TURKEY POINT NUCLEAR GENERATING UNITS 3 AND 4 (TURKEY POINT)
SUBSEQUENT LICENSE RENEWAL APPLICATION (SLRA)
REQUESTS FOR ADDITIONAL INFORMATION (RAIS)
SAFETY - SET 5

1. Reactor Coolant Pump Motor Flywheel, TLAA 4.3.5

Regulatory Basis:

Pursuant to 10 CFR 54.21(c), the SLRA shall include an evaluation of time-limited aging analyses (TLAAs). 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. In accordance with 10 CFR 54.21(c)(1)(i), the applicant has proposed to disposition the SLRA Section 4.3.5 TLAA for the RCP motor flywheel in accordance with 10 CFR 54.21(c)(1)(i) to demonstrate that the CLB analyses remain valid for the subsequent period of extended operation (SPEO).

RAI 4.3.5-2

Background:

To support its TLAA disposition of § 54.21(c)(1)(i), the applicant included the PWR Owners Group report, PWROG-17011-NP, Rev. 0, August 2017 in Enclosure 4 of the SLRA. PWROG-17011-NP provides the generic SLR methodology for deterministic and risk-informed analyses related to integrity of Westinghouse RCP motor flywheels. PWROG-17011-NP is not approved by the NRC for use in SLR applications. In order to complete its review of this TLAA the staff must determine whether the applicant's proposed implementation of the generic SLR flywheel methodology in PWROG-17011-NP is acceptable for demonstrating, per § 54.21(c)(1)(i), that the CLB analyses of the PTN 3 and 4 flywheels will remain valid for the subsequent period of extended operation (SPEO).

Issue:

The risk assessment in PWROG-17011-NP, Section 3 used the probabilistic fracture mechanics (PFM) analysis methodology to generate conditional probability of failure (PoF) for reactor coolant pump (RCP) flywheels for the 80-year risk assessment. The staff noted that the PoFs for the case when ISI was performed every 4 years for only the first 10 years of operation in PWROG-17011-NP for 80-year SLR terms are lower than the corresponding PoFs in WCAP-15666-A for 60-year initial LR terms. The reason for this is not clear. In theory, when a selected flaw is given 20 more years to grow without any ISI, the PoF should be higher.

Request:

Please explain why the PoFs for the ISI case documented above are lower for the 80-year SLR analysis in PWROG-17011-NP compared to the corresponding PoFs for this ISI case for the 60-

year LR analysis in WCAP-15666-A. If there is an error in the PoF analysis for this ISI case, please provide the correct PoF calculations for the 60-year and/or 80-year analyses, as needed. Please revise the PWROG-17011-NP report, as needed, to show the correct PoF calculations.

2. Reactor Vessel Material Surveillance, GALL AMP XI.M31

The applicant credits the Reactor Vessel Materials Surveillance Aging Management Program with managing the effects of loss of fracture toughness due to neutron embrittlement of reactor pressure vessel (RPV) components. In order to determine if the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation in accordance with 10 CFR 54.21 (a)(3), the staff requires additional information, as detailed below.

Regulatory Basis:

Section 54.21(a)(3) of 10 CFR states for each structure and component subject to an aging management review per § 54.21(a)(1), the applicant shall demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

B.2.3.19-1

Background:

The GALL-SLR, Section XI.M31 provides guidance for the Reactor Vessel Material Surveillance AMP. The GALL-SLR, in the program description states in part that:

> This program includes withdrawal and testing of at least one surveillance capsule addressing the subsequent period of extended operation, with a neutron fluence of the surveillance capsule between one and two times the peak neutron fluence of interest projected at the end of the subsequent period of extended operation. The peak reactor vessel neutron fluence of interest at the end of the subsequent period of extended operation should address the time-limited aging analyses (TLAAs) described in the following sections of the Standard Review Plan for Review of Subsequent License Renewal Applications for Nuclear Power Plants (SRP-SLR), as applicable: Sections 4.2.2.1.2 (Upper-Shelf Energy), 4.2.3.1.3 (Pressurized Thermal Shock) and 4.2.3.1.4 (Pressure-Temperature Limits) for pressurized water reactors (PWRs); and Sections 4.2.2.1.2 (Upper-Shelf Energy), 4.2.3.1.4 (Pressure Temperature Limits), 4.2.3.1.5 (Elimination of Boiling Water Reactor Circumferential Weld Inspection) and 4.2.3.1.6 (Boiling Water Reactor Axial Welds) for boiling water reactors (BWRs). If a capsule meeting this neutron fluence criterion has not been tested prior to entering the subsequent period of extended operation, then the program includes the withdrawal and testing (or alternatively the retrieval from storage, reinsertion for additional neutron fluence accumulation, if necessary, and testing) of one capsule addressing the subsequent period of extended operation to meet this criterion. If a surveillance capsule was previously identified for withdrawal and testing to address the initial period of

extended operation, it is not acceptable to redirect or postpone the withdrawal and testing of that capsule to achieve a higher neutron fluence that meets the neutron fluence criterion for the subsequent period of extended operation.

Both the “Parameters Monitored or Inspected” and “Monitoring and Trending” program element in GALL-SLR XI.M31 contain similar wording to the above.

