the IP2 and IP3 PWR Vessel Internals Programs, respectively. The staff finds this acceptable because it is in conformance with the staff's recommended aging management position that is given in SRP-LR Section 3.1.2.2.17 and in the GALL AMRs that are based on this SRP-LR section.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.17 criteria. For those line items that apply to LRA Section 3.1.2.2.17, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.18 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program.

3.1.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In LRA Tables 3.1.2-1-IP2 through 3.1.2-4-IP2 and 3.1.2-1-IP3 through 3.1.2-4-IP3, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In these LRA tables, the applicant indicated, via Notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided more information about how it will manage the aging effects. Specifically, Note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation. The following sections document the staff's evaluation.

3.1.2.3.1 Reactor Vessel—Summary of Aging Management Review

The staff reviewed LRA Tables 3.1.2-1-IP2 and 3.1.2-1-IP3, which summarize the results of AMR evaluations for the RV component groups. The staff's review did not identify any line items with plant-specific Notes F through J, indicating that the combinations of component type, material, environment, and AERM for this system are consistent with the GALL Report.

SER Section 3.1.2.1 documents the staff's evaluation of the line items with Notes A through E.

3.1.2.3.2 Reactor Vessel Internals—Summary of Aging Management Review

The staff reviewed LRA Tables 3.1.2-2-IP2 and 3.1.2-2-IP3, which summarize the results of AMR evaluations for the RVI component groups. The staff's review did not identify any line items with plant-specific Notes F through J, indicating that the combinations of component type, material, environment, and AERM for this system are consistent with the GALL Report.

SER Section 3.1.2.1 documents the staff's evaluation of the line items with Notes A through E.

3.1.2.3.3 Reactor Coolant System and Pressurizer—Summary of Aging Management Review

The staff reviewed LRA Tables 3.1.2-3-IP2 and 3.1.2-3-IP3, which summarize the results of AMR evaluations for the RCPB.

LRA Tables 3.1.2-3-IP2 and 3.1.3-3-IP3 include AMRs on management of fouling in stainless steel RCS HX tubes whose external surfaces are exposed to treated borated water in a greater than 60 degrees C (140 degrees F) environment. In these AMRs, the applicant credits its Water Chemistry Control—Primary and Secondary Program with managing fouling affecting the heat transfer function of stainless steel HX tubes externally exposed to treated borated water in a greater than 60 degrees C (140 degrees F) environment. These AMRs are marked with a Note H, indicating that this aging effect is not in the GALL Report for this component and material.

In Audit Item 190, the staff asked the applicant to explain how it ensures the effectiveness of the water chemistry control. By letter dated December 18, 2007, the applicant stated that fouling of HX tubes occurs due to the lack of effective water chemistry control on the tube surface and that contaminants, such as corrosion products, often deposit on the tube surfaces, which reduces their heat transfer capability. The applicant stated that treating the water chemistry to reduce the development of any contaminants would minimize the fouling of the HX tubes. To verify the effectiveness of the water chemistry programs, the applicant will use the One-Time Inspection Program to inspect the external surfaces of these HX tubes during the period of extended operation. The applicant stated that, to accomplish this, it will amend the AMRs for these HX tubes by adding LRA RCS AMR Note 104, which indicates that a One-Time Inspection will be performed to verify the effectiveness of the Water Chemistry Control—Primary and Secondary Program in managing aging.

The staff verified that, in the applicant's letter of December 18, 2007, the applicant appropriately amended the AMRs on loss of material for these stainless steel HX components by adding LRA RCS AMR Note 104. The staff noted that the applicant's amended basis for aging management conforms with other AMRs in the GALL Report, Volume 2, for PWR systems (such as GALL AMR V.A-16) in which a program corresponding to GALL AMP XI.M2, "Water Chemistry," is recommended for aging management of loss of heat transfer capability due to fouling in stainless steel HX tubes exposed to treated water, and for which a program corresponding to GALL AMP XI.M32, "One-Time Inspection," is recommended for verification of the effectiveness of the water chemistry program in managing this aging effect. Thus, the staff finds the applicant's basis for aging management to be acceptable because (1) the implementation of the Water Chemistry Control—Primary and Secondary Program would minimize the buildup of contaminants that could lead to corrosion products and fouling in HX tubes, (2) the implementation of the One-Time Inspection Program would verify that this process is not

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occurring, and (3) this approach conforms with the staff's aging management basis in GALL AMR V.A-16.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not addressed in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.4 Steam Generator—Summary of Aging Management Review

The staff reviewed LRA Tables 3.1.2-4-IP2 and 3.1.2-4-IP3, which summarize the results of AMR evaluations for the SG component groups.

LRA Tables 3.1.2-4-IP2 and 3.1.2-4-IP3 include AMRs on management of fouling in nickel alloy SG tubes whose internal surfaces are exposed to treated borated water and whose external surfaces are exposed to treated water. In these AMRs, the applicant credits its Water Chemistry Control—Primary and Secondary Program with managing the loss of heat transfer function due to fouling on internal surfaces that are exposed to treated borated water and whose external surfaces are exposed to treated water. These AMRs are marked with Note H, indicating that this aging effect is not in the GALL Report for this component and material.

In Audit Item 190, the staff asked the applicant to explain how it would ensure the effectiveness of the water chemistry control. By letter dated December 18, 2007, the applicant stated that fouling of SG tubes occurs due to the lack of effective water chemistry control on the tube surface and that contaminants, such as corrosion products, often deposit on the tube surfaces, which reduces their heat transfer capability. The applicant stated that treating the water chemistry to reduce the development of any contaminants would minimize the fouling of the SG tubes. To verify the effectiveness of the water chemistry programs, the applicant will use the One-Time Inspection Program to inspect the external surfaces of these SG tubes during the period of extended operation. The applicant stated that, to accomplish this, it will amend the AMRs for these tubes by adding LRA RCS AMR Note 104, which indicates that a One-Time Inspection will be performed to verify the effectiveness of the Water Chemistry Control—Primary and Secondary Program in managing aging.

The staff verified that, in the applicant's letter of December 18, 2007, the applicant had appropriately amended the AMRs on loss of heat transfer function due to fouling for these nickel alloy SG components by adding LRA RCS AMR Note 104. The staff noted that the applicant's amended basis for aging management conforms with other AMRs in the GALL Report, Volume 2, for PWR systems (such as GALL AMR V.A-16) in which a program corresponding to GALL AMP XI.M2, "Water Chemistry," is recommended for aging management of loss of heat transfer capability due to fouling in HX tubes exposed to treated water type environments, and for which a program corresponding to GALL AMP XI.M32, "One-Time Inspection," is recommended for verification of the effectiveness of the water chemistry program in managing this aging effect. Thus, the staff finds the applicant's basis for aging management to be acceptable because (1) the implementation of the Water Chemistry Control—Primary and Secondary Program would minimize the buildup of contaminants that could lead to corrosion products and fouling in SG tubes, (2) the implementation of the

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One-Time Inspection Program would be used to verify that this is not occurring, and (3) this approach conforms with the staff's aging management basis in GALL AMR V.A-16.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not addressed in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the RV, RVI, and RCS components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2 Aging Management of Engineered Safety Features Systems

This section of the SER documents the staff's review of the applicant's AMR results for the following engineered safety feature (ESF) system components and component groups:

- RHR system
- CS system
- containment isolation support system
- safety injection system
- containment penetrations

3.2.1 Summary of Technical Information in the Application

LRA Section 3.2 provides AMR results for the ESF system components and component groups. LRA Table 3.2.1, "Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the ESF system components and component groups.

The applicant's AMRs evaluated and incorporated applicable plant-specific and industry operating experience in the determination of AERMs. The plant-specific evaluation included CRs and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

3.2.2 Staff Evaluation

The staff reviewed LRA Section 3.2 to determine whether the applicant provided sufficient information to demonstrate that the effects of aging for the ESF system components within the scope of license renewal and subject to an AMR will be adequately managed so that the

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intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to verify the applicant's claim that certain AMRs are consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA is applicable and that the applicant identified the appropriate GALL Report AMRs. SER Section 3.0.3 documents the staff's evaluations of the AMPs. SER Section 3.2.2.1 documents the details of the staff's audit evaluation.

During an onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's additional evaluations are consistent with the SRP-LR Section 3.2.2.2 acceptance criteria. SER Section 3.2.2.2 documents the staff's evaluations.

The staff also conducted a technical review of the remaining AMRs not consistent with or not addressed in the GALL Report. The technical review evaluated whether the applicant identified all plausible aging effects and whether the aging effects listed are appropriate for the material-environment combinations specified. SER Sections 3.2A.2.3 (for IP2) and 3.2B.2.3 (for IP3) document the staff's evaluations.

For components that the applicant claimed are not applicable or require no aging management, the staff reviewed the AMR line items and the plant's operating experience to verify the applicant's claims.

Table 3.2-1 summarizes the staff's evaluation of components, aging effects or mechanisms, and AMPs listed in LRA Section 3.2 and addressed in the GALL Report.

