish limits such that initiation of fatigue cracks is precluded. Fatigue analyses were prepared for these components to determine the effects of cyclic loadings resulting from changes in system temperature, pressure, and seismic loading cycles. These ASME Code Section III, Class 1, fatigue analyses are based upon explicit numbers and amplitudes of thermal and pressure transients described in the design specifications. The intent of the design basis transient definitions is to bound a wide range of possible events with varying ranges of severity in temperature, pressure, and flow. The fatigue analyses were required to demonstrate that the CUF will not exceed the design allowable limit of 1.0 when the equipment is exposed to all of the postulated transients. Since the calculation of fatigue usage factors is part of the CLB and is used to support safety determinations, and since the number of occurrences of each transient type was based upon 60-year assumptions, these Class 1 fatigue analyses have been identified as TLAAs requiring evaluation for the SPEO.

The ASME Code Section III, Class 1, allowable stress calculations remain valid for the SPEO. The results demonstrate that the number of assumed thermal cycles will not be exceeded in 80 years of plant operation. PTN will monitor transient cycles using the PTN Fatigue Monitoring AMP and assure that the corrective action specified in the program is taken if any applicable transient cycle count comes within 80 percent of the design or projected cycle limit. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

17.3.3.2 ANSI B31.1 AND ASME BOILER AND PRESSURE VESSEL CODE, SECTION III, CLASS 3 PIPING

The RCS primary loop piping and balance-of-plant piping are designed to the requirements of ANSI B31.1, Power Piping. The exceptions are the PTN Units 3 and 4 pressurizer surge lines and the PTN Unit 4 EDG safety-related piping. The pressurizer surge lines have been designed to the requirements of ASME Code Section III, Class 1. The Unit 4 EDG safety-related piping has been designed to the requirements of ASME Code Section III, Class 3, which is essentially the same as ANSI B31.1 design requirements. The evaluation of the Unit 4 EDG safety-related piping fatigue is, therefore, included in this section.

Piping and components designed in accordance with ANSI B31.1 design rules are not required to have an explicit analysis of cumulative fatigue usage, but cyclic loading is considered in a simplified manner in the design process. These codes first require prediction of the overall number of thermal and pressure cycles expected during the 80-year lifetime of these components. Then a stress range reduction factor is determined for that number of cycles using a table from the applicable design code. If the total number of cycles is 7,000 or less, the stress range reduction factor of 1.0 is applied that would not reduce the allowable stress value. These are considered to be implicit fatigue analyses since they are based upon cycles anticipated for the life of the component, and are, therefore, TLAAs requiring evaluation for the SPEO.

Design requirements in ANSI B31.1 assume a stress range reduction factor to provide conservatism in the piping design to account for fatigue due to thermal cyclic operation. The cyclic qualification of the piping is based on the number of equivalent full-temperature cycles. The stress range reduction factor is 1.0 provided the number of anticipated cycles is limited to 7,000 equivalent full-temperature cycles. A review of the ANSI B31.1 piping within the scope of SLR was performed in order to identify those systems that operate at elevated temperature and to establish their cyclic operating practices. Under current plant operating practices, piping systems within the scope of SLR are only occasionally subject to cyclic operation. Typically, systems are subject to continuous steady-state operation and vary operating temperatures only during plant heatup and cooldown, during plant transients, or during periodic testing. From the EPRI TR-104534, Volume 2, Section 4, piping systems subject to thermal fatigue due to temperature cycling are described as follows: C31

> For initial screening, systems in which the fluid temperature can vary more than 200°F in austenitic steel components and more than 150°F in carbon and low alloy steel components are potentially of concern for fatigue due to thermal transients. Thus, carbon steel systems or portions of systems with operating temperatures less than 220°F and stainless steel systems or portions of systems with operating temperatures less than 270°F may generally be excluded from such concerns, since room temperature represents a practical minimum exposure temperature for most plant systems.

Conservatively, based on this assessment, any system or portions of systems with operating temperatures less than 220°F were conservatively excluded from further consideration. Once a system is established to operate at a temperature above 220°F, the next step is to determine the system operating characteristics. For example, it is determined when the system is in heatup and cooldown mode, such as during testing, reactor trips, sampling or swapping trains. The operating characteristics of a pipe segment are established by reviewing system operations and conducting interviews with appropriate operations personnel. With these operating characteristics defined, a determination can be made regarding whether a system is expected to exceed 7,000 full temperature cycles in 80 years of operation. In order to exceed 7,000 cycles, a system would be required to heatup and cooldown approximately once every four days. Systems that may exceed 7,000 cycles in 80 years were evaluated further.

The ASME Code Section III, Class 3, and ANSI B31.1 allowable stress calculations remain valid for the SPEO. The results demonstrate that the number of assumed thermal cycles will not be exceeded in 80 years of plant operation. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i) with the exception of the RCS hot leg primary sample tubing which will be dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

17.3.3.3 ENVIRONMENTALLY ASSISTED FATIGUE

NUREG-2192 provides a recommendation for evaluating the effects of the reactor water environment on the fatigue life of ASME Code Section III, Class 1, components that contact reactor coolant to support closure of Generic Safety Issue (GSI)-190. One method acceptable to the NRC for satisfying this recommendation is to assess the impact of the reactor coolant environment on a sample of critical components. These critical components should include those selected in NUREG/CR-6260, “Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components.”