The description of the applicant’s Reactor Vessel Material Surveillance AMP states that this program includes withdrawal and testing of the X_4 surveillance capsule and that this capsule is demonstrated as being within one to two times the peak reactor vessel neutron fluence of interest at the end of the SPEO in the TLAAs for USE, PTS, and P-T limits. The applicant claimed that its Reactor Vessel Material Surveillance AMP (SLRA Section B.2.3.19) will be consistent with the 10 elements of NUREG-2191, Section XI.M31, “Reactor Vessel Material Surveillance.”

Issue:

According to the Turkey Point Units 3 and 4 UFSAR, Capsule X4 is scheduled to be withdrawn at a fluence of 9.297×10^{19} n/cm^2. The staff’s safety evaluation (SE) approving the most recent approved capsule withdrawal schedule for Turkey Point Units 3 and 4[1] indicates that this fluence is approximately equivalent to the projected 80 year (67 effective full power years (EFPY)) peak RPV fluence, considering extended power uprate conditions. The SE also concluded the proposed withdrawal fluence was between one and two times the peak RPV fluence at 60 years, and that the schedule would continue to meet the requirements of ASTM E185-82 and thus meet 10 CFR 50, Appendix H. However, the staff notes the neutron embrittlement time-limited aging analyses in the SLRA are based on neutron fluences projected to 72 EFPY.

Per SLRA Table 4.2.1-1, three components for each unit have projected neutron fluence values at 80 years that exceed the projected withdrawal fluence for Capsule X_4. The components are as follows:

Turkey Point Units 3 and 4 intermediate shell forgings with a projected fluence of 1.08×10^{20} n/cm^2

- Turkey Point Unit 3 inner shell (IS) to lower shell (LS) circumferential welds, and LS forgings with projected ID fluences at 80 years (72 EFPY) of 9.86×10^{19} n/cm^2
- Turkey Point Unit 4 inner shell (IS) to lower shell (LS) circumferential welds, and LS forgings with projected ID fluences at 80 years (72 EFPY) of 9.81×10^{19} n/cm^2

The same fluence values are used in the pressurized thermal shock (PTS) TLAA evaluation and these are the highest projected fluence values for 80 years used in the neutron embrittlement

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[1] Turkey Point Nuclear Plant, Units 3 and 4 - Review of Reactor Vessel Material Surveillance Program - Revised Surveillance Capsule Withdrawal Schedule (TAC NOS. ME9564 and ME9565). September 4, 2013 (ADAMS Accession No. ML13191A090)

TLAA evaluations. However, these fluence values are larger than the expected withdrawal fluence of Capsule X_4 documented in the UFSAR.

Therefore, it does not appear that Capsule X_4 will be withdrawn and tested at a neutron fluence sufficient to be between one and two times the peak RPV neutron fluence of interest projected at the end of the subsequent period of extended operation, consistent with the applicant's claim of consistency with GALL-SLR, Section XI.M31.

Furthermore, since Capsule X_4 is credited as fulfilling the guidance of the GALL Report for initial license renewal (i.e., 40 to 60 years of operation) to withdraw and test a capsule with between one and two times the peak RPV fluence at 60 years, extending the schedule for Capsule X_4 to cover both the 60 and 80 year peak RPV fluences would also not be consistent with the applicant's claim of consistency with GALL-SLR, Section XI.M31.

Request:

Justify how the predicted fluence of Capsule X_4 at the time of withdrawal will be one to two times the peak RPV fluence of interest at 80 years.

If the predicted fluence of Capsule X_4 at withdrawal will be less than 1.0 times the peak RPV fluence at 80 years, justify the claim of consistency with GALL-SLR, Section XI.M31 or identify and justify an exception to the GALL-SLR, Section XI.M31.

B.2.3.19-2

Background:

GALL-SLR AMP XI.M31 states under "Monitoring and Trending" program element that if no in-vessel surveillance capsules are available, an alternative neutron fluence monitoring program uses alternative dosimetry, either from in-vessel capsules or ex-vessel capsules, to monitor neutron fluence during the subsequent period of extended operation, and that the methods used in this alternative neutron fluence monitoring program are consistent with RG 1.190, including appropriate benchmarking, as described in GALL-SLR Report AMP X.M2, "Neutron Fluence Monitoring."

The applicant claimed that its Reactor Vessel Material Surveillance AMP (SLRA Section B.2.3.19) will be consistent with the 10 elements of NUREG-2191, Section XI.M31, "Reactor Vessel Material Surveillance."

Issue:

The description of the RV Material Surveillance AMP does not describe any provisions for neutron fluence monitoring after capsule X_4 is withdrawn and tested, which is scheduled to occur during the initial license renewal period.

Request:

Describe how the RV fluence will be monitored after the last scheduled capsule is withdrawn and tested.

3. Flux Thimble Tube Inspection, GALL AMP XI.M37

Regulatory Basis:

Section 54.21(a)(3) of 10 CFR states for each structure and component subject to an aging management review per § 54.21(a)(1), the applicant shall demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

RAI B.2.3.24-1

Background:

SLRA Section B.2.3.24 and the “monitoring and trending” program element state that flux thimble tube wall thickness measurements are trended and wear rates are calculated using the methodology of either WCAP-12866, "Bottom Mounted Instrumentation Flux Thimble Wear" or PTN letter JPNS-PTN-91-5374, "BMI Thimble Tube Wear Evaluation."

The applicant also stated that the methodology set forth in these documents includes sufficient conservatism to ensure that wall thickness acceptance criteria continue to be met during plant operation between scheduled inspections.