Table 3.2-1 Staff Evaluation for Engineered Safety Features System Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel and stainless steel piping, piping components, and piping elements in emergency core cooling system (3.2.1-1)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Consistent with GALL Report (see SER Section 3.2.2.2.1)

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel with stainless steel cladding pump casing exposed to treated borated water (3.2.1-2)	Loss of material due to cladding breach	A plant-specific AMP is to be evaluated. Reference NRC Information Notice 94-63, "Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks"	Yes	Not applicable	Not applicable (see SER Section 3.2.2.2.2)
Stainless steel containment isolation piping and components internal surfaces exposed to treated water (3.2.1-3)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Control – Primary and Secondary and One-Time Inspection	Consistent with GALL Report (see SER Section 3.2.2.2.3(1))
Stainless steel piping, piping components, and piping elements exposed to soil (3.2.1-4)	Loss of material due to pitting and crevice corrosion	A plant-specific AMP is to be evaluated.	Yes	Not applicable	Not applicable (see SER Section 3.2.2.2.3(2))
Stainless steel and aluminum piping, piping components, and piping elements exposed to treated water (3.2.1-5)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (see SER Section 3.2.2.2.3(3))
Stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil (3.2.1-6)	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis and One-Time Inspection	Consistent with GALL Report (see SER Section 3.2.2.2.3(4))
Partially encased stainless steel tanks with breached moisture barrier exposed to raw water (3.2.1-7)	Loss of material due to pitting and crevice corrosion	A plant-specific AMP is to be evaluated for pitting and crevice corrosion of tank bottoms because moisture and water can egress under the tank due to cracking of the perimeter seal from weathering.	Yes	Not applicable	Not applicable (see SER Section 3.2.2.2.3(5))

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel piping, piping components, piping elements, and tank internal surfaces exposed to condensation (internal) (3.2.1-8)	Loss of material due to pitting and crevice corrosion	A plant-specific AMP is to be evaluated.	Yes	One-Time Inspection	Consistent with GALL Report (see SER Section 3.2.2.2.3(6))
Steel, stainless steel, and copper alloy HX tubes exposed to lubricating oil (3.2.1-9)	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis and One-Time Inspection	Consistent with GALL Report (see SER Section 3.2.2.2.4(1))
Stainless steel HX tubes exposed to treated water (3.2.1-10)	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable (see SER Section 3.2.2.2.4(2))
Elastomer seals and components in standby gas treatment system exposed to air - indoor uncontrolled (3.2.1-11)	Hardening and loss of strength due to elastomer degradation	A plant-specific AMP is to be evaluated.	Yes	Not applicable	Not applicable to PWRs (see SER Section 3.2.2.2.5)
Stainless steel high-pressure safety injection (HPSI) (charging) pump miniflow orifice exposed to treated borated water (3.2.1-12)	Loss of material due to erosion	A plant-specific AMP is to be evaluated for erosion of the orifice due to extended use of the centrifugal HPSI pump for normal charging.	Yes	Not applicable	Not applicable (see SER Section 3.2.2.2.6)
Steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air - indoor uncontrolled (internal) (3.2.1-13)	Loss of material due to general corrosion and fouling	A plant-specific AMP is to be evaluated.	Yes	Not applicable	Not applicable to PWRs (see SER Section 3.2.2.2.7)
Steel piping, piping components, and piping elements exposed to treated water (3.2.1-14)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (see SER Section 3.2.2.2.8(1))

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel containment isolation piping, piping components, and piping elements internal surfaces exposed to treated water (3.2.1-15)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Control – Primary and Secondary and One-Time Inspection	Consistent with GALL Report (see SER Section 3.2.2.2.8(2))
Steel piping, piping components, and piping elements exposed to lubricating oil (3.2.1-16)	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis and One-Time Inspection	Consistent with GALL Report (see SER Section 3.2.2.2.8(3))
Steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil (3.2.1-17)	Loss of material due to general, pitting, crevice, and microbiologically -influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes	Not applicable	Not applicable (see SER Section 3.2.2.2.9)
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.2.1-18)	Cracking due to stress corrosion cracking (SCC) and intergranular stress corrosion cracking (IGSCC)	BWR Stress Corrosion Cracking and Water Chemistry	No	Not applicable	Not applicable to PWRs
Steel piping, piping components, and piping elements exposed to steam or treated water (3.2.1-19)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Not applicable	Not applicable to PWRs
Cast austenitic stainless steel piping, piping components, and piping elements exposed to treated water (borated or unborated) > 250°C (> 482°F) (3.2.1-20)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	Not applicable	Not applicable to PWRs

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
High-strength steel closure bolting exposed to air with steam or water leakage (3.2.1-21)	Cracking due to cyclic loading, SCC	Bolting Integrity	No	Not applicable	Not applicable (see SER Section 3.2.2.1.1)
Steel closure bolting exposed to air with steam or water leakage (3.2.1-22)	Loss of material due to general corrosion	Bolting Integrity	No	Not applicable	Not applicable (see SER Section 3.2.2.1.1)
Steel bolting and closure bolting exposed to air - outdoor (external), or air - indoor uncontrolled (external) (3.2.1-23)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	Bolting Integrity	Consistent with GALL Report
Steel closure bolting exposed to air - indoor uncontrolled (external) (3.2.1-24)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Bolting Integrity	Consistent with GALL Report (see SER Section 3.2.2.1.2)
Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water > 60°C (> 140°F) (3.2.1-25)	Cracking due to SCC	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable (see SER Section 3.2.2.1.1)
Steel piping, piping components, and piping elements exposed to closed-cycle cooling water (3.2.1-26)	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable (see SER Section 3.2.2.1.1)
Steel heat exchanger components exposed to closed-cycle cooling water (3.2.1-27)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Water Chemistry Control – Closed Cooling Water	Consistent with GALL Report

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel piping, piping components, piping elements, and HX components exposed to closed-cycle cooling water (3.2.1-28)	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Water Chemistry Control – Closed Cooling Water	Consistent with GALL Report
Copper alloy piping, piping components, piping elements, and HX components exposed to closed-cycle cooling water (3.2.1-29)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Water Chemistry Control – Closed Cooling Water	Consistent with GALL Report
Stainless steel and copper alloy HX tubes exposed to closed-cycle cooling water (3.2.1-30)	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Water Chemistry Control – Closed Cooling Water	Consistent with GALL Report
External surfaces of steel components including ducting, piping, ducting closure bolting, and containment isolation piping external surfaces exposed to air - indoor uncontrolled (external); condensation (external) and air - outdoor (external) (3.2.1-31)	Loss of material due to general corrosion	External Surfaces Monitoring	No	External Surfaces Monitoring	Consistent with GALL Report
Steel piping and ducting components and internal surfaces exposed to air - indoor uncontrolled (Internal) (3.2.1-32)	Loss of material due to general corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Externals Surfaces Monitoring, Fire Protection, or Periodic Surveillance and Preventive Maintenance	Consistent with GALL Report (see SER Section 3.2.2.1.3)
Steel encapsulation components exposed to air - indoor uncontrolled (internal) (3.2.1-33)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable	Not applicable (see SER Section 3.2.2.1.1)

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel piping, piping components, and piping elements exposed to condensation (internal) (3.2.1-34)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable	Not applicable (see SER Section 3.2.2.1.1)
Steel containment isolation piping and components internal surfaces exposed to raw water (3.2.1-35)	Loss of material due to general, pitting, crevice, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable (see SER Section 3.2.2.1.1)
Steel HX components exposed to raw water (3.2.1-36)	Loss of material due to general, pitting, crevice, galvanic, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable (see SER Section 3.2.2.1.1)
Stainless steel piping, piping components, and piping elements exposed to raw water (3.2.1-37)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion	Open-Cycle Cooling Water System	No	Periodic Surveillance and Preventive Maintenance	Consistent with GALL Report (see SER Section 3.2.2.1.4)
Stainless steel containment isolation piping and components internal surfaces exposed to raw water (3.2.1-38)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable (see SER Section 3.2.2.1.1)
Stainless steel HX components exposed to raw water (3.2.1-39)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable (see SER Section 3.2.2.1.1)
Steel and stainless steel HX tubes (serviced by open-cycle cooling water) exposed to raw water (3.2.1-40)	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable (see SER Section 3.2.2.1.1)

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Copper alloy > 15% Zn piping, piping components, piping elements, and HX components exposed to closed cycle cooling water (3.2.1-41)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Selective Leaching	Consistent with GALL Report
Gray cast iron piping, piping components, piping elements exposed to closed-cycle cooling water (3.2.1-42)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Selective Leaching	Consistent with GALL Report
Gray cast iron piping, piping components, and piping elements exposed to soil (3.2.1-43)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable	Not applicable (see SER Section 3.2.2.1.1)
Gray cast iron motor cooler exposed to treated water (3.2.1-44)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable	Not applicable (see SER Section 3.2.2.1.1)
Aluminum, copper alloy > 15% Zn, and steel external surfaces, bolting, and piping, piping components, and piping elements exposed to air with borated water leakage (3.2.1-45)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Boric Acid Corrosion Prevention	Consistent with GALL Report
Steel encapsulation components exposed to air with borated water leakage (internal) (3.2.1-46)	Loss of material due to general, pitting, crevice and boric acid corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Not applicable	Not applicable (see SER Section 3.2.2.1.1)
Cast austenitic stainless steel piping, piping components, and piping elements exposed to treated borated water > 250°C (> 482°F) (3.2.1-47)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	Not applicable	Not applicable (see SER Section 3.2.2.1.1)

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel or stainless-steel-clad steel piping, piping components, piping elements, and tanks (including safety injection tanks/accumulators) exposed to treated borated water > 60°C (> 140°F) (3.2.1-48)	Cracking due to SCC	Water Chemistry	No	Water Chemistry Control – Primary and Secondary	Consistent with GALL Report
Stainless steel piping, piping components, piping elements, and tanks exposed to treated borated water (3.2.1-49)	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Water Chemistry Control – Primary and Secondary	Consistent with GALL Report
Aluminum piping, piping components, and piping elements exposed to air - indoor uncontrolled (internal/external) (3.2.1-50)	None	None	NA	None	Consistent with GALL Report
Galvanized steel ducting exposed to air - indoor controlled (external) (3.2.1-51)	None	None	NA	Not applicable	Not applicable (see SER Section 3.2.2.1.1)
Glass piping elements exposed to air - indoor uncontrolled (external), lubricating oil, raw water, treated water, or treated borated water (3.2.1-52)	None	None	NA	None	Consistent with GALL Report
Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.2.1-53)	None	None	NA	None	Consistent with GALL Report

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel piping, piping components, and piping elements exposed to air - indoor controlled (external) (3.2.1-54)	None	None	NA	Not applicable	Not applicable (see SER Section 3.2.2.1.1)
Steel and stainless steel piping, piping components, and piping elements in concrete (3.2.1-55)	None	None	NA	None	Consistent with GALL Report
Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to gas (3.2.1-56)	None	None	NA	None	Consistent with GALL Report
Stainless steel and copper alloy < 15% Zn piping, piping components, and piping elements exposed to air with borated water leakage (3.2.1-57)	None	None	NA	None	Consistent with GALL Report

The staff's review of the ESF system component groups followed any one of several approaches. In one approach, documented in SER Section 3.2.2.1, the staff reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. In the second approach, documented in SER Section 3.2.2.2, the staff reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. In the third approach, documented in SER Sections 3.2A.2.3 (for IP2) and 3.2B.2.3 (for IP3), the staff reviewed AMR results for components that the applicant indicated are not consistent with, or not addressed in, the GALL Report. SER Section 3.0.3 documents the staff's review of AMPs credited to manage or monitor aging effects of the ESF system components.