This sample of components can be evaluated by applying environmental life correction factors to the existing ASME Code fatigue analyses. Demonstrating that these components, and other site- specific locations that are more limiting, have an environmentally adjusted CUF less than or equal to the design limit of 1.0 is an acceptable option for managing environmentally assisted metal fatigue for the reactor coolant pressure boundary. Since the calculation of fatigue usage factors is part of the CLB and is used to support safety determinations, and since the number of occurrences of each transient type was based upon 60-year assumptions, these Class 1 fatigue analyses have been identified as TLAAs requiring evaluation for the SPEO. C31

For the reactor vessels, RVI, pressurizers, steam generators, and RCPs, the environmentally assisted fatigue analysis remains valid for the SPEO. PTN will monitor transient cycles using the PTN Fatigue Monitoring AMP and assure that the corrective action specified in the program is taken if any of the actual cycles approach their analyzed numbers. These components are dispositioned in accordance with 10 CFR 54.21 (c)(1)(iii).

For the pressurizer surge line, PTN will manage the effects of aging due to fatigue on the pressurizer surge line by implementing volumetric examination of the welds using the Pressurizer Surge Line Fatigue Program (Section 17.2.3.1) in accordance with 10 CFR 54.21(c)(1)(iii).

17.3.3.4 REACTOR VESSEL UNDERCLAD CRACKING

In early 1971, an anomaly identified as grain boundary separation, perpendicular to the direction of the cladding weld overlay, was identified at another nuclear plant in the heat-affected zone of reactor vessel base metal. Reactor vessel underclad cracking involves cracks in base metal forgings immediately beneath austenitic SS cladding, which are created as a result of the weld- deposited cladding process. Westinghouse performed an analysis of flaw growth associated with underclad cracking in 1971, and concluded that reactor vessel integrity could be assured for the entire 40-year original plant license term. Since the reactor vessel underclad cracking is part of the CLB and is used to support safety determinations, and since the probability of failure was based upon operating history assumptions, this cracking analysis has been identified as a TLAA requiring evaluation for the SPEO.

Flaw indications indicative of underclad cracks have been evaluated in accordance with the acceptance criteria of the ASME Code Section XI at other nuclear plants. Such indications have been found during pre-service and ISI of plants considered to have cladding conditions, which are suspect with respect to underclad cracking. These flaw indications have been dispositioned as being acceptable for further service without repair or detailed evaluation, because they meet the conservative requirements of the ASME Code Section XI, Paragraph IWB-3500.

Fracture evaluations have also been performed to evaluate underclad cracks, and the results have always been that the flaws are acceptable. A number of field examples, which have involved cladding cracks and exposure of the base metal due to cladding removal, were summarized. In several cases, the cladding cracks have been suspected to extend into the base metal, and have been analyzed as such. In these cases, the cracks were suspected to be exposed to the water environment, and successive monitoring inspections were conducted on the area of concern. No changes were found due to propagation or further deterioration of any type. The NRC then allowed the surveillance to be discontinued.

Finally, underclad cracks found during pre-service and ISI have been evaluated in accordance with the acceptance criteria of the ASME Code Section XI. The observed underclad cracks are very shallow, confined in depth to less than 0.295 inch and have lengths up to 2.0 inches. The fatigue crack growth assessment for these small cracks shows very little extension over 80 years, even if they were exposed to the reactor water and with crack tip pressure of 2,500 psi. For the worst-case scenario, a 0.30-inch-deep continuous axial flaw in the beltline region would grow to 0.43 inch after 80 years. The minimum allowable axial flaw size for normal, upset and test conditions is 0.67 inch, and for emergency and faulted conditions, it is 1.25 inches. Since the allowable flaw depths far exceed the maximum flaw depth after 80 years of fatigue crack growth, underclad cracks of any shape are acceptable for service for 80 years, regardless of the size or orientation of the flaws. Therefore, per PWROG-17031-NP, Rev. 0, "A Review of Cracking Associated with Weld Deposited Cladding in Operating PWR Plants," it may be concluded that underclad cracks are of no concern relative to structural integrity of the reactor vessel for a period of 80 years. C31

Based on the above information, the analysis associated with reactor vessel underclad crack growth has been projected to the end of the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

17.3.3.5 REACTOR COOLANT PUMP FLYWHEEL

NUREG-2191 identifies "Fatigue analysis of the reactor coolant pump flywheel" as a potential site-specific TLAA. Fatigue in the flywheels is a recognized and analyzed aging effect. Due to industry OE, the possibility of RCP overspeed or RCP vibration prompted concerns regarding the potential effects of missiles that might result from the failure of the RCP motor flywheel, including damage to RCP seals or other pressure boundary components.

Since the RCP flywheel probability of failure is part of the CLB and is used to support safety determinations, and since the probability of failure was based upon 60-year assumptions, these Class 1 fatigue analyses have been identified as TLAAs requiring evaluation for the SPEO.