Issue:

The applicant stated its program is consistent with the “detection of aging effects,” and “monitoring and trending” program elements. However, the applicant did not explain or justify how the methodology in either of these documents provide conservative estimates of flux thimble tube wear and include sufficient conservatism to ensure that wall thickness acceptance criteria continue to be met during plant operation between scheduled inspections.

Furthermore, the applicant did not explain the criteria that will be used to determine which methodology will be used (i.e., WCAP-12866 or PTN letter JPNS-PTN-91-5374) to trend flux thimble tube wall thickness measurements and calculate wear rates.

Request:

- Discuss the differences between the two methodologies (i.e., WCAP-12866 and PTN letter JPNS-PTN-91-5374) used to trend flux thimble tube wall thickness measurements and calculate wear rates.

- Discuss the correlation between these two methodologies and justify the criteria that will be used to determine which methodology will establish the inspection schedule of the flux thimble tubes.

- Justify that the methods in WCAP-12866 and PTN letter JPNS-PTN-91-5374 provide conservative estimates of flux thimble tube wear and include sufficient conservatism to ensure that wall thickness acceptance criteria continue to be met during plant operation between scheduled inspections.

RAI B.2.3.24-2

Background:

SLRA Section B.2.3.24 and the "detection of aging effects' program element indicate that the Flux Thimble Tube Inspection Program includes periodic bobbin coil eddy current testing used to monitor for loss of material and wear of the flux thimble tubes during the SPEO and that the frequency of examinations is based on site-specific wear data and wear predictions.

During its audit, the staff reviewed the applicant's results from previous flux thimble inspections and noted that several flux thimble tubes were projected to not exceed the through-wall acceptance criteria through the SPEO.

Issue:

During its audit, the staff noted from past inspections that it appears the applicant's program does not rely solely on site-specific wear data and wear predictions to schedule future inspections. However, based on the applicant's program basis document and current procedures it's not clear how long the inspection interval can be prolonged based on site-specific wear data and wear predictions before an inspection is performed to confirm these predictions.

Request:

- Verify whether the Flux Thimble Tube Inspection Program includes periodic inspections that confirm the site-specific wear predictions are accurate or conservative during the SPEO.

- Discuss how long the inspection interval for flux thimble tubes can be prolonged based on site-specific wear data and wear predictions before an inspection is performed to confirm that wear predictions are accurate or conservative? Justify that this amount of time is appropriate to ensure the acceptance criteria for through-wall wear is not exceeded prior to this confirmation.

4. Boric Acid Corrosion, GALL AMP XI.M10

Regulatory Basis:

Section 54.21(a)(3) of 10 CFR requires an applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. One of the findings that the staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken with respect to managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. As described in SRP-SLR, an applicant may demonstrate compliance with 10 CFR 54.21(a)(3) by referencing the GALL-SLR Report. In order to complete its review and enable the formulation of a finding under 10 CFR 54.29(a), the staff requires additional information in regard to the matters described below.

RAI B.2.3.4-1

Background:

The original boric acid wastage surveillance program for the initial license renewal (PTN-ENG-LRAM-00-0028, Revision 4) limited the scope of the walkdowns to carbon steel components. Subsequent aging management guidance in the GALL and GALL-SLR Reports AMP XI.M10 included copper alloy with greater than 15 percent zinc as a material susceptible to loss of material due to boric acid corrosion. Although the program basis document (FLPCORP020-REPT-074, Revision 1) states that the “AMP covers any susceptible structures and components on which boric acid corrosion may occur,” the implementing procedure (0-ADM-537, Boric Acid Corrosion Control Program, Revision 13) only discusses steel components and does not specifically identify copper alloy with greater than 15 percent zinc.

SLRA Table 3.2.2-1, “Emergency Containment Cooling,” and SLRA Table 3.3.2-10, “Normal Containment Cooling,” (which address systems in the engineered safety features and auxiliary systems, respectively) include heat exchanger tubes made from copper alloy greater than 15 percent zinc. However, the discussion in SLRA Table 3.2-1 for item 3.2.1-008 states that there are no components made from copper alloy with greater than 15 percent zinc, exposed to air with borated water leakage, in the engineered safety features systems. Similarly, the discussion in SLRA Table 3.3-1 for item 3.3.1-009 only addresses steel components and by inference indicates that there are no components made from copper alloy with greater than 15 percent zinc, exposed to air with borated water leakage, in the auxiliary systems. The staff notes that these AMR items for copper alloy only cite an environment of condensation, whereas, other AMR items in both systems for components made from steel include an environment of “air with borated water leakage,” and credit the Boric Acid Corrosion program for managing loss of material. The staff also notes that the external surfaces of the heat exchanger tubes made from copper alloy with greater than 15 percent zinc in SLRA Tables 3.2.2-1 and 3.3.2-10, are not being managed for loss of material.

Issue:

It is unclear to the staff that the components made from copper alloy with greater than 15 percent zinc that are located inside the containment building will not be exposed to air with borated water leakage. As discussed in industry operating experience cited in the GALL-SLR Report (LER 346/2002-008), air-side fouling of the containment air coolers resulted from boric acid deposition due to reactor coolant system leakage. Based on the lack of AMR items and the lack of specificity in the boric acid corrosion program implementing procedure (0-ADM-537), the staff is unsure whether inspections of the external surfaces for components made from the copper alloy with greater than 15 percent zinc will be included in the program.