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3.2.2.1 AMR Results Consistent with the GALL Report

LRA Section 3.2.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the ESF system components:

- Bolting Integrity Program
- Boric Acid Corrosion Prevention Program
- Buried Piping and Tanks Inspection Program
- External Surfaces Monitoring Program
- Heat Exchanger Monitoring Program
- Oil Analysis Program
- One-Time Inspection Program
- Periodic Surveillance and Preventive Maintenance Program
- Selective Leaching Program
- Water Chemistry Control - Auxiliary Systems Program
- Water Chemistry Control - Closed Cooling Water Program
- Water Chemistry Control - Primary and Secondary Program

LRA Tables 3.2.2-1-IP2 through 3.2.2-5-IP2 and 3.2.2-1-IP3 through 3.2.2-5-IP3 summarize the results of AMRs for the ESF systems components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report, where the report does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

For each AMR line item, the applicant stated how the information in the tables aligns with the information in the GALL Report. Notes A through E indicate how the AMR is consistent with the GALL Report. The staff audited these AMRs.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging

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effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs.

In response to RAIs 2.3A.2.3-1 and 2.3B.2.3-2, by letter dated December 6, 2007, the applicant revised the LRA to include an AMR line item for aluminum valve body with an internal environment of treated air, an external environment of indoor air, and an aging effect of "none," and Note C or Note C with plant-specific Note 301.

In response to RAI 2.3A.2.2-1, by letter dated March 12, 2008, the applicant revised the LRA to include several AMR line items associated with the CS (IP2) system which were not previously included within the scope of license renewal under 10 CFR 54.4(a)(2). The AMR line items added included stainless steel bolting, flow indicator, piping, tubing, and valve body with internal environments of treated water or indoor air, external environment of indoor air, an aging effect of "loss of material" or "none," and Notes A or C.

By letter dated June 30, 2009, the applicant submitted an annual update to the LRA, identifying changes made to the CLB that materially affect the contents of the LRA. For the containment isolation support system, the applicant revised LRA Table 3.2.2-3-IP2 to add AMR line items for stainless steel piping exposed internally to treated air with an aging effect of "none," and exposed externally to soil with an aging effect of "loss of material." These line items were annotated with plant-specific Note 201 and/or Note C.

The staff reviewed the applicant's revisions, noted above, and found that the additional AMR results are consistent with the GALL Report for these combinations of materials and environments. On the basis of its review, the staff finds that all applicable aging effects were identified, and the aging effects listed are appropriate for the combination of materials and environments identified.

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On the basis of its audit and review, the staff determines that, for AMRs not requiring further evaluation, as identified in LRA Table 3.2.1, the applicant's references to the GALL Report are acceptable and no further evaluation is required.

3.2.2.1.1 AMR Results Identified as Not Applicable

In LRA Table 3.2.1, the applicant identifies Items 21, 22, 25, 26, 33, 34, 35, 36, 38, 39, 40, 43, 44, 46, 47, 51, and 54, as not applicable since the component, material, and environment combination does not exist at IP. For each of these items, the staff reviewed the LRA and the applicant's supporting documents, and confirmed the applicant's claim that the component, material, and environment combination does not exist at IP. On the basis that IP does not have this combination, the staff finds that these AMRs are not applicable to IP.

LRA Table 3.2.1, Line Item 18 addresses stainless steel piping, piping components, and piping elements exposed to treated water >60°C (>140 °F) in BWRs. The LRA states that this line item is only applicable to boiling water reactor (BWR) designs, and, therefore, it is not applicable. Since IP2 and IP3 are both PWRs, the staff finds this line item is not applicable.

LRA Table 3.2.1, Line Item 19 addresses steel piping, piping components, and piping elements exposed to steam or treated water. The LRA states that this line item is only applicable to BWR designs, and, therefore, it is not applicable. Since IP2 and IP3 are both PWRs, the staff finds this line item is not applicable.

LRA Table 3.2.1, Line Item 20 addresses cast austenitic stainless steel piping, piping components, and piping elements exposed to treated water (borated or unborated) > 250°C (>482 °F). The LRA states that this line item is only applicable to BWR designs, and, therefore, it is not applicable. Since IP2 and IP3 are both PWRs, the staff finds this line item is not applicable.

3.2.2.1.2 Steel Closure Bolting Exposed to Air-Indoor Uncontrolled

In the discussion column of LRA Table 3.2.1, Item 3.2.1-24, the applicant stated that loss of preload is a design-driven effect and not an AERM. This statement is contrary to the GALL Report recommendation. During the audit, the staff asked the applicant to justify why other aging effects are not applicable and why the Bolting Integrity Program (B.1.2) did not take exception to the GALL Report since at Indian Point, loss of preload is not considered an aging effect (Audit Item 270).

In its response dated, December 18, 2007, the applicant stated:

> The review of IPEC operating experience did not identify instances in which mechanical components failure was attributable to loss of pressure boundary bolting preload. This is consistent with the EPRI Mechanical Tools (EPRI 1010639, Appendix F, Section 3.1) that do not consider loss of preload an aging effect for bolted closures. Gasket creep will normally occur shortly after initial loading, which allows for addressing this mechanism by installing practices and subsequent maintenance of the joint. Self-loosening is also not an aging mechanism but is an event-driven mechanism that occurs due to improper joint

design or installation that doesn't properly consider the potential for this mechanism. This would be detected early in component service life and actions would be taken to prevent recurrence.

The program addresses all bolting regardless of size except reactor head closure stud, which are addressed by the Reactor Head Closure Studs Program. The program relies on industry recommendations for comprehensive bolting maintenance, as delineated in EPRI TR-104213 for pressure retaining bolting and structural bolting. The Bolting Integrity Program also includes preventive measures to preclude or minimize loss of preload, which is consistent with the GALL report so an exception to the GALL program description was not required.

Commitment 2 will be clarified to specifically state the Bolting Integrity Program manages loss of preload and loss of material for all external loading.

Clarification to be incorporated into the LRA.

The staff finds the applicant's response acceptable, because the Bolting Integrity Program includes preventive measures that preclude or minimize loss of preload. This is consistent with the GALL Report. In the same letter, the applicant amended the LRA to provide clarification as stated above. On this basis, the staff finds the AMR results for this line item acceptable.

3.2.2.1.3 Loss of Material Due to General Corrosion

In the discussion column of LRA Table 3.2.1, Item 3.2.1-32, the applicant stated that loss of material from the internal surfaces of steel components exposed to indoor air is managed by the Externals Surfaces Monitoring, Fire Protection, and Periodic Surveillance and Preventive Maintenance Programs. During the audit, the staff asked the applicant to elaborate on how the Fire Protection Program would manage the loss of carbon steel components and to explain why the associated Table 2 items did not credit this. The staff also asked the applicant to compare the HX (housing) inspection frequency between the Periodic Surveillance and Preventive Maintenance Program proposed by the applicant and the External Surfaces Monitoring Program recommended by the GALL Report (Audit Item 272).

In its response, dated December 18, 2007, the applicant stated:

As in the associated Table 2 line items, either the Fire Protection Program or the Periodic Surveillance and Preventive Maintenance Programs manage loss of material of carbon steel components by periodic visual inspection of component internal surfaces. One or the other program is adequate: both programs are not necessary. Table 3.3.2-12-IP2 and Table 3.3.2-12-IP3 include line items referring to Item 3.2.1-32 and crediting the Fire Protection Program. The associated components are part of the Halon or carbon dioxide gaseous fire protection systems. The specific components referencing Item 3.2.1-32 are distribution header components that are open to the atmosphere resulting in an indoor air internal environment.

The Fire Protection Program manages loss of material for external carbon steel components by visual inspection of external surface. The IP2 cable spreading

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room Halon fire suppression system is visually inspected under the Fire Protection Program. The IP3 cable spreading room, 480V switchgear room, and EDG [emergency diesel generator] room CO_2 fire suppression system is visually inspected under the Fire Protection Program. For systems where internal carbon steel surfaces are exposed to the same environment as external surfaces, external surfaces will be representative of internal surfaces. Thus, loss of material on internal carbon steel surfaces is also managed by the Fire Protection Program

Table 2 items that refer to Table 1 Item 3.2.1-32 credit the PSPM [periodic surveillance and preventive maintenance] for internal surfaces of carbon steel heat exchanger (housing) with an environment of indoor-air. The PSPM Program inspections are performed at least once per 5 years. Loss of material due to corrosion is a long-term aging effect for carbon steel components air in-door (int). The affected components have been in service for the life of the plant without significant corrosion. Based on the slow acting aging mechanisms confirmed by plant operating experience, the inspection frequency of at least once per 5 years is sufficient. The intervals of inspections may be adjusted, as necessary, based on inspection experience. The GALL program "Inspection of Internal Surfaces and Miscellaneous Piping and Duct Components" includes visual inspections to assure that existing environmental conditions are not causing material degradation that could result in a loss of component intended functions. Locations are chosen to include conditions likely to exhibit these aging effects and inspection intervals are established such that they provide timely detection of degradation.