During normal operation, the RCP flywheel possesses sufficient kinetic energy to potentially produce high-energy missiles in the unlikely event of failure. Conditions that may result in overspeed of the RCP increase both the potential for failure and the kinetic energy. The aging effect of concern is fatigue crack initiation in the flywheel bore keyway. An evaluation of the probability of failure during the SPEO was performed, and it demonstrated that the flywheel design has a high structural reliability with a very high flaw tolerance and negligible flaw crack extension over an 80-year service life. Based on the above information, the RCP flywheel fatigue analysis remains valid for the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

17.3.4 ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT

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Thermal, radiation, and cyclical aging analyses of plant electrical and instrumentation components, developed to meet 10 CFR 50.49 requirements, have been identified as TLAAs. The NRC has established EQ requirements in 10 CFR 50.49 and 10 CFR Part 50, Appendix A, Criterion 4. 10 CFR 50.49 specifically requires that an EQ program be established to demonstrate that certain electrical components located in harsh plant environments are qualified to perform their safety function in those harsh environments after the effects of in-service aging. Harsh environments are defined as those areas of the plant that could be subject to the harsh environmental effects of a LOCA, HELB, or post-LOCA radiation. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of environmental qualification. Aging evaluations for electrical components in the EQ Program that specify a qualification of at least 60 years have been identified as TLAAs for license renewal because the criteria contained in 10 CFR 54.3 are met.

The PTN Environmental Qualification of Electric Equipment AMP (Section 17.2.1.4) meets the requirements of 10 CFR 50.49 for the applicable electrical components important to safety. 10 CFR 50.49 defines the scope of components to be included, requires the preparation and maintenance of a list of components within the scope of the PTN Environmental Qualification of Electric Equipment AMP, and requires the preparation and maintenance of a qualification file that includes component performance specifications, electrical characteristics and the environmental conditions to which the components could be subjected during their service life.

10 CFR 50.49(e)(5) contains provisions for aging that require, in part, consideration of all significant types of aging degradation that can affect component functional capability. 10 CFR 50.49(e)(5) also requires replacement or refurbishment of components not qualified for the current license term prior to the end of designated life, unless additional life is established through ongoing qualification. 10 CFR 50.49(f) establishes four methods of demonstrating qualification for aging and accident conditions. 10 CFR 50.49(k) and (l) permit different qualification criteria to apply based on plant and component vintage. Supplemental EQ regulatory guidance for compliance with these different qualification criteria is provided in the Division of Operating Reactors (DOR) Guidelines, "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors," NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety Related Electrical Equipment," and NRC RG 1.89, Revision 1, "Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants."

The PTN Environmental Qualification of Electric Equipment AMP will manage the effects of aging effects for the components associated with the EQ TLAA. This AMP implements the requirements of 10 CFR 50.49 (as further defined and clarified by NUREG-0588 and RG 1.89, Rev. 1). Component aging evaluations are reanalyzed on a routine basis to extend the qualifications of components as part of the PTN Environmental Qualification of Electric Equipment AMP. Important attributes for the reanalysis of an aging evaluation include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met). The methodology of the PTN Environmental Qualification of Electric Equipment AMP is further described in Section 17.2.1.4.

Under the PTN Environmental Qualification of Electric Equipment AMP, the reanalysis of an aging evaluation could extend the qualification of the component. If the qualification cannot be extended by reanalysis, the component must be refurbished, replaced, or requalified prior to exceeding the period for which the current qualification remains valid. A reanalysis is to be performed in a timely manner such that sufficient time is available to refurbish, replace, or re-qualify the component if the reanalysis is unsuccessful. C31

The effects of aging on the intended function(s) will be adequately managed for the SPEO. The PTN Environmental Qualification of Electric Equipment AMP has been demonstrated to be capable of programmatically managing the qualified lives of the electrical and instrumentation components falling within the scope of the program for SLR. The PTN Environmental Qualification of Electric Equipment AMP provides reasonable assurance that the aging effects will be managed and that EQ components will continue to perform their intended functions for the SPEO. Therefore, this result meets the requirements of 10 CFR 54.21(c)(1)(iii).

17.3.5 CONCRETE CONTAINMENT UNBONDED TENDON PRESTRESS

The PTN Units 3 and 4 containment buildings are prestressed, post-tensioned, reinforced-concrete structures composed of vertical cylinder walls and a shallow dome, supported on a conventionally reinforced concrete base slab. The cylinder walls are provided with vertical tendons and horizontal hoop tendons. The dome is provided with three groups of tendons oriented 120-degrees apart. Over time, the containment prestressing forces decrease due to relaxation of the steel tendons and due to creep and shrinkage of the concrete.

The prestress force of containment tendons decreases over time as a result of seating of anchorage losses, elastic shortening of concrete, creep of concrete, shrinkage of concrete, relaxation of prestressing steel, and friction losses. At the time of initial licensing, the magnitude of the prestress losses throughout the life of the plant was predicted, and the estimated final effective preload at the end of 40 years was calculated for each tendon type. The final effective preload was then compared with the minimum required preload to confirm the adequacy of the design. The estimated final effective prestressing force at the end of plant life was previously extended to 60 years during the initial license renewal process.