Request:

a) Provide the bases to justify the lack of consideration for an external environment of "air with borated water leakage," for heat exchanger tubes in either the emergency or normal containment cooling systems that are made from copper alloy with greater than 15 percent zinc.

b) Confirm that the Boric Acid Corrosion program will manage loss of material due to boric acid corrosion for all components made from copper alloy with greater than 15 percent zinc when exposed to an external environment of air with borated water leakage.

5. Flow-Accelerated Corrosion, GALL AMP XI.M17

Regulatory Basis:

10 CFR 54.21(a)(3) requires an applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. One of the findings that the staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken with respect to managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. As described in SRP-SLR, an applicant may demonstrate compliance with 10 CFR 54.21(a)(3) by referencing the GALL-SLR Report. In order to complete its review and enable the formulation of a finding under 10 CFR 54.29(a), the staff requires additional information in regard to the matters described below.

RAI B.2.3.8-1

Background:

The "scope of program" program element for NUREG-2191, AMP XI.M17, "Flow-Accelerated Corrosion," states that the program, described by the Electric Power Research Institute (EPRI) guidelines in Nuclear Safety Analysis Center (NSAC)-202L, "Recommendations for an Effective Flow-Accelerated Corrosion Program," includes procedures and administrative controls to assure that structural integrity is maintained for piping components. NSAC-202L, Revisions 2, 3, and 4, Section 3.1, “Governing Document,” recommends the inclusion of quality assurance requirements.

Procedure 0-ADM-530, “Flow-Accelerated Corrosion (FAC) Inspection Implementation Program,” Revision 0D, defines CHECWORKS™ and CHEC-NDE™ as computer software developed by EPRI to predict susceptible components and to input component inspection results into a plant database. Procedure IM-AA-101, “Software Quality Assurance Program,” Revision 12, provides the essential elements to meet the quality assurance standards established in the Quality Assurance Topical Report. Procedure IM-AA-101 also defines four levels of software classification based on the task for which the output is to be used.

Procedure ENG-FAC-2.3-7, “Validation of Flow-Accelerated Corrosion Program Software,” Revision 9, notes that CHECWORKS™ is classified as software quality assurance Level C, “Business Critical.” However, the software classification determination in JIM-MIS-1178-EPRI, Revision 1, for CHECWORKS™ states that the software is classified as Level D, “Other.”

Issue:

It is not clear to the staff whether the software products used in the Flow-Accelerated Corrosion program (i.e., CHECWORKS™ and CHEC-NDE™) are currently classified as Level C or Level D. In addition, it is not clear to the staff whether for subsequent license renewal these software products would meet the classification criteria for Level A, “Safety-Related,” (if the generated calculations or data are relied upon as the means of decision making for supporting safety-related operational function), or Level B, “Regulatory / Quality-Related,” (if the software will ensure compliance with commitments that are required by nuclear regulations).

Request:

For any software products used in the Flow-Accelerated Corrosion program, provide the software quality assurance classification, as delineated in Procedure IM-AA-101, “Software Quality Assurance Program,” and the bases for the classification.

RAI B.2.3.8-2

Background:

The GALL-SLR Report AMP XI.M17, “Flow-Accelerated Corrosion,” “detection of aging effects” program element states that the inspection program delineated in NSAC-202L includes the identification of susceptible locations. Procedure ER-AA-111, “Flow-Accelerated Corrosion (FAC) Program,” Revision 1, Section 5.1, “Program Scope,” states that the “System Susceptibility Evaluation (SSE) developed from this section becomes a Basis Document for the FAC Program.” It also states that the SSE should include guidance from NSAC-202L; that it should be updated to include additions and deletions of systems; and that it should be maintained to ensure changes in chemistry, operation, and design are appropriately addressed. NSAC-202L, Revisions 2, 3, and 4, Section 4.2, “Identifying Susceptible Systems,” recommends that the Susceptibility Analysis identify the systems, or portions of systems excluded from the FAC program and the basis for their exclusion.

Issue:

The program basis documentation associated with the Flow-Accelerated Corrosion program neither discussed nor referenced a System Susceptibility Evaluation. The staff notes that the SLRA discusses an enhancement to the "detection of aging effects" program element that will reassess piping systems that have been excluded from wall thickness monitoring based on operation less than 2 percent of plant operating time. It is unclear to the staff how this reassessment can be performed if there is no current system susceptibility evaluation that documents which systems or portions of systems have been excluded based on limited operation.

Request:

Provide information regarding the development of the System Susceptibility Evaluation discussed in Procedure ER-AA-111, "Flow-Accelerated Corrosion (FAC) Program," Section 5.1, "Program Scope." Include a discussion about the enhancement to the "detection of aging effects" program element to perform a "re-assessment" of excluded components if an initial assessment of excluded components does not exist.

RAI B.2.3.8-3

Background:

The "acceptance criteria" program element for NUREG-2191, AMP XI.M17, "Flow-Accelerated Corrosion," states "The minimum allowable wall thickness is the thickness needed to satisfy the component's design loads under the original code of construction." Turkey Point Report FPLCORP020-REPT-079, "Aging Management Program Basis Document – Flow-Accelerated Corrosion," Revision 1, Section 4.6, "Acceptance Criteria," states that this element of the AMP is consistent without exception with NUREG-2191.

FPL SPEC-M-006, Revision 5, Section 6.4, "Acceptance Criteria for Underthickness," states: "Section III of the ASME Code allows the use of the 10% rule as given in 6.4.1." SPEC-M-006, Section 6.4.1, "Ten Percent Rule," states: "When the measured thickness is greater than 0.9 times the calculated required thickness, the item meets the provisions of the ASME Code."