The staff reviewed the AMR result lines referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. The staff's review of the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Sections 3.0.3.3.7. The staff noted that the applicant's inspection frequency, which is based on the plant-specific operating experience, will provide for timely detection of aging prior to the loss of intended functions. The staff further noted that the applicant's inspection frequency of the periodic visual inspections may increase based on the inspection results. On the basis of its review, the staff finds the applicant's response acceptable because (1) the applicant's inspection frequency has been adjusted based on their plant specific operating experience, which is consistent with the recommendations provided in GALL AMP XI.M38 and (2) the applicant's inspection frequency may be altered based on the inspection results, which may increase the inspection frequency. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material of carbon steel HX housings exposed to indoor air through visual inspections.

The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with the GALL Report. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so

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that their intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff reviewed the AMR result lines referring to Note E, as amended by letters dated April 30, 2008, June 11, 2008, and June 30, 2009, and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. The staff's review of the applicant's Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.7. The staff's review of the applicant's External Surfaces Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.5. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material of carbon steel piping, pump casings (External Surfaces Monitoring Program only), and valve bodies exposed to indoor air through visual inspections.

The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with the GALL Report. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.1.4 Stainless Steel Piping, Piping Components and Piping Elements Exposed to Raw Water

In LRA Tables 3.2.2-1-IP2 and 3.2.2-1-IP3, which cite Table 3.2.1, Item 3.2.1-37, the applicant proposed to manage loss of material of stainless steel piping, piping components and piping elements exposed to raw water using Periodic Surveillance and Preventive Maintenance Program. However, the AMP recommended by the GALL Report for this AERM is GALL AMP XI.M20, "Open-Cycle Cooling Water System." The applicant referred to Note E to the Table 2 line items indicating that a different AMP is credited.

The staff reviewed the AMR result lines referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. The staff's review of the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.7. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material of material of stainless steel piping, piping components and piping elements exposed to raw water through visual inspections.

The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with the GALL Report. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.2.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation Is Recommended

In LRA Section 3.2.2.2, the applicant further evaluated aging management, as recommended by the GALL Report, for the ESF system components and provided information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to cladding (breach)
- loss of material due to pitting and crevice corrosion
- reduction of heat transfer due to fouling
- hardening and loss of strength due to elastomer degradation
- loss of material due to erosion
- loss of material due to general corrosion and fouling
- loss of material due to general, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion
- QA for aging management of nonsafety-related components

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the GALL Report and for which the report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addresses the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.2.2.2. The staff's review of the applicant's further evaluation follows.

3.2.2.2.1 Cumulative Fatigue Damage

LRA Section 3.2.2.2.1 states that fatigue is a TLAA, as defined in 10 CFR 54.3, "Definitions." Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.3 documents the staff's review of the applicant's evaluation of this TLAA.

During the audit, the staff noted that numerous line items in Tables 3.2.2-1-IP2 and 3.2.2-1-IP3 credit "TLAA—Metal Fatigue" to manage the aging effect of cumulative fatigue damage and indicate that Section 4.3 of the LRA addresses the evaluation. However, in LRA Section 4.3, it appears that the text does not include the discussion for certain components, such as flex hose, flow elements, thermowell, and tubing. The staff asked the applicant to explain the discrepancy (Audit Item 267).

In its response dated December 18, 2007, the applicant stated the following:

> The components identified, with the exception of flex hoses, are all considered part of the "piping and in-line components" line item identified in LRA Table 4.1-1

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and 4.1-2 and as such are evaluated as part of the system. ASME B31.1 stress analysis is performed as required for the RHR system. These components are addressed by the 7000 cycle discussion in LRA Section 4.3.2 and further details are provided in section 3 of the TLAA—Mechanical Fatigue report IP-RPT-06-LRD04. The flex hoses should not be included as part of the TLAA evaluation since they isolate portions of the system from each other and would not be part of a specific stress analysis for the system or parts of the system. The line items for the flex hose in the RHR system in Tables 3.2.2-1-IP2 and 3.2.2-1-IP3 that identify TLAA—Metal Fatigue will be removed.

Clarification to be incorporated into the LRA.

The staff finds the applicant's response acceptable, because the applicant has explained that the components identified by the staff, with the exception of flex hoses, are considered piping and in-line components, which will be evaluated as part of their respective systems. The applicant further explained that the discussion in LRA Section 4.3.2 addresses these components. The applicant explained that the component flex hose is not part of a specific stress analysis and agreed to clarify this in the LRA. The staff verified, in the letter dated December 18, 2007, that the applicant amended the LRA to remove the flex hose component with the following material, environment, aging effect and program combination : stainless steel, treated borated water greater than 140 °F, cracking-fatigue and TLAA—metal fatigue from LRA Table 3.2.2-1-1P2. This component/material/environment combination is not applicable to IP3, therefore an amendment to LRA Table 3.2.2-1-1P3 was not required.

3.2.2.2.2 Loss of Material Due to Cladding (Breach)

The staff reviewed LRA Section 3.2.2.2.2 against the criteria in SRP-LR Section 3.2.2.2.2.

LRA Section 3.2.2.2.2 addresses loss of material due to cladding breach. It states that this aging effect is not applicable because there are no stainless-steel-clad steel pump casings in IP ESF systems.

SRP-LR Section 3.2.2.2.2 states that loss of material due to cladding breach may occur in pressurized-water reactor (PWR) steel pump casings with stainless steel cladding exposed to treated borated water.

The staff finds that this item is not applicable because the IP2 and IP3 ESF do not have steel pump casings with stainless steel cladding exposed to treated borated water.

Based on the above, the staff concludes that SRP-LR Section 3.2.2.2.2 criteria do not apply.

3.2.2.2.3 Loss of Material Due to Pitting and Crevice Corrosion

The staff reviewed LRA Section 3.2.2.2.3 against the criteria in SRP-LR Section 3.2.2.2.3.

(1) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion for internal surfaces of stainless steel piping and components in containment isolation components exposed to treated water and states that the Water Chemistry Control - Primary and Secondary Program manages this aging effect. The One-Time Inspection

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Program will confirm the effectiveness of the Water Chemistry Control - Primary and Secondary Program by an inspection of a representative sample of components crediting this program, including those in areas of stagnant flow and other susceptible locations.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur on internal surfaces of stainless steel containment isolation piping, piping components, and piping elements exposed to treated water. The existing AMP monitors and controls water chemistry to mitigate degradation. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of selected components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

The staff reviewed the Water Chemistry Control - Primary and Secondary Program, which monitors chlorides, fluorides, and dissolved oxygen to limit the contaminants, thus minimizing the occurrences of aging effects and maintaining component ability to perform intended functions. The applicant has stated that the Water Chemistry Control - Primary and Secondary Program will be verified for effectiveness by the One-Time Inspection Program. The One-time Inspection Program provides inspection of selected stainless steel components exposed to treated water at susceptible locations such as stagnant areas for loss of material due to pitting and crevice corrosion in applicable ESF systems. The staff evaluated the Water Chemistry Control—Primary and Secondary Program and the One-time Inspection Program and documented the evaluations in Sections 3.0.3.2.17 and 3.0.3.1.9, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report and are adequate to manage loss of material due to pitting and crevice corrosion on internal surfaces of stainless steel containment isolation piping and components exposed to treated water.

(2) LRA Section 3.2.2.2.3 addresses loss of material from pitting and crevice corrosion for stainless steel piping and piping components exposed to a soil environment, stating that the Buried Piping and Tanks Inspection Program manages this aging effect. The Buried Piping and Tanks Inspection Program includes (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel, copper alloy, gray cast iron, and stainless steel components. Buried components will be inspected when excavated during maintenance, within 10 years of entering the period of extended operation, and within the first 10 years of the period of extended operation unless opportunistic inspections occur within these 10-year periods.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements exposed to soil. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

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During the audit, the staff noted that IP3 has two line items in Table 3.2.2-2 (Containment Spray) and Table 3.2.2-4 (Safety Injection Systems), which correspond to GALL Report Item V.D1-26, Piping, Piping Components and Piping Elements, and reference Table 1, Item 3.2.1-4. The staff asked the applicant to explain why IP2 does not have similar items and why the Buried Piping and Tanks Program is adequate for managing the aging effect of loss of material due to pitting and crevice corrosion (Audit Item 268).

In its response, dated December 18, 2007, the applicant stated the following:

> GALL V.D1-26 is for buried piping. While the IP3 configuration of this piping includes a section of buried piping exposed to soil, the IP2 piping configuration for these systems does not include buried piping exposed to soil. The Buried Piping and Tanks Program is consistent with the GALL program and includes surveillance and preventive measures to manage loss of material due to the corrosion by protecting the external surface of buried carbon steel piping and tanks.

The staff verified that IP2 does not have ESF piping exposed to soil, and therefore, this item is not applicable to IP2.

On the basis of its review, the staff finds the applicant's Buried Piping and Tanks Program adequate to manage the effects of aging for IP3 because the applicant's program provide for surveillance and preventive measures that include coating the buried carbon steel piping and tanks on the external surface to mitigate corrosion, which is consistent with the recommendations in GALL AMP XI.M28.

(3) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion in BWR stainless steel and aluminum piping and states that this aging effect is not applicable to IP, which are PWRs.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in BWR stainless steel and aluminum piping, piping components, and piping elements exposed to treated water.