Examinations performed as part of the PTN Concrete Containment Unbonded Tendon Prestress AMP (Section 17.2.1.3) and the PTN ASME Section XI, Subsection IWL, AMP (Section 17.2.2.31), in accordance with ASME Section XI, Subsection IWL, requirements, include the measurement of the prestressing force values from multiple tendons within each tendon group (vertical, hoop, and dome) during periodic examinations. These measurements are compared to MRVs and predicted lower limit force values to verify that the containment structure is performing its intended function, as well as to compare the actual loss of prestress rate to the predicted rate. Trend lines of the individual tendon prestressing force values for each tendon group are developed to predict future tendon prestressing force values to ensure the containment structure will continue to perform its intended function.

Trend lines calculated, based on the most recent tendon surveillances for all three tendons groups at PTN Units 3 and 4, have been extended from 60 years to 80 years. In all cases, the trend lines indicate the prestressing forces will remain above the MRVs through the end of the SPEO. The implementation of the PTN Concrete Containment Unbonded Tendon Prestress AMP (Section 17.2.1.3) and the PTN ASME Section XI, Subsection IWL, AMP (Section 17.2.2.31) will provide reasonable assurance that the loss of containment tendon unbonded prestress will be adequately managed so that the intended functions are maintained during the SPEO. Since the concrete containment unbonded tendon prestress analysis has been projected to the end of the SPEO, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii). C31

17.3.6 CONTAINMENT LINER PLATE AND PENETRATIONS FATIGUE ANALYSIS

The PTN prestressed concrete containment structures are designed to contain the radioactive material that would be released in the unlikely event of design basis accidents. Each containment structure includes a liner attached to the entire inside surface that provides a leak-tight membrane. The design specification requires the liner to be analyzed for the effects of cyclic loading. Since the current design analysis for the containment liner is based upon 60-year design inputs, it has been identified as a TLAA requiring evaluation for the SPEO.

The interior surface of each containment is lined with welded steel plate to provide an essentially leak-tight barrier. Design criteria are applied to the liner to assure that the specified allowed leak rate is not exceeded under the design basis accident conditions. Prior to SLR, the following fatigue loads were described in UFSAR Appendix 5B, Section B.2.1, and were considered in the design of the liner plates. The following fatigue loads are considered a TLAA for the purpose of SLR:

(1) Thermal cycling due to annual outdoor temperature variations. The number of cycles for this loading is 60 for the plant life of 60 years.

(2) Thermal cycling due to containment interior temperature varying during the heatup and cooldown of the RCS. The number of cycles for this loading is assumed to be 500.

(3) Thermal cycling due to the maximum hypothetical accident will be assumed to be one.

(4) Thermal load cycles in the piping system are somewhat isolated from the liner plate penetrations by concentric sleeves between the pipe and the liner plate. The attachment sleeve is designed in accordance with ASME Code Section III fatigue considerations. All penetrations are reviewed for a conservative number of cycles to be expected during the unit life.

Each of the four previous items has been evaluated for the SPEO as follows:

(1) For item (1), the number of thermal cycles due to annual outdoor temperature variations was increased from 60 to 80 for the SPEO. The effect of this increase is insignificant in comparison to the assumed 500 thermal cycles due to containment interior temperature varying during heatup and cooldown of the RCS. The 500 thermal cycles includes a margin of 300 thermal cycles above the 200 RCS allowable design heatup and cooldown cycles, which is sufficient margin to accommodate the additional 20 cycles of annual outdoor temperature variation. Therefore, this loading condition is considered valid for the SPEO as it is enveloped by item (2).

(2) For item (2), the assumed 500 thermal cycles was evaluated based on the more limiting heatup and cooldown design cycles (transients) for the RCS. The RCS was designed to withstand 200 heatup and cooldown thermal cycles. The SLRA evaluation determined that the originally projected number of maximum RCS design cycles is conservative enough to envelop the projected cycles for the PEO. Therefore, the original containment liner plate fatigue analysis for 500 heatup and cooldown cycles is considered valid for the SPEO. C31

(3) For item (3), the assumed value for thermal cycling due to the maximum hypothetical accident remains valid. No maximum hypothetical accident has occurred and none is expected; therefore, this assumption is considered valid for the SPEO.

(4) For item (4), the design of the containment penetrations has been reviewed. The design meets the general requirements of the 1965 Edition of ASME Code Section III. The main steam piping, feedwater piping, blowdown piping, and letdown piping are the only piping penetrating the containment wall and liner plate that contribute significant thermal loading on the liner plate. The projected number of actual operating cycles for these piping systems through 80 years of operation was determined to be less than the original design limits.