Issue:

Based on the staff's review of FPL SPEC-M-006, the ASME Code Section III "10% rule" acceptance criterion is based on the opinion of a participating ASME Code member. There is no evidence in plant-specific documents, or in ASME Code language or formal interpretations that this opinion has been endorsed by an industry consensus process. Lacking an industry consensus review, it is not clear that the ASME Code Section III "10% rule" acceptance criterion is consistent with the acceptance criteria in GALL-SLR AMP XI.M17.

Request:

Provide the specific statements from the ASME Code Section III that explicitly state the acceptability of the "10 percent rule."

6. External Surfaces Monitoring of Mechanical Components, GALL AMP XI.M36

Regulatory Basis:

Section 54.21(a)(3) of 10 CFR requires an applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. One of the findings that the staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken with respect to managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. As described in SRP-SLR, an applicant may demonstrate compliance with 10 CFR 54.21(a)(3) by referencing the GALL-SLR Report. In order to complete its review and enable the formulation of a finding under 10 CFR 54.29(a), the staff requires additional information in regard to the matters described below.

RAI B.2.3.23-1

Background:

As provided in Enercon Report FPLCORP020-REPT-094, "Aging Management Program Basis Document – External Surfaces Monitoring of Mechanical Components," Procedure 0-ADM-564, "Systems / Programs Monitoring," implements the associated program. Section 4.1, "Requirements," of this implementing procedure states that license renewal walkdowns shall be done in accordance with Attachment 2, "System/Component Groups Requiring Inspection for License Renewal Walkdown Report." Procedure 0-ADM-564, Attachment 2 includes forms for individual systems, or portions of systems, and specifies the components, material, and purpose of the inspection (e.g., valves, carbon steel, external loss of material).

Report FPLCORP020-REPT-094, Section 6.0, "Implementing Documents," identifies procedural actions for the program's implementing procedures. For Procedure 0-ADM-564, the specified action is to include the enhancements from the "parameters monitored or inspected," "detection of aging effects," "acceptance criteria," and "corrective actions" program elements. The staff notes that these enhancements do not revise the "scope of program" program element to include any components in aging management review (AMR) reports that are not currently listed in the implementing procedures.

Issue:

It is not clear that all of the AMR items crediting the External Surfaces Monitoring of Mechanical Components program for subsequent license renewal are currently included in the implementing procedure's walkdown forms. For example, SLRA Table 3.3.2-15, "Fire Protection," includes a number of components that credit the External Surfaces Monitoring of Mechanical Components AMP; however, there is no corresponding form in Procedure 0-ADM-564, Attachment 2 for any components in the fire protection system. In addition, although SLRA Table 3.2.2-2, "Containment Spray," includes stainless steel components that credit the External Surfaces Monitoring of Mechanical Components AMP, Procedure 0-ADM-564, Attachment 2, Form 30, "Containment Spray," only identifies carbon steel or cast iron components and does not include any stainless steel components.

Request:

Clarify whether all AMR items that credit the External Surfaces Monitoring of Mechanical Component program for subsequent license renewal are currently included in the associated implementing procedures, or delineate which existing enhancement will update the implementing procedures to include all such AMR items.

RAI B.2.3.23-2

Background:

As provided in Enercon Report FPLCORP020-REPT-094, "Aging Management Program Basis Document – External Surfaces Monitoring of Mechanical Components," Procedure 0-ADM-564, "Systems / Programs Monitoring," implements the associated program. Procedure 0-ADM-564, Attachment 2, "System/Component Groups Requiring Inspection for License Renewal Walkdown Report," provides forms for recording inspection results. For a number of system/component groups, the forms state "Walkdown is performed under PTN-LRAM-00-0028." The staff notes that PTN-LRAM-00-0028, "Boric Acid Wastage Surveillance Program – License Renewal Basis Document," is part of the original license renewal documentation and was added to Procedure 0-ADM-564 in December 2017. The stated purpose of PTN-LRAM-00-0028 is to document those activities of the Boric Acid Wastage Surveillance Program, which are credited as part of the license renewal process.

Issue:

The current implementing procedure for the External Surfaces Monitoring of Mechanical Components Program, 0-ADM-564, appears to credit the boric acid corrosion inspections performed through PTN-LRAM-00-0028. However, the program basis document, FPLCORP020-REPT-094, does not include any discussion regarding inspections associated with the boric acid corrosion program. Consequently, it is not clear to the staff if all aspects of the inspections (e.g., scope, extent, action request flagging) being performed through PTN-LRAM-00-0028 have commensurate requirements as the inspections detailed in Procedure 0-ADM-564, Section 4.3, "Performance of Walkdowns."

Request:

Clarify the extent to which walkdowns being performed under PTN-LRAM-00-0028 are being credited for walkdowns in Procedure 0-ADM-564, as stated on applicable walkdown forms in 0-ADM-564, Attachment 2. For those portions of the walkdowns that credit PTN-LRAM-00-0028, provide information to show that the applicable inspection requirements in Procedure 0-ADM-564 are either included or are not required to be included in the walkdowns being performed under PTN-LRAM-00-0028.