This item is not applicable to IP because IP2 and IP3 are PWRs. On this basis, the staff finds that the SRP-LR 3.2.2.2.3(3) criteria do not apply to IP.

(4) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion and states that it could occur in copper alloy and stainless steel piping and components in ESF systems exposed to lubricating oil. The Oil Analysis Program manages loss of material by periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits to preserve an environment not conducive to corrosion. The One-Time Inspection Program will use visual inspections or NDEs of representative samples to confirm the effectiveness of the Oil Analysis Program in managing aging effects for components crediting this program.

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SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil. The existing program periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion. Therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation to verify the effectiveness of the lubricating oil programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that intended functions of components will be maintained during the period of extended operation.

The staff reviewed the Oil Analysis Program, which monitors oil chemical and physical properties, wear metals, contaminants, additives, and water and thus minimizes the occurrence of aging effects and maintains component ability to perform intended functions. The effectiveness of the Oil Analysis Program is verified by the One-Time Inspection Program. The One-Time Inspection Program provides inspection of selected stainless steel and copper alloy components exposed to lubricating oil for loss of material due to pitting and crevice corrosion in applicable ESF systems. The staff evaluated the Oil Analysis and the One-Time Inspection Programs and documented the evaluations in SER Sections 3.0.3.2.12 and 3.0.3.1.9, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report and are adequate to manage loss of material due to pitting and crevice corrosion in stainless steel and copper piping and components exposed to lubricating oil.

(5) LRA Section 3.2.2.2.3 addresses loss of material from pitting and crevice corrosion. It states that this aging effect is not applicable to IP2 and IP3 ESF system outdoor stainless steel tank bottoms exposed to raw water. Their design includes a perimeter seal under the tank lip and grouting behind the seal between the concrete foundation and the tank bottom to a depth of 18 inches which precludes the entry of water leaking from the outside and moving under the tank bottoms.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering.

During the audit, the staff asked the applicant to identify the specific stainless tanks and their functions in the ESF systems that are applicable and to provide the equipment drawings of each applicable tank for onsite review.

As documented in the Audit Report (ADAMS Accession No. ML083540662), the staff reviewed equipment drawings for IP2 and IP3 and confirmed that the design included a fibrated rope seal around the lip of the tank, a 1-inch layer of grout that was placed behind the fibrated rope seal after the tank was welded, and a hot-poured bitumastic put on the outside perimeter of the tank after it was erected. The RWSTs were also erected on an elevated surface which was designed with a gradual decline around the perimeter to preclude outside water from leaking under the tanks.

The staff agrees with the applicant's determination that Item (5) of SRP-LR Section 3.2.2.2.3 does not apply to IP ESF systems because the moisture barrier configuration prevents exposure to raw water in the ESF system.

(6) LRA Section 3.2.2.2.3 addresses loss of material from pitting and crevice corrosion for ESF stainless steel components internally exposed to condensation and states that the One-Time Inspection Program manages this aging effect by using visual and other non-destructive examination (NDE) techniques to verify that loss of material has not occurred or is so insignificant that no AMP for these components is warranted.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, piping elements, and tanks exposed to internal condensation. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

During the audit, the staff asked the applicant to explain how a one-time inspection will be performed on these components and why a One-Time Inspection Program is sufficient to manage the aging effect of loss of material due to pitting and crevice corrosion (Audit Item 269).

In a letter dated December 18, 2007, the applicant responded:

> Parameter to be monitored or inspected is wall thickness. Inspection techniques will be visual (VT-I or equivalent) or volumetric (RT or UT) inspection.
>
> The normal internal environment for the gas analyzers is air/gas with material of stainless steel and no aging effects. Since condensation may be possible, a one time inspection was conservatively included to verify that unacceptable pitting and crevice corrosion, although not expected, is not occurring, thereby confirming that there is no need for an ongoing aging management program for the period of extended operation. As specified in the One-Time Inspection Program, unacceptable inspection findings will be evaluated in accordance with the site corrective action process to determine the need for subsequent (including periodic) inspections and for monitoring and trending the results.

The staff noted that the One-Time Inspection Program will confirm that loss of material is not occurring or is insignificant for internal stainless steel surfaces exposed to condensation in ESF systems. This program uses visual and other NDE techniques to confirm that loss of material is not occurring or is so insignificant that an AMP for these components is not warranted. The staff evaluated the One-Time Inspection Program and documented the evaluation in SER Section 3.0.3.1.9. The staff finds that this program include activities that are consistent with the recommendations in the GALL Report and are adequate to manage loss of material due to pitting and crevice corrosion for ESF stainless steel components internally exposed to condensation.

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Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.3 criteria. For those line items that apply to LRA Section 3.2.2.2.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.4 Reduction of Heat Transfer Due to Fouling

The staff reviewed LRA Section 3.2.2.2.4 against the criteria in SRP-LR Section 3.2.2.2.4.

(1) LRA Section 3.2.2.2.4 addresses reduction of heat transfer due to fouling in copper alloy HX tubes exposed to lubricating oil in ESF systems and states that the Oil Analysis Program manages this aging effect. This program periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits to preserve an environment that is not conducive to fouling. The One-Time Inspection Program will use visual inspections or NDEs of representative samples to ascertain whether the Oil Analysis Program has been effective in managing aging effects for components crediting this program.

SRP-LR Section 3.2.2.2.4 states that reduction of heat transfer due to fouling may occur in steel, stainless steel, and copper alloy HX tubes exposed to lubricating oil. The existing AMP monitors and controls lube oil chemistry to mitigate reduction of heat transfer due to fouling. However, control of lube oil chemistry may not always be fully effective in precluding fouling; therefore, the effectiveness of lube oil chemistry control should be verified to ensure that fouling does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of lube oil chemistry control. A one-time inspection of selected components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

The staff reviewed the Oil Analysis Program, which monitors oil chemical and physical properties, excessive metal loss caused by wear, contaminants, additives, and water and thus minimizes the occurrence of aging effects and maintains component ability to perform intended functions. The effectiveness of the Oil Analysis Program is verified by the One-Time Inspection Program. The One-Time Inspection Program provides inspection of stainless steel and copper HX tubes exposed to lubricating oil for reduction of heat transfer due to fouling at susceptible locations where contaminants can accumulate in applicable ESF systems. The staff evaluated the Oil Analysis and the One-Time Inspection Programs and documented the evaluations in SER Sections 3.0.3.2.12 and 3.0.3.1.9, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report and are adequate to manage reduction of heat transfer due to fouling in copper HX tubes exposed to lubricating oil.

(2) LRA Section 3.2.2.2.4 addresses reduction of heat transfer due to fouling for stainless steel HX tubes exposed to treated water. It states that this aging effect is not applicable

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because there are no stainless steel HX tubes with an intended function of heat transfer exposed to treated water in the ESF systems.

SRP-LR Section 3.2.2.2.4 states that reduction of heat transfer due to fouling may occur in stainless steel HX tubes exposed to treated water.

The staff agrees that Item (2) of SRP-LR Section 3.2.2.2.4 does not apply to IP ESF systems because IP2 and IP3 do not have stainless steel HX tubes exposed to treated water with an intended function of heat transfer in the ESF systems.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.4 criteria. For those line items that apply to LRA Section 3.2.2.2.4, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.5 Hardening and Loss of Strength Due to Elastomer Degradation

The staff reviewed LRA Section 3.2.2.2.5 against the criteria in SRP-LR Section 3.2.2.2.5.

LRA Section 3.2.2.2.5 addresses hardening and loss of strength due to elastomer degradation, stating that this aging effect is not applicable to IP, which are PWRs.

SRP-LR Section 3.2.2.2.5 states that hardening and loss of strength due to elastomer degradation may occur in elastomer seals and components of the BWR standby gas treatment system ductwork and filters exposed to air—indoor uncontrolled.

This item is not applicable to IP because IP2 and IP3 are PWRs. On this basis, the staff finds that SRP-LR 3.2.2.2.5 criteria do not apply to IP.

Based on the above, the staff concludes that SRP-LR Section 3.2.2.2.5 criteria do not apply.

3.2.2.2.6 Loss of Material Due to Erosion

The staff reviewed LRA Section 3.2.2.2.6 against the criteria in SRP-LR Section 3.2.2.2.6.

LRA Section 3.2.2.2.6 addresses loss of material due to erosion in the stainless steel high-pressure safety injection (HPSI) pump miniflow recirculation orifice exposed to treated borated water and states that this aging effect is not applicable because IP2 and IP3 use separate positive displacement pumps for normal makeup to the RCS.

SRP-LR Section 3.2.2.2.6 states that loss of material due to erosion may occur in the stainless steel HPSI pump miniflow recirculation orifice exposed to treated borated water.

During its review, the staff examined the applicant's updated final safety analysis report and associated plant drawings to verify the applicant's statement that the HPSI pumps were infrequently used. The staff noted that the HPSI miniflow recirculation lines containing flow orifices are used only during emergency core cooling system injection or during HPSI pump

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testing. The staff also noted that HPSI pumps are actuated only during testing and are not used during normal charging. Since loss of material due to erosion can occur in these components only if they are frequently operated, the staff finds that erosion is not plausible for IP HPSI pumps and flow orifices. On this basis, the staff agrees that SRP-LR Section 3.2.2.2.6 criterion does not apply to IP2 and IP3 ESF systems.

Based on the above, the staff concludes that SRP-LR Section 3.2.2.2.6 criteria do not apply.

3.2.2.2.7 Loss of Material Due to General Corrosion and Fouling

The staff reviewed LRA Section 3.2.2.2.7 against the criteria in SRP-LR Section 3.2.2.2.7.