The effects of aging on the intended function(s) of the liner will be adequately managed for the SPEO by the PTN Fatigue Monitoring AMP (Section 17.2.1.1), which monitors transient cycles to ensure the transient limits are not exceeded during the SPEO, validating the assumptions used in these evaluations. No penetration TLAAs were identified. The analyses associated with the containment liner plate have been evaluated and determined to remain valid for the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

17.3.7 OTHER SITE-SPECIFIC TLAAS

17.3.7.1 BOTTOM-MOUNTED INSTRUMENTATION THIMBLE TUBE WEAR

As discussed in NRC IN 87-44, Supplement 1, "Thimble Tube Thinning in Westinghouse Reactors," thimble tubes have experienced thinning as a result of flow-induced vibration. Thimble tube wear results in degradation of the RCS pressure boundary and could potentially create a non-isolable leak of reactor coolant. Since flow-induced vibration continues throughout the plant life, thimble tube wear is considered a TLAA. The NRC staff requested that licensees perform the actions described in NRC Bulletin No. 88-09, "Thimble Tube Thinning in Westinghouse Reactors." In response to this bulletin, PTN established a program for inspection and assessment of thimble tube thinning. PTN commitments to the NRC for two eddy current inspections of the thimble tubes for each unit were completed in May 1990 for Unit 4, and in December 1992 for Unit 3. The results demonstrated that the thimble tubes were acceptable for operation and that no appreciable thinning had occurred between the two inspections. Based on the results of the inspections and the flaw analyses performed, only the Unit 3 thimble tube N-05 required further evaluation.

The subsequent inspection on Unit 3 thimble tube N-05 was performed in October 2004. The results of this inspection indicated that N-05 was within the acceptance criteria for thimble tube wall thinning, which is less than 70 percent wall loss; however, thimble tube wear had continued. In 2009, Unit 3 thimble tube N-05 was replaced. Based on the above, the PTN Flux Thimble Tube Inspection AMP is an effective program for managing the aging effect of material loss due to fretting wear.

The PTN Flux Thimble Tube Inspection AMP (Section 17.2.2.24) provides an effective program to managing the aging effects of material loss due to fretting wear for the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii). C31

17.3.7.2 EMERGENCY CONTAINMENT COOLER TUBE WEAR

Emergency containment cooler tube wear was assessed for the operating term as flow rate through the emergency containment coolers could exceed the nominal design flow during certain plant conditions and cause wear of the coils. The wall thickness and wear rate determined in this assessment were projected for the initial PEO and is a TLAA for the SPEO.

The component cooling water (CCW) flow rate through the emergency containment coolers could exceed the nominal design flow during certain plant conditions. High flow rates can produce increased wear on the inside surface of the emergency containment cooler coils. The CCW flow rate through the emergency containment coolers could exceed the nominal design flow of 2,000 gpm during the injection phase of a LOCA or during the monthly operability test. Flow rates as high as 5,500 gpm have been experienced during the surveillance test.

This high flow rate can produce increased wear on the inside surface of the emergency containment cooler coils. This increased erosion wear rate has been predicted to be up to mils/year due to flow-induced erosion with an additional impingement wear rate of mils/year at those locations subject to impingement. This results in a wear rate in the range of 0.5 mils/year to 1.1 mils/year depending on coil tube location. This effect was evaluated, and the tube wall nominal thickness of 0.049 inches did not decrease below the minimum required wall thickness of 0.010 inches during the initial operating period. Since tube wear continues throughout the plant life, emergency containment cooler tube wear is considered a TLAA.

To ensure emergency containment cooler coil reliability, an inspection for minimum tube wall thickness was conducted in 2011 prior to the initial PEO. Results concluded that the calculated tube wear rates would be acceptable for the PEO. However, since cooler tube wall loss has been observed, periodic ultrasonic thickness measurements of the emergency containment cooler coils to confirm updated tube wear rates would be acceptable for the revised 80-year plant life will be performed.

The PTN Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components AMP will ensure that the aging effect of emergency containment cooler tube wear will be adequately managed for the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(iii).

17.3.7.3 LEAK-BEFORE-BREAK FOR REACTOR COOLANT SYSTEM PIPING

A site-specific Leak-Before-Break (LBB) analysis was performed for PTN Units 3 and 4 in 1994, as stated in 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," and approved by the June 23, 1995 letter from Richard P. Croteau (NRC) to J. H. Goldberg (FPL), “PTN Units 3 and 4 - Approval to Utilize Leak-Before-Break Methodology for Reactor Coolant System Piping.” The LBB analysis was performed to show that any potential leaks that develop in the RCS loop piping can be detected by plant monitoring systems before a postulated crack causing the leak would grow to unstable proportions during the 40-year plant life. The NRC safety evaluation concluded that the LBB analysis was consistent with the criteria in NUREG-1061, Volume 3, and NUREG-0800, Section 3.6.3; therefore, the analysis complied with 10 CFR 50, Appendix A, General Design Criterion 4.

The LBB analysis for PTN Units 3 and 4 was revised to address the initial PEO, utilizing criteria consistent with the original LBB analysis and was subsequently revised to address the EPU. Since the LBB analysis depends on the potential that a postulated crack would grow to unstable proportions during the plant life, which is dependent on the length of plant operation, the LBB analysis is a TLAA. C31

The aging effects that must be addressed for SPEO include thermal aging of the primary loop piping components and fatigue crack growth. 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 only significant thermal aging effect on the RCS loop piping is embrittlement of the duplex ferritic CASS components. This effect results in a reduction in fracture toughness of the material.

The LBB analysis for PTN Units 3 and 4 was revised to address the SPEO utilizing criteria consistent with the original LBB analysis. Since the primary loop piping includes cast SS fittings, fully aged fracture toughness properties were determined for each heat of material. Based on loading, pipe geometry, and fracture toughness considerations, enveloping critical locations were determined at which LBB crack stability evaluations were made. Through-wall flaw sizes were postulated at the critical locations that would cause leakage at a rate 10 times the leakage detection system capability. Including the requirement for margin of applied loads, large margins against flaw instability were demonstrated for the postulated flaw sizes.