RAI B.2.3.23-3

Background:

The discussion for the Operating Experience in SLRA Section B.2.3.23, “External Surfaces Monitoring of Mechanical Components,” states that, during the December 2017 AMP effectiveness review, the “systems” sub-part of the Systems and Structures Monitoring Program failed the “scope of programs,” “detection of aging effects,” and “corrective actions” program elements. The Operating Experience section also states that “corrective actions have been initiated and completed to resolve AMP issues regarding the ineffectiveness of the Systems and Structures Monitoring AMP.” The staff notes that recent changes to Procedure 0-ADM-564 included: (December 2017) revising Attachment 2, Walkdown Forms and (April 2018) adding several instructions to action requests when significant deficiencies are identified during license renewal walkdowns.

Recent NRC inspection reports (05000250/2017003 and 05000250/2017007), include findings associated with: a) failure to promptly identify and correct external corrosion on component cooling water piping, and b) failure to inspect intake cooling water piping in accordance with procedure 0-ADM-564, respectively. The staff notes that the associated findings were documented in inspection reports dated October 2, 2017, and November 9, 2017, and would have been appropriate for consideration during the December 2017 AMP effectiveness review discussed in the SLRA.

In addition, NRC inspection report 05000250/2017004 includes an adverse trend related to identification and resolution of corrosion-related issues on the intake cooling water and component cooling water systems. This inspection report discusses walkdowns performed by a Turkey Point Coatings Task Force in November 2017 that identified numerous corrosion issues on the intake cooling water valve pits, including the issues recently found by NRC inspectors. The NRC inspection report identifies the licensee’s findings that various corrosion control procedures were not being adequately implemented, with system engineers and other plant personnel not identifying corrosion-related issues, believing that they were being addressed by other programs. The NRC inspection report also states that at the end of the inspection period (December 31, 2017) the licensee’s investigations and development of corrective actions to address the programmatic issues with identification and resolution of corrosion-related issues were not completed.

Issue:

The operating experience discussion for the External Surfaces Monitoring of Mechanical Components AMP states that corrective actions have been completed to resolve the identified ineffectiveness issues for the existing AMP. However, based on information in NRC inspection reports, programmatic issues from the Turkey Point Coatings Task Force (chartered in November 2017) had not yet been completed. The staff notes that the only change made to the implementing procedure (0-ADM-564) after December 2017 was the addition of instructions for including keywords and descriptions to corrective action documents that identify significant deficiencies identified during license renewal walkdowns. It was not clear to the staff that this change addressed the various identification and resolution of corrosion-related issues discussed in the NRC inspection reports.

Request:

Provide a discussion regarding the findings and long term corrective actions for the programmatic corrosion issues identified by the Turkey Point Coatings Task Force, as discussed in NRC inspection report 05000250/2017004. Include a description of changes to the External Surfaces Monitoring of Mechanical Components program that will result from the corrective actions being considered.

7. Fire Protection, GALL AMP XI.M26

Regulatory Basis:

Section 54.21(a)(3) of 10 CFR requires an applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. One of the findings that the staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken with respect to managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis. As described in the SRP-SLR, an applicant may demonstrate compliance with 10 CFR 54.21(a)(3) by referencing the GALL-SLR Report. In order to complete its review and enable making a finding under 10 CFR 54.29(a), the staff requires additional information in regard to the matters described below.

RAI 3.5.2.10-1

Background:

For AMP XI.M26, “Fire Protection,” the GALL-SLR Report recommends visual inspection by fire protection qualified personnel of penetration seals, fire barrier walls, ceilings, floors, doors, fire damper assemblies, and other fire barrier materials at a frequency in accordance with an NRC-approved fire protection program. Table 3.5.2-10 of the SLRA cites the Fire Protection AMP to manage loss of material and cracking of stainless steel drip shields over thermo-lag exposed to outdoor air. The staff reviewed 0-ADM-016, “Fire Protection Program” and FPL-CORP020-REPT-086, “Aging Management Program Basis Document – Fire Protection” and noted that credited raceway protection located beneath the turbine/generator bearings is potentially exposed to leaking oil and that metal drip shields are installed to reduce direct impact effects of oil leaking on the 1-hour fire rated barrier system.

Issue:

The staff noted that the plant-specific procedures do not address how cracking and loss of material will be managed for the drip shields. It is unclear to the staff how the loss of material and cracking for these stainless steel drip shields will be managed by the Fire Protection AMP.

Request:

Discuss how loss of material and cracking of these stainless steel drip shields will be managed by the Fire Protection program. Provide a description of the inspections performed and procedures used to inspect the stainless steel drip shields such that the intended functions are not impaired by either aging effect.

8. Stress Corrosion Cracking

RAI 3.5.2.1.2-1

Regulatory Basis:

Section 54.21(a)(3) of 10 CFR requires the applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. As described in SRP-SLR, an applicant may demonstrate compliance with 10 CFR 54.21(a)(3) by referencing the GALL-SLR Report and when evaluation of the matter in the GALL-SLR Report applies to the plant.

Background:

SRP-SLR Table 3.5-1, item 010, recommends that stainless steel (SS) penetration sleeves and penetration bellows, and dissimilar metal welds be managed for cracking due to stress corrosion cracking (SCC) by the AMP XI.S1, "ASME Section XI, Subsection IWE," and AMP

XI.S4, "10 CFR Part 50, Appendix J" programs. SRP-SLR Section 3.5.2.2.1.6, associated with SRP-SLR Table 3.5-1, item 010, recommends a further evaluation of additional appropriate examination/evaluation methods that needs to be implemented to detect this aging effect in SS components and dissimilar metal welds of the containment pressure-retaining boundary.