LRA Section 3.2.2.2.7 addresses loss of material due to general corrosion and fouling on steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air—indoor uncontrolled and states that this aging effect is not applicable to IP, which are PWRs.

SRP-LR Section 3.2.2.2.7 states that loss of material due to general corrosion and fouling may occur on steel drywell and the suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air—indoor uncontrolled and may cause plugging of the spray nozzles and flow orifices.

This item applies to BWR steel drywell and the suppression chamber spray system and is therefore not applicable to IP because IP2 and IP3 are PWRs. On this basis, the staff finds that that SRP-LR Section 3.2.2.2.7 criteria do not apply to IP.

Based on the above, the staff concludes that SRP-LR Section 3.2.2.2.7 criteria do not apply.

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

The staff reviewed LRA Section 3.2.2.2.8 against the criteria in SRP-LR Section 3.2.2.2.8.

(1) LRA Section 3.2.2.2.8 addresses loss of material due to general, pitting, and crevice corrosion in BWR steel piping, piping components, and piping elements exposed to treated water and states that this aging effect is not applicable to IP, which are PWRs.

SRP-LR Section 3.2.2.2.8 states that loss of material due to general, pitting, and crevice corrosion may occur in BWR steel piping, piping components, and piping elements exposed to treated water.

This line item is not applicable to IP because IP2 and IP3 are PWRs. On this basis, the staff finds that the SRP-LR criteria do not apply to IP.

(2) LRA Section 3.2.2.2.8 addresses loss of material due to general, pitting, and crevice corrosion for primary containment penetration steel piping and components exposed to treated water and states that the Water Chemistry Control—Primary and Secondary Program manages this aging effect. The One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control—Primary and Secondary Program by an

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inspection of a representative sample of components crediting this program, including those in areas of stagnant flow and other susceptible locations.

SRP-LR Section 3.2.2.2.8 states that loss of material due to general, pitting, and crevice corrosion may occur on the internal surfaces of steel containment isolation piping, piping components, and piping elements exposed to treated water. The existing AMP monitors and controls water chemistry to mitigate degradation. However, control of water chemistry does not preclude loss of material due to general, pitting, and crevice corrosion at locations with stagnant flow conditions. Therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of selected components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing such that the component's intended functions will be maintained during the period of extended operation.

The staff reviewed the Water Chemistry Control—Primary and Secondary Program which monitors chlorides, fluorides, and dissolved oxygen to limit the contaminants and thus minimizes the occurrence of aging effects and maintains component ability to perform intended functions. The applicant has stated that the Water Chemistry Control—Primary and Secondary Program will be verified for effectiveness by the One-Time Inspection Program. The One-time Inspection Program provides inspections of selected steel components exposed to treated water at susceptible locations, such as stagnant areas for loss of material due to general, pitting, and crevice corrosion in applicable ESF systems. The staff evaluated the Water Chemistry Control—Primary and Secondary Program and the One-time Inspection Program and documented the evaluations in SER Sections 3.0.3.2.17 and 3.0.3.1.9, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report and are adequate to manage loss of material due to general, pitting, and crevice corrosion on internal surfaces of containment isolation piping and components exposed to treated water.

(3) LRA Section 3.2.2.2.8 addresses loss of material due to general, pitting, and crevice corrosion for steel piping and ESF system components exposed to lubricating oil and states that the Oil Analysis Program manages this aging effect by periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits to preserve an environment not conducive to corrosion. The One-Time Inspection Program will use visual inspections or NDEs of representative samples to verify that the Oil Analysis Program has been effective in managing aging effects for components crediting this program.

SRP-LR Section 3.2.2.2.8 states that loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, and piping elements exposed to lubricating oil. The existing program periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion. Therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation to verify the effectiveness of lubricating oil programs. A

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one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that intended functions of components will be maintained during the period of extended operation.

The staff reviewed the Oil Analysis Program, which monitors oil chemical and physical properties, excessive metal loss caused by wear, contaminants, additives, and water and thus minimizes the occurrence of aging effects and maintains component ability to perform intended functions. The One-Time Inspection Program verifies the effectiveness of the Oil Analysis Program. The One-Time Inspection Program provides inspection of steel piping and components exposed to lubricating oil for loss of material due to general, pitting, and crevice corrosion at susceptible locations where contaminants can accumulate in applicable ESF systems. The staff evaluated the Oil Analysis and the One-Time Inspection Programs and documented the evaluations in SER Sections 3.0.3.2.12 and 3.0.3.1.9, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report and are adequate to manage loss of material due to general, pitting, and crevice corrosion in steel piping and components exposed to lubricating oil.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.8 criteria. For those line items that apply to LRA Section 3.2.2.2.8, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.9 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.2.2.2.9 against the criteria in SRP-LR Section 3.2.2.2.9.

LRA Section 3.2.2.2.9 addresses loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion in steel piping (with or without coating or wrapping), piping components, and piping elements buried in soil and states that this aging effect is not applicable because there are no buried carbon steel components in ESF systems with intended functions for license renewal at IP2 or IP3.

SRP-LR Section 3.2.2.2.9 states that loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion may occur in steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil.

In the LRA, the applicant stated that SRP-LR Section 3.2.2.2.9 does not apply to the IP ESF systems because there are no buried carbon steel components in ESF systems with intended functions for license renewal at IP. During the audit and review, the staff verified that there is no buried carbon steel piping associated with the ESF systems at IP. On this basis, the staff finds that SRP-LR Section 3.2.2.2.9 criteria do not apply to IP.

Based on the above, the staff concludes that SRP-LR Section 3.2.2.2.9 criteria do not apply.

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3.2.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program.

3.2A.2.3 IP2 AMR Results Not Consistent with or Not Addressed in the GALL Report

The staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with, or not addressed in, the GALL Report. In LRA Tables 3.2.2-1-IP2 through 3.2.2-5-IP2, the applicant indicated, via Notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided additional information about how it will manage the aging effects. Specifically, Note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation. The following sections document the staff's evaluation.

3.2A.2.3.1 Residual Heat Removal System—Summary of Aging Management Review—LRA Table 3.2.2-1-IP2

The staff reviewed LRA Table 3.2.2-1-IP2, which summarizes the results of AMR evaluations for the residual heat removal system component groups.

In LRA Table 3.2.2-1-IP2, the applicant proposed to manage reduction of heat transfer in stainless steel HX tube sides exposed to an internal environment of treated borated water by using the Water Chemistry Control—Primary and Secondary Program. The applicant used Note G to indicate that the environment for this component and material is not in the GALL Report.

SER Section 3.0.3.2.17 documents the staff's evaluation of the Water Chemistry Control—Primary and Secondary Program. The staff finds that the Water Chemistry Control—Primary and Secondary Program monitors chlorides, fluorides, and dissolved oxygen to limit the contaminants and thus minimizes the occurrence of aging effects and maintains component ability to perform intended functions. The Water Chemistry Control—Primary and Secondary Program is consistent with the GALL Report, with no exceptions, and in accordance with the latest revision of the EPRI water chemistry guidelines. The applicant also stated that the One-Time Inspection Program will verify the effectiveness of the Water Chemistry Control—Primary and Secondary Program in managing aging effects. On the basis of the review discussed above and the applicant's plant-specific and industry operating experience, the staff finds that the Water Chemistry Control—Primary and Secondary Program will adequately manage the

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aging effect of fouling in stainless steel HX tube-side components exposed to an internal environment of borated water.

In LRA Table 3.2.2-1-IP2, the applicant proposed to manage loss of material due to wear in stainless steel HX tube sides exposed to an external environment of treated water by using the Heat Exchanger Monitoring Program. The applicant used Note H to indicate that the aging effect for this component and material is not in the GALL Report.

SER Section 3.0.3.3.3 documents the staff's evaluation of the Heat Exchanger Monitoring Program. The staff finds that the Heat Exchanger Monitoring Program includes periodic visual inspection or NDEs to detect loss of material due to wear on the outside tube surfaces. The staff confirms that IP2 RHR HXs and the RHR pump seal coolers are included in the scope of the Heat Exchanger Monitoring Program. On this basis, the staff finds that the aging effect of loss of material due to wear in stainless steel HX tube sides exposed to an external environment of treated water will be adequately managed by using the Heat Exchanger Monitoring Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not addressed in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2A.2.3.2 Containment Spray System—Summary of Aging Management Review—LRA Table 3.2.2-2-IP2

The staff reviewed LRA Table 3.2.2-2-IP2, which summarizes the results of AMR evaluations for the CS system component groups.

In LRA Table 3.2.2-2-IP2, the applicant used Note G and identified no aging effects for the stainless steel flow element, spray nozzles, piping, tubing, and valves exposed to an interior environment of plant indoor air. This line item is similar to Item VF-12 in the GALL Report, which is for stainless steel piping, piping components, and piping elements in an external environment of air—indoor uncontrolled. Because the LRA item is similar to the GALL Report item for that material and environment, the staff finds that the exposure of stainless steel material to plant indoor air will not result in AERMs during the period of extended operation.

In LRA Table 3.2.2-2-IP2, the applicant proposed to manage loss of material in stainless steel piping and valves exposed to an external environment of plant indoor air by using the External Surfaces Monitoring Program. The applicant used Note G to indicate that the environment for this component and material is not in the GALL Report.

The staff finds that the applicant's External Surfaces Monitoring Program performs periodic visual inspections of external surfaces during system engineer walkdowns. These walkdowns are performed at least every refueling outage. SER Section 3.0.3.2.5 documents the staff's evaluation of the External Surfaces Monitoring Program. The staff finds that the aging effect of loss of material in stainless steel piping and valves exposed to an external environment of plant indoor air will be adequately managed by using the External Surfaces Monitoring Program.