For the SPEO, a site-specific fatigue crack growth analysis for PTN Units 3 and 4 for an 80-year plant life was performed. A design transient set that bounds the PTN design transients was utilized in the fatigue crack growth analysis, and it was determined that fatigue crack growth for the SPEO is negligible. The LBB analysis for the RCS primary loop piping has been projected to the end of the SPEO; therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

17.3.7.4 LEAK-BEFORE-BREAK CLASS 1 AUXILIARY PIPING

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 SPEO, 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 SPEO, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

17.3.7.5 CODE CASE N-481 REACTOR COOLANT PUMP INTEGRITY ANALYSIS

To support the EPU, Westinghouse performed an evaluation of the Code Case N-481 RCP integrity analysis to identify if it is acceptable for the PEO. The results of the evaluation concluded that the previous RCP integrity analysis conclusions documented in 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 PTN Units 3 and 4,” for the RCP casings remain valid for the 60-year licensed operating period at EPU conditions. Based on these conclusions, no AMP beyond the examinations required in ASME Section XI is required to manage the thermal embrittlement for the RCP casings. Since the analysis depends on the potential that a postulated crack would grow to unstable proportions during the plant life, which is dependent on the length of plant operation, the analysis is a TLAA.

To demonstrate continued compliance during the SPEO, the analyses associated with the application of Code Case N-481 to the RCP casing during the SPEO was re-evaluated by PWROG-17033-NP, 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." C31

The effects of aging on the intended function(s) will be adequately managed by the PTN ISI AMPs for the period of extended operation projected to the end of the SPEO. Therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(ii).

17.3.7.6 CRANE LOAD CYCLE LIMIT

A review of design specifications for cranes is within the scope of license renewal and has been performed. Crane design includes considerations for frequency of operation and expected size of loads, relative to their maximum load capacity. Based upon these considerations, cranes are given an expected maximum number of design cycles over their life, which also correlates to a number of cycles on structural members.

Since the maximum number of design load cycles over the current 60-year life of the cranes provide the basis for acceptability of the design for cyclic operation over the life of the cranes, these cyclic analyses are considered TLAAs. Therefore, the maximum number of design load cycles for the PEO was evaluated for the SPEO.

At PTN Units 3 and 4, the load cycle limit was identified as a TLAA for the following cranes within the scope of SLR:

- Reactor building polar cranes
- Spent fuel cask cranes
- Intake structure bridge cranes (also called intake area gantry cranes or intake structure cranes)
- Turbine gantry cranes (also called turbine cranes)
- Reactor cavity manipulator cranes (also called fuel handling manipulator cranes)
- Spent fuel bridge cranes

Metal fatigue (fatigue stress) results from repeated loading. Routinely, a load or stress is applied and completely or partially removed or reversed repeatedly. This manner of loading is important if high stresses are repeated for a few cycles, or if lower stresses are repeated many times.

<u>All Cranes except Spent Fuel Bridge Cranes</u>

This evaluation is used to determine if a cyclic limit must be placed on the operational life of the subject cranes to ensure safe operation. Although the fatigue criterion in place during the manufacturing of the cranes is not explicitly addressed in Electrical Overhead Crane Institute (EOCI)-61, it can be concluded that proven analytical methods as a source of design input is credible. Since EOCI-61 does not explicitly address fatigue, a comparison was made with the fatigue provisions of the sixth edition of the AISC Manual of Steel Construction, which is the code of record for structural design, in order to determine the allowable number of cycles of loading that are inherent in the EOCI-61 criteria.

For up to 2,000,000 cycles of maximum load, Section 1.7.3 of the AISC Manual of Steel Construction requires that the allowable stresses be based on the use of A7 steel using Sections 1.5 and 1.6 of the specification. It also stipulates that these allowables be compared to the algebraic difference between the maximum computed stress and the minimum computed stress, but not be less than those required to support either the maximum or minimum computed stress in accordance with Sections 1.5 and 1.6. C31

The cranes covered by this calculation are configured so that the minimum computed stress is effectively zero. In other words, there is no stress reversal. Therefore, the maximum loading controls the design of the structural elements (max. stress).

Therefore, the cranes are acceptable for use of up to 2,000,000 cycles of maximum loads. For an 80-year period of operation, this equates to 68 cycles per day.

Spent Fuel Bridge Cranes

The spent fuel bridge cranes were replaced in 1990. Design of the spent fuel bridge cranes was in accordance with CMAA-70, with added seismic requirements.

Per the AISC Manual of Steel Construction, maximum stresses developed in the main structural elements and their connections are minimal relative to the strength and fatigue allowables. The only element with significant stress levels is the connection plate of the upper walkway to the side of the W10x33 column. The maximum stress in this element for loads, inclusive of the walkway, is approximately 20 ksi. If this stress is conservatively considered totally reversing, the resulting stress range is within the allowable tolerance for Service Class A Crane. Therefore, the cranes are acceptable for use of up to 200,000 cycles of maximum loads.