Subsequent license renewal application (SLRA) Section 3.5.2.2.1.6, associated with SLRA Table 3.5-1, item 3.5-1, 010, states that cracking of dissimilar metal welds for containment penetrations will be managed by the ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J, Aging Management Programs (AMPs) with no additional examinations. The SLRA claims that theses dissimilar metal welds are not considered susceptible to SCC since it requires a concentration of chloride contaminants that is not normally present in significant quantities, as well as high stress and temperatures greater than 140ºF, and no site operating experience (OE) of cracking has been identified for dissimilar metal welds.

The summary statement for “scope of program” element in Section 4.1.b of the program basis document FPLCORP020-REPT-102 (PBD) for the SLRA Section B.2.3.30 “ASME Section XI, Subsection IWE” AMP states, in part, that the AMP is credited with managing the effects of cracking of dissimilar metal welds associated with penetration sleeves and SS fuel transfer tube.

Issue:

The general visual examinations of ASME Section XI, Subsection IWE AMP are not capable of detecting cracking due to mechanisms such as stress corrosion cracking (SCC) or fatigue loading until failure. The “detection of aging effects” program element in PBD Section 4.4.b and the program enhancement included in LRA Section B.2.3.30 do not include any augmented techniques (e.g., surface examination) capable of detecting such cracking, nor does the AMP credit appropriate local leak rate testing capable of detecting such cracking that is being performed for these components (i.e., dissimilar metal welds and SS components such as fuel transfer tube). It is not clear to the staff if the “detection of aging effects” program element in the SLRA Section B.2.3.30 AMP is adequate for managing aging effects with regard to capability to detect cracking.

Based on the information provided in the SLRA, it is not clear how cracking due to stress corrosion cracking (SCC) will be managed by the ASME Section XI, Section IWE and the 10 CFR Part 50, Appendix J Programs for the containment penetrations with dissimilar metal welds, and the stainless steel penetrations and expansion joints from the spent fuel storage and handling structures. The programs in the SLRA do not include an enhancement to implement additional appropriate examination/evaluation methods to detect this aging effect.

Additionally, sufficient technical justification was not provided in the SLRA Section 3.5.2.2.1.6 to consider the SCC aging effect as not applicable since (1) the SLRA Section 3.5.2.2.1.6 states that these are high-temperature piping systems where localized temperatures at penetrations are less than 200ºF by design (i.e., are/can be exposed to more than 140ºF – temperature needed for SCC to develop), and (2) these components are exposed to an air – indoor uncontrolled and air – outdoor environment (SLRA items in Tables 3.5.2-1 and 3.5.2-15) for which other SCC factors (e.g., contaminants) are not being controlled or managed adequately to demonstrate that this aging effect will be prevented from occurring.

The staff notes that the SRP-SLR Table 3.5 1, item 010, recommendation is intended to address the aging effect of cracking due to SCC in SS and dissimilar metal weld material in penetrations sleeves and penetration bellows. Line items in SLRA Table 3.5.2-1 and 3.5.2-15, associated with SLRA Table 3.5.1, Item 3.5-1, 010, have a note A indicating that they are consistent with the GALL-SLR Report item for component, material, environment and aging effect.

Request:

1. Clarify if dissimilar metal welds in penetrations sleeves, and SS fuel transfer tube (including penetration sleeves and expansion joints) will be managed for cracking due to SCC using the ASME Section XI, Section IWE and the 10 CFR Part 50, Appendix J programs. Otherwise, provide adequate technical justification for not requiring management of the aging effects of cracking due to SCC for these components.

2. If these components will be managed for cracking due to SCC, clarify how the ASME Section XI, Section IWE and the 10 CFR Part 50, Appendix J programs will be enhanced to provide additional examination and/or evaluation methods that are capable of detecting this aging effect, consistent with the recommendations from the GALL-SLR Report, and the further evaluation in SRP-SLR Section 3.5.2.2.1.6. If an Appendix J local leak rate test is credited, identify the leak rate test and the interval at which it is being performed for each component, and justify its appropriateness for detecting cracking.

9. Atmospheric Metallic Tanks, GALL AMP XI.M29

Regulatory Basis:

Section 54.21(a)(3) of 10 CFR requires an applicant to demonstrate that the effects of aging for structures and components will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the subsequent period of extended operation. One of the findings that the staff must make to issue a renewed license (10 CFR 54.29(a)) is that actions have been identified and have been or will be taken with respect to managing the effects of aging during the period of extended operation on the functionality of structures and components that have been identified to require review under 10 CFR 54.21, such that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the current licensing basis (CLB). As described in SRP-LR, an applicant may demonstrate compliance with 10 CFR 54.21(a)(3) by referencing the GALL Report. In order to complete its review and enable making a finding under 10 CFR 54.29(a), the staff requires additional information in regard to the matters described below.

RAI B.2.3.17-2

Background:

UFSAR Section 9.15.1.2.2 states that the Unit 4A and Unit 4B emergency diesel generator diesel oil storage tanks (DOST) are constructed of reinforced concrete with a steel lining.

SLRA Table 3.5.2-9 states that there are no aging effects or aging management program for the Unit 4 DOST carbon steel liners exposed to concrete.

GALL-SLR Report, Section 3.2.2.2.9 states that there are no aging effects for carbon steel components exposed to concrete unless ground water intrusion (in this case, water from precipitation) could occur.