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On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not addressed in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2A.2.3.3 Containment Isolation Support System—Summary of Aging Management Review—LRA Table 3.2.2-3-IP2

The staff reviewed LRA Table 3.2.2-3-IP2, which summarizes the results of AMR evaluations for the containment isolation support system component groups. All AMR results in the table had Notes A through E. The staff's evaluation of these line items is documented in SER Section 3.2.2.1.

On the basis of its review, as documented in SER Section 3.2.2.1, the staff finds that all AMR results described in LRA Table 3.2.2-3-IP3 are consistent with the GALL Report.

3.2A.2.3.4 Safety Injection System—Summary of Aging Management Review—LRA Table 3.2.2-4-IP2

The staff reviewed LRA Table 3.2.2-4-IP2, which summarizes the results of AMR evaluations for the safety injection system component groups.

In LRA Table 3.2.2-4-IP2, the applicant used Note G and identified no aging effects for stainless steel piping, tubing, and valves exposed to an interior environment of plant indoor air. This line item is similar to Item VF-12 in the GALL Report, which is for stainless steel piping, piping components, and piping elements in an external environment of air—indoor uncontrolled. Because the LRA item is similar to the GALL Report item for that material and environment, the staff finds that the exposure of stainless steel material to plant indoor air will not result in aging that will be of concern during the period of extended operation.

In LRA Table 3.2.2-4-IP2, the applicant proposed to manage loss of material in stainless steel piping and tanks exposed to an external environment of outdoor air by using the External Surfaces Monitoring Program. The applicant used Note G to indicate that the environment for this component and material is not in the GALL Report.

The staff finds that the applicant's External Surfaces Monitoring Program performs periodic visual inspections of external surfaces during system engineer walkdowns. SER Section 3.0.3.2.5 documents the staff's evaluation of the External Surfaces Monitoring Program. The staff finds that the aging effect of loss of material in stainless steel piping and tanks exposed to an external environment of outdoor air will be adequately managed by using the External Surfaces Monitoring Program.

In LRA Table 3.2.2-4-IP2, the applicant proposed to manage fouling in copper alloy HX tubes exposed to an external environment of plant indoor air by using the Periodic Surveillance and Preventive Maintenance Program. The applicant used Note G to indicate that the environment for this component and material is not in the GALL Report.

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SER Section 3.0.3.3.7 documents the staff's evaluation of the Periodic Surveillance and Preventive Maintenance Program. The staff finds that the Periodic Surveillance and Preventive Maintenance Program includes periodic inspections and tests of the equipment. The staff confirms that IP2 recirculation pump motor cooling coils are included in the scope of the Periodic Surveillance and Preventive Maintenance Program. On this basis, the staff finds that the aging effect of fouling in copper alloy HX tubes exposed to an external environment of plant indoor air will be adequately managed by using the Periodic Surveillance and Preventive Maintenance Program.

In LRA Table 3.2.2-1-IP2, the applicant proposed to manage loss of material due to wear in stainless steel HX tube sides exposed to an external environment of treated water by using the Heat Exchanger Monitoring Program. The applicant used Note H to indicate that the aging effect for this component and material is not in the GALL Report.

SER Section 3.0.3.3.3 documents the staff's evaluation of the Heat Exchanger Monitoring Program. The staff finds that the Heat Exchanger Monitoring Program includes periodic visual inspection or NDEs to detect loss of material due to wear on the outside tube surfaces. The staff confirms that IP2 RHR HXs and the RHR pump seal coolers are included in the scope of the Heat Exchanger Monitoring Program. On this basis, the staff finds that the aging effect of loss of material due to wear in stainless steel HX tube sides exposed to an external environment of treated water will be adequately managed by using the Heat Exchanger Monitoring Program.

In LRA Table 3.2.2-4-IP2, the applicant used Note G and identified no aging effects for stainless steel piping, tubing, and valve bodies in the safety injection system exposed to air—indoor internal environments. The applicant did not credit any AMPs for these component, material, and environment combinations because it concluded that there are no AERMs for these components exposed to air—indoor internal environments.

The staff verified that, although the GALL Report does not include AMR items for aging of stainless steel components exposed to air—indoor environments, the report does include AMR Item V.F-12 with an AMR for stainless steel piping components exposed to external air—indoor environments and the position that there are no AERMs for stainless steel components exposed to such environments. The staff verified that no operating experience implies that stainless steel component surfaces exposed to air—indoor environments have no AERMs. Thus, the staff finds it valid to conclude that there are no AERMs for the surfaces of stainless steel piping, tubing, and valve bodies exposed to air—indoor internal environments. On the basis of this finding, the staff concludes that the applicant need not credit any AMPs for these component, environment, material, and aging effect combinations.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not addressed in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.2A.2.3.5 Containment Penetrations—Summary of Aging Management Review—LRA Table 3.2.2-5-IP2

The staff reviewed LRA Table 3.2.2-5-IP2, which summarizes the results of AMR evaluations for the containment penetrations component groups.

In LRA Table 3.2.2-5-IP2, the applicant used Note G and identified no aging effects for the stainless steel flow element, piping, regulator, sampler housing, tubing, and valves exposed to an interior environment of plant indoor air. These line items are similar to Item VF-12 in the GALL Report, which is for stainless steel piping, piping components, and piping elements in an external environment of air—indoor uncontrolled. Because the LRA item is similar to the GALL Report item for that material and environment, the staff finds that the exposure of stainless steel material to plant indoor air will not result in aging that will be of concern during the period of extended operation.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not addressed in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2B.2.3 IP3 AMR Results Not Consistent with or Not Addressed in the GALL Report

The staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report. In LRA Tables 3.2.2-1-IP3 through 3.2.2-5-IP3, the applicant indicated, via Notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided additional information about how it will manage the aging effects. Specifically, Note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation. The following sections document the staff's evaluation.

3.2B.2.3.1 Residual Heat Removal System—Summary of Aging Management Review—LRA Table 3.2.2-1-IP3

The staff reviewed LRA Table 3.2.2-1-IP3, which summarizes the results of AMR evaluations for the residual heat removal system component groups.

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In LRA Table 3.2.2-1-IP3, the applicant proposed to manage reduction of heat transfer in stainless steel HX tube sides exposed to an internal environment of treated borated water by using the Water Chemistry Control—Primary and Secondary Program. The applicant used Note G to indicate that the environment for this component and material is not in the GALL Report.

SER Section 3.0.3.2.17 documents the staff's evaluation of the Water Chemistry Control—Primary and Secondary Program. The staff finds that the Water Chemistry Control—Primary and Secondary Program monitors chlorides, fluorides, and dissolved oxygen to limit the contaminants and thus minimizes the occurrence of aging effects and maintains component ability to perform its intended functions. The Water Chemistry Control—Primary and Secondary Program is consistent with the GALL Report, with no exceptions, and in accordance with the latest revision of the EPRI water chemistry guidelines. The applicant also stated that the One-Time Inspection Program will verify the effectiveness of the Water Chemistry Control—Primary and Secondary Program in managing aging effects. On the basis of the review discussed above and the applicant's plant-specific and industry operating experience, the staff finds that the Water Chemistry Control—Primary and Secondary Program will adequately manage the aging effect of fouling in stainless steel HX tube side components exposed to an internal environment of borated water.

In LRA Table 3.2.2-1-IP3, the applicant proposed to manage loss of material due to wear in stainless steel HX tube sides exposed to an external environment of treated water by using the Heat Exchanger Monitoring Program. The applicant used Note H to indicate that the aging effect for this component and material is not in the GALL Report.

SER Section 3.0.3.3.3 documents the staff's evaluation of the Heat Exchanger Monitoring Program. The staff finds that the Heat Exchanger Monitoring Program includes periodic visual inspection or NDEs to detect loss of material due to wear on the outside tube surfaces. The staff confirmed that IP3 RHR HXs and the RHR pump seal coolers are included in the scope of the Heat Exchanger Monitoring Program. On this basis, the staff finds that the aging effect of loss of material due to wear in stainless steel HX tube sides exposed to an external environment of treated water will be adequately managed by using the Heat Exchanger Monitoring Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not addressed in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2B.2.3.2 Containment Spray System—Summary of Aging Management Review—LRA Table 3.2.2-2-IP3

The staff reviewed LRA Table 3.2.2-2-IP3, which summarizes the results of AMR evaluations for the containment spray system component groups.

During the audit, the staff noted that for IP3 on LRA pages 3.2-48 to 3.2-51, 11 line items reference Note G and the plant-specific Note 202. Note G states that the GALL Report does not include the environment for this component and material. Note 202 states that the treated water

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environment contains sodium hydroxide. The staff asked the applicant to explain how the AMPs listed in each line item will manage the aging effects for the material and environment for the specified component (Audit Item 356).

In its response dated December 18, 2007, the applicant stated the following:

> Per audit items 90 and 91, components exposed to sodium hydroxide are managed by the Periodic Surveillance and Preventive Maintenance Program. The LRA line items in Table 3.2.2-2-IP3 will be revised to replace the Water Chemistry Control – Auxiliary Systems with Periodic Surveillance and Preventive Maintenance (PSPM) Program as the aging management program for components with Notes G and 202.
>
> The PSPM Program will perform visual or other NDE inspections on the inside surfaces of a representative sample of stainless steel components exposed to sodium hydroxide once every five years to manage loss of material and cracking.
>
> Clarification to be incorporated into the LRA.