Since the spent fuel bridge cranes were installed in 1990 and the SPEO for PTN ends on 2053, the spent fuel bridge cranes will have operated for 63 years. For the SPEO, this equates to 8.6 cycles per day. This is far more cycles than these cranes experience.

The analyses associated with crane design, including fatigue, remain valid for the SPEO; therefore, this TLAA is dispositioned in accordance with 10 CFR 54.21(c)(1)(i).

17.4 SUBSEQUENT LICENSE RENEWAL (SLR) COMMITMENTS LIST

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The current license for PTN ends and the SPEO begins on the following dates:

- Unit 3: 07/19/2032 (01/19/2032 for AMP and enhancement implementation no later than 6 months prior to SPEO)
- Unit 4: 04/10/2033 (10/10/2032 for AMP and enhancement implementation no later than 6 months prior to SPEO)

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Table 17.4-1

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.

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Table 17.4-1 License Renewal Commitments (Continued)					
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 CUFen calculations. b) Update the plant procedure to identify and require monitoring of the 80-year projected plant transients that are utilized as inputs to CUFen 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

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Table 17.4-1 License Renewal Commitments (Continued)

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

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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. 2. CRDM Thermal Sleeves a) Continue to monitor the industry operating experience regarding wear of CRDM thermal sleeves.	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

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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
5 (continued)			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

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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
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

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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
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

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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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.	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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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	**FSAR Supplement Section**	**NUREG-2192 Section**	**Commitment**	**Implementation Schedule**	**Source**
12 (continued)			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 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.		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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.	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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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
15 (continued)			The 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. 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.		

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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
15 (continued)			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.		

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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
15 (continued)			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 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.		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
15 (continued)			• 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		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
15 (continued)			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. 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.		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
15 (continued)			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.		

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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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.	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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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
16 (continued)			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. • The additional inspections are completed within the interval (e.g., refueling outage interval, 10-year inspection interval) in which the original inspection was conducted.		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
16 (continued)			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: • 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	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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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
17 (continued)			• 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). • 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).		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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; 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

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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 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.	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 PTN4: 4/20/2028 - 10/10/2032	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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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
20 (continued)			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.	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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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
20 (continued)			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 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.		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
20 (continued)			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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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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. 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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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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;	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

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
22 (continued)			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.		
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
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

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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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-2018-152 (A10) L-2018-166 (A16) L-2018-222 (A2) 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; 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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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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	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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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
27 (continued)			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 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.		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
27 (continued)			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: i) 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.		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
27 (continued)			j) 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 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.		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
27 (continued)			k) 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. l) 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.		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
27 (continued)			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. m) Include spreadsheets for tracking deficiencies associated with the program to monitor, trend, and resolve issues. n) 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.		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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. 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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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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.	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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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
30 (continued)			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. 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).		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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.	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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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
31 (continued)			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. 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.		

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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
31 (continued)			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.		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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

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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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.	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 (A14) 10/17/2018 FPL Response to NRC RAI No. 3.5.2.1.2-1 ML18292A642 L-2018-193 (A8) 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

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
34 (continued)			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 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-2018-223 (A1, A6, A7) L-2019-012 (A13) 2/13/2019 FPL Response to Follow-on NRC RAI No. 3.5.2.1.2-1a ML19050A420

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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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.	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

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
35 (continued)			f) Revise the AMP governing procedure, or develop a new implementing procedure, to direct the trending and evaluation of related operating 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. i) 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.		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
35 (continued)			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 PTN4: 4/10/2028 - 10/10/2032	L-2018-082 SLRA Rev. 1, ML18072A232 L-2019-012 (A9, A11) 02/13/2019 FPL Response to NRC RAI No. B.2.3.32-2 3.5.1.100-1a ML19050A420 L-2019-087 (A2)

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
36 (continued)			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.		L-2019-048 (A9) 03/15/2019 FPL Response to NRC RAI No. 3.5.2.2.2.6-9 ML19078A132 L-2019-087 (A2) 5/6/2019 FPL Revised Response to NRC RAI No. 3.5.2.2.2.6-9 ML19128A149

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
36 (continued)			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.		

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Table 17.4-1 License Renewal Commitments (Continued)					
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)	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 (A16) 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

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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
39 (continued)			• 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 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.		L-2018-191 (A4, A7) 11/28/2018 FPL Response to NRC RAI No. B.2.3.35-5, RAI No. 3.5.1.47-1 ML18334A182 L-2018-223 (A5) 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 (A10) 2/13/2019 FPL Response to NRG RAI No. B.2.3.35-3a 3.5.1.100-1a ML19050A420

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
39 (continued)			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.		

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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
39 (continued)			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 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 the governing AMP procedure regarding use of quantitative criteria and more frequent inspections, with operating experience specifically considered and trended, for identified degradation until repaired.		