During the audit, the staff walked down the 4A DOST and noted that with the exception of the manway enclosures, tank sample connections, and flame arrestors (all located on the top of the tank), all of the penetrations into the tank are located inside the attached emergency diesel generator building. The staff noted that each of the penetrations on the roof are sealed or caulked at the component to concrete interface. The staff could not walk down the 4B emergency diesel rooms because work was being conducted on the A train.

SLRA Section B.2.3.35, “Structures Monitoring,” Program Enhancement No.1 states that the Unit 4 DOST liner will be added to the scope of the program.

SLRA Table 3.5.2-9, “Emergency Diesel Generator Building,” states that managing loss of sealing for elastomeric weather proofing materials exposed to outdoor air is managed by the Structures Monitoring Program. This AMR cites SRP-SLR item 3.5.1-072.

Issue:

The statement that there are no aging effects for the Unit 4 DOST carbon steel liners exposed to concrete and the addition of the Unit 4 DOST liners to the scope of the Structures Monitoring

Program appear to conflict. If the elastomeric seals for the manway enclosures, tank sample connections, and flame arrestors associated with the Unit 4 DOST liners were to degrade, water could intrude between the steel liner and concrete.

It is not clear whether the AMR items in SLRA Table 3.5.2.9 that cite SRP-SLR item 3.5.1-072 would include the manway enclosures, tank sample connections, and flame arrestors for the 4A and 4B DOST, because SLRA Table 3.5.2-9 states that there are no aging effects for the DOST liner.

Request:

State whether the 4B DOST has any penetrations exposed to outdoor air other than the manway enclosure, tank sample connections, and flame arrestor located on the roof.

State whether loss of sealing will be managed for the manway enclosures, tank sample connections, and flame arrestors associated with the 4A and 4B DOSTs by the Structures Monitoring Program.

RAI B.2.3.17-3

Background:

SLRA Section B.2.3.17 states that the tank design of the condensate storage tanks (CST), refueling water storage tanks (RWST), and Unit 3 diesel oil storage tank (DOST) does not specify the use of sealant or caulking for the tank-to-concrete interface.

During the on-site audit, the staff noted that the CSTs, RWSTs, and Unit 3 DOST tank to concrete interface joint appeared to be sealed with either an elastomeric compound or an unknown hard material. Except in minor degraded areas, the interface joint is coated.

During the audit, the staff also noted that the tank to concrete interface:

- For the CSTs, is above ground elevation; however, there is an approximately ½- inch deep depressed area that could accumulate moisture around the entire circumference of each tank.
- For the RWSTs, is essentially at ground elevation including some areas where the joint is covered with stone and some sediment and there are some locations where it appears that the ground slopes towards the tank to concrete interface.
- For the Unit 3 DOST, is approximately 3-inches above grade.

During the audit, the staff reviewed plant-specific documents and noted the following:

- For the CSTs: (a) there is a 1/8-inch layer of asphalt between the tank bottom and foundation; and (b) the concrete outside of the tank to concrete interface has a 1-inch slope away from the tank over the concrete foundation's width.

- For the RWST and Unit 3 DOST, the concrete outside of the tank to concrete interface has a 1-inch slope away from the tank over the concrete foundation's width.

Issue:

The tank bottom to concrete interface joint is subject to loss of material that is not readily observable if the joint is not sealed or the tank configuration does not readily drain water away from the joint. GALL-SLR Report AMP XI.M29 recommends periodic wall thickness measurements of the tank bottom, but does not include specific recommendations for the quantity of data points or location of the bottom thickness measurements. However, when there is the potential for water intrusion under the tank; the staff requires further information in this regard to complete its evaluation.

Based on the walkdowns and the review of plant-specific documents, the staff has concluded that the following tanks could be susceptible to periodic wetting at the tank to concrete interface if the sealant is not a permanent part of the design of the tank to concrete interface and if permanently installed, inspections are not conducted on the sealant.

- For the CSTs because based on observation during the audit, water could accumulate in the depressed area sufficient to overcome the 1-inch slope away from the tank over the concrete foundation's width.

- For the RWSTs because the tanks are essentially at ground elevation including some areas where the area is covered with stone and some sediment and there are some locations where it appears that the ground slopes towards the tank to concrete interface.

- For the Unit 3 DOST because even though the tank is above grade and there is a 1-inch slope away from the tank over the concrete foundation's width, local weather conditions will probably result in periodic challenges to the sealant.

It should be noted that the low-frequency electromagnetic testing (LFET) technique can be capable of scanning the entire bottom of the tank in order to detect discrete locations where augmented bottom thickness measurements should be conducted. The staff's evaluation of the use of this technique is documented in NUREG-2172, "Safety Evaluation Report Related to the License Renewal of Callaway Plant, Unit 1," Section 3.0.3.2.8.

Request:

1. Is the installed sealant (elastomeric or other) at the base of the CSTs, RWSTs, and Unit 3 DOST a permanent plant feature that will be credited as a preventive action for the tank to concrete interface joint? If yes, what is the sealant material type and will the sealant be inspected?

   If applicable, what is the method and what are the acceptance criteria for the inspection results?

   If the response is no to either portion of this question, respond to questions 2 and 3.

2. State the quantity and location of data points for the periodic bottom thickness measurements of the tanks. In addition, state the basis for why the quantity and location of data points will be sufficient to detect loss of material due to pitting or crevice corrosion.

3. If the LFET technique will be used, state the criteria for followup discrete tank thickness measurements. If other scanning techniques will be used, state the basis for the effectiveness of these techniques in detecting loss of material due to pitting or crevice corrosion and the criteria for followup discrete tank thickness measurements.