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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. 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

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Table 17.4-1 License Renewal Commitments (Continued)					
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

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Table 17.4-1 License Renewal Commitments (Continued)					
Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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

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Table 17.4-1 License Renewal Commitments (Continued)					
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

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Table 17.4-1 License Renewal Commitments (Continued)					
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

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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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
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. 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

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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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; 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
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; 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

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Table 17.4-1 License Renewal Commitments (Continued)

Item No.	FSAR Supplement Section	NUREG-2192 Section	Commitment	Implementation Schedule	Source
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

17.5 REFERENCES

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Federal Regulations

1. U.S. Code of Federal Regulations, Title 10, Part 50 (10 CFR 50), "Domestic Licensing of Production and Utilization Facilities".

   a. 10 CFR 50.2, "Definitions"

   b. 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants"

   c. 10 CFR 50.55a, "Codes and Standards"

   d. 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events"

   e. 10 CFR 50.61a, "Alternate Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events"

   f. 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants"

   g. 10 CFR 50.90, "Amendment of License or Construction Permit at Request of Holder"

   h. 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants"

   i. 10 CFR Part 50, Appendix G, "Fracture Toughness Requirements"

   j. 10 CFR Part 50, Appendix H, "Reactor Vessel Material Surveillance Program Requirements"

   k. 10 CFR Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors"

2. U.S. Code of Federal Regulations, Title 10, Part 54, (10 CFR 54), "Requirements for Renewal of Operating Licenses for Nuclear Power Plants".

   a. 10 CFR 54.21, "Contents of Application--Technical Information"

NRC (Generic Letters, NUREGs, Regulatory Guides, Information Notices)

3. NRC, DOR Guidelines, "Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors," U. S. Nuclear Regulatory Commission, Washington D.C., June 1979.

4. NRC, Generic Safety Issue 190, "Fatigue Evaluation of Metal Components for 60-Year Plant Life," U. S. Nuclear Regulatory Commission, Washington D.C.

5. NRC, NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety Related Electrical Equipment," Agencywide Documents Access and Management System (ADAMS) Accession No. ML031480402, U. S. Nuclear Regulatory Commission, Washington D.C., July 1981.

6. NRC, NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," ADAMS Accession No. ML070250180, U.S. Nuclear Regulatory Commission, Washington D.C., July, 1980.

7. NRC, NUREG-0737, "Clarification of TMI Action Plan Requirements," ADAMS Accession No. ML051400209 U.S. Nuclear Regulatory Commission, Washington D.C., November 1980. C31

8. NRC, NUREG-1061, Volume 3, "Report of the NRC Piping Review Committee; Evaluation of Potential for Pipe Breaks," ADAMS Accession No. ML093170485, U.S. Nuclear Regulatory Commission, Washington D.C., November 1984.

9. NRC, NUREG-1339, "Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants," ADAMS Accession No. ML031430208, U.S. Nuclear Regulatory Commission, Washington D.C., June 1990.

10. NRC, NUREG-1759, "Safety Evaluation Report Related to the License Renewal of Turkey Point Nuclear Plant, Units 3 and 4," U.S. Nuclear Regulatory Commission, Washington D.C., April 2002.

11. NRC, NUREG-2191, "Generic Aging Lessons Learned for Subsequent License Renewal (GALL-SLR) Report," U.S. Nuclear Regulatory Commission, Washington D.C., Volumes 1 and 2, July 2017.

12. NRC, NUREG-2192, "Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants," U.S. Nuclear Regulatory Commission, Washington D.C., July 2017.

13. NUREG/CR-5999, "Interim Fatigue Design Curves for Carbon, Low-Alloy, and Austenitic Stainless Steels in LWR Environments," U.S. Nuclear Regulatory Commission, Washington D.C., August 1993.

14. NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components," ADAMS Accession No. ML031480219, U.S. Nuclear Regulatory Commission, Washington D.C., March 1995.

15. NRC, Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants,"

ADAMS Accession No. ML070290283, U.S. Nuclear Regulatory Commission, Washington D.C., March 2007.

16. NRC, Regulatory Guide 1.35.1, "Determining Prestressing Forces for Inspection of Prestressed Concrete Containments," ADAMS Accession No. ML003740040, U.S. Nuclear Regulatory Commission, Washington D.C., July 1990.

17. NRC, Regulatory Guide 1.54, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants," Revision 2, ADAMS Accession No. ML102230344, U.S. Nuclear Regulatory Commission, Washington D.C., October 2010.

18. NRC, Regulatory Guide 1.65, Revision 1, "Materials and Inspections for Reactor Vessel Closure Studs," ADAMS Accession No. ML092050716. U.S. Nuclear Regulatory Commission, Washington D.C., April 2010.

19. NRC, Regulatory Guide 1.89, Revision 1, "Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants," ADAMS Accession No. ML031320126, U. S. Nuclear Regulatory Commission, June 1984.

20. NRC, Regulatory Guide 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," ADAMS Accession No. ML031430205, U.S. Nuclear Regulatory Commission, Washington D.C., May 1988.

21. NRC, Regulatory Guide 1.127, Revision 2, "Criteria and Design Features for Inspection of Water-Control Structures Associated with Nuclear Power Plants," ADAMS Accession No. ML15107A412, U.S. Nuclear Regulatory Commission, Washington D.C., February 2016. C31

22. NRC, Regulatory Guide 1.160, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Revision 3, ADAMS Accession No. ML113610098, U.S. Nuclear Regulatory Commission, Washington D.C., May 2012.

23. NRC, Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," Revision 0, ADAMS Accession No. ML003740058. U.S. Nuclear Regulatory Commission, Washington D.C., September 1995.

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