By letter dated June 30, 2009, the applicant submitted an annual update to the LRA, identifying changes made to the CLB that materially affect the contents of the LRA. As a result of an engineering change, the applicant modified the buffer chemical in the containment spray system from sodium hydroxide (liquid injection) to sump baskets containing sodium tetraborate. The AMR line items affected by this change are those discussed above in the response to the audit questions. The applicant stated that the sodium hydroxide injection components are retired in place and are disconnected and drained. The applicant further stated that the sump baskets have no license renewal intended function and are not in scope for license renewal. The staff determined that these components no longer have an intended function that meets any of the criteria in 10 CFR 54.4(a). Therefore, the staff finds that the removal of the components from the scope of license renewal is acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not addressed in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2B.2.3.3 Containment Isolation Support System—Summary of Aging Management Review—LRA Table 3.2.2-3-IP3

The staff reviewed LRA Table 3.2.2-3-IP3, which summarizes the results of AMR evaluations for the containment isolation support system component groups. All AMR results in the table had Notes A through E. The staff's evaluation of these line items is documented in SER Section 3.2.2.1.

On the basis of its review, as documented in SER Section 3.2.2.1, the staff finds that all AMR results described in LRA Table 3.2.2-3-IP3 are consistent with the GALL Report.

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3.2B.2.3.4 Safety Injection System—Summary of Aging Management Review—LRA Table 3.2.2-4-IP3

The staff reviewed LRA Table 3.2.2-4-IP3, which summarizes the results of AMR evaluations for the safety injection system component groups.

In LRA Table 3.2.2-4-IP3, the applicant used Note G and identified no aging effects for stainless steel piping, tubing, and valves exposed to an interior environment of plant indoor air. This line item is similar to Item VF-12 in the GALL Report, which is for stainless steel piping, piping components, and piping elements in an external environment of air—indoor uncontrolled. Because the LRA item is similar to the GALL Report item for that material and environment, the staff finds that the exposure of stainless steel material to plant indoor air will not result in aging that will be of concern during the period of extended operation.

In LRA Table 3.2.2-4-IP3, the applicant proposed to manage loss of material in stainless steel piping and tanks exposed to an external environment of outdoor air by using the External Surfaces Monitoring Program. The applicant used Note G to indicate that the environment for this component and material is not in the GALL Report.

The staff finds that the applicant's External Surfaces Monitoring Program performs periodic visual inspections of external surfaces during system engineer walkdowns. SER Section 3.0.3.2.5 documents the staff's evaluation of the External Surfaces Monitoring Program. The staff finds that the aging effect of loss of material in stainless steel piping and tanks exposed to an external environment of outdoor air will be adequately managed by using the External Surfaces Monitoring Program.

In LRA Table 3.2.2-4-IP3, the applicant proposed to manage fouling in copper alloy HX tubes exposed to an external environment of plant indoor air by using the Periodic Surveillance and Preventive Maintenance Program. The applicant used Note G to indicate that the environment for this component and material is not in the GALL Report.

SER Section 3.0.3.3.7 documents the staff's evaluation of the Periodic Surveillance and Preventive Maintenance Program. The staff finds that the Periodic Surveillance and Preventive Maintenance Program includes periodic inspections and tests of the equipment. The staff confirmed that IP3 recirculation pump motor cooling coils are included in the scope of the Periodic Surveillance and Preventive Maintenance Program. On this basis, the staff finds that the aging effect of fouling in copper alloy HX tubes exposed to an external environment of plant indoor air will be adequately managed by using the Periodic Surveillance and Preventive Maintenance Program.

In LRA Table 3.2.2-1-IP3, the applicant proposed to manage loss of material due to wear in stainless steel HX tube sides exposed to an external environment of treated water by using the Heat Exchanger Monitoring Program. The applicant used Note H to indicate that the aging effect for this component and material is not in the GALL Report.

SER Section 3.0.3.3.3 documents the staff's evaluation of the Heat Exchanger Monitoring Program. The staff finds that the Heat Exchanger Monitoring Program includes periodic visual inspection or NDEs to detect loss of material due to wear on the outside tube surfaces. The staff confirmed that IP3 RHR HXs and the RHR pump seal coolers are included in the scope of

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the Heat Exchanger Monitoring Program. On this basis, the staff finds that the aging effect of loss of material due to wear in copper alloy HX tube sides exposed to an external environment of lube oil will be adequately managed by using the Heat Exchanger Monitoring Program.

In LRA Table 3.2.2-4-IP3, the applicant used Note G and identified no aging effects for stainless steel piping, tubing, and valve bodies in the safety injection system exposed to air—indoor internal environments. The applicant did not credit any AMPs for these components, material, and environment combinations because it concluded that there are no AERMs for these components exposed to air—indoor internal environments.

The staff verified that, although the GALL Report does not include AMR items on aging of stainless steel components exposed to air—indoor environments, the report does include AMR Item V.F-12 with an AMR for stainless steel piping components exposed to external air—indoor environments and the position that there are no AERMs for stainless steel components exposed to such environments. The staff verified that no operating experience implies that stainless steel component surfaces exposed to air—indoor environments have no AERMs. Thus, the staff finds it valid to conclude that there are no AERMs for surfaces of stainless steel piping, tubing, and valve bodies exposed to air—indoor internal environments. On the basis of this finding, the staff concludes that the applicant need not credit any AMPs for these component, environment, material, and aging effect combinations.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not addressed in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2B.2.3.5 Containment Penetrations—Summary of Aging Management Review—LRA Table 3.2.2-5-IP3

The staff reviewed LRA Table 3.2.2-5-IP3, which summarizes the results of AMR evaluations for the containment penetrations component groups.

In LRA Table 3.2.2-5-IP3, the applicant used Note G and identified no aging effects for the stainless steel flow element, piping, regulator, sampler housing, tubing, and valves exposed to an interior environment of plant indoor air. This line item is similar to Item VF-12 in the GALL Report, which is for stainless steel piping, piping components, and piping elements in an external environment of air—indoor uncontrolled. Because the LRA item is similar to the GALL Report item for that material and environment, the staff finds that the exposure of stainless steel material to plant indoor air will not result in aging that will be of concern during the period of extended operation.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not addressed in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.2.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the ESF system components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3 Aging Management of Auxiliary Systems

This section of the SER documents the staff's review of the applicant's AMR results for the following auxiliary systems components and component groups of:

- spent fuel pit cooling
- SW
- CCW
- compressed air
- nitrogen
- chemical and volume control
- primary makeup water
- HVAC
- containment cooling and filtration
- control room HVAC
- fire protection—water
- fire protection—CO_2, Halon, and RCP oil collection systems
- fuel oil
- EDG
- security generator
- Appendix R diesel generators
- city water
- plant drains
- miscellaneous systems in scope for 10 CFR 54.4(a)(2)
-

3.3.1 Summary of Technical Information in the Application

LRA Section 3.3 provides AMR results for the auxiliary systems components and component groups. LRA Table 3.3.1, "Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the auxiliary systems components and component groups.

The applicant's AMRs evaluated and incorporated applicable plant-specific and industry operating experience in the determination of AERMs. The plant-specific evaluation included CRs and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

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3.3.2 Staff Evaluation

The staff reviewed LRA Section 3.3 to determine whether the applicant had provided sufficient information to demonstrate that the effects of aging for the auxiliary systems components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to verify the applicant's claim that certain AMRs are consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA is applicable and that the applicant identified the appropriate GALL Report AMRs. SER Section 3.0.3 documents the staff's evaluations of the AMPs. SER Section 3.3.2.1 presents details of the staff's evaluation.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations are consistent with the SRP-LR Section 3.3.2.2 acceptance criteria. SER Section 3.3.2.2 documents the staff's evaluations.

The staff also conducted a technical review of the remaining AMRs not consistent with or not addressed in the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed are appropriate for the combinations of material and environment specified. SER Sections 3.3A.2.3 (for IP2) and 3.3B.2.3 (for IP3) document the staff's evaluations.

For components that the applicant claimed are not applicable or require no aging management, the staff reviewed the AMR line items and the plant's operating experience to verify the applicant's claims.

Table 3.3-1 summarizes the staff's evaluation of components, aging effects or mechanisms, and AMPs listed in LRA Section 3.3 and addressed in the GALL Report.

Table 3.3-1 Staff Evaluation for Auxiliary System Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel cranes - structural girders exposed to air - indoor uncontrolled (external) (3.3.1-1)	Cumulative fatigue damage	TLAA to be evaluated for structural girders of cranes. See the SRP-LR, Section 4.7 for generic guidance for meeting the requirements of 10 CFR 54.21(c)(1).	Yes	TLAA	Consistent with GALL Report (see SER Section 3.3.2.2.1)

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel and stainless steel piping, piping components, piping elements, and heat exchanger components exposed to air - indoor uncontrolled, treated borated water or treated water (3.3.1-2)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Consistent with GALL Report (see SER Section 3.3.2.2.1)
Stainless steel heat exchanger tubes exposed to treated water (3.3.1-3)	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable (see SER Section 3.3.2.2.2)
Stainless steel piping, piping components, and piping elements exposed to sodium pentaborate solution > 60°C (> 140°F) (3.3.1-4)	Cracking due to SCC	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (see SER Section 3.3.2.2.3(1))
Stainless steel and stainless clad steel heat exchanger components exposed to treated water > 60°C (> 140°F) (3.3.1-5)	Cracking due to SCC	A plant specific AMP is to be evaluated.	Yes	Not applicable	Not Applicable (see SER Section 3.3.2.2.3(2))
Stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust (3.3.1-6)	Cracking due to SCC	A plant specific AMP is to be evaluated.	Yes	Not applicable	Not Applicable (see SER Section 3.3.2.2.3(3))

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel non-regenerative heat exchanger components exposed to treated borated water > 60°C (> 140°F) (3.3.1-7)	Cracking due to SCC and cyclic loading	Water Chemistry and a plant-specific verification program. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	Yes	Water Chemistry Control – Primary and Secondary, and One Time Inspection	Consistent with GALL Report (see SER Section 3.3.2.2.4(1))
Stainless steel regenerative heat exchanger components exposed to treated borated water > 60°C (> 140°F) (3.3.1-8)	Cracking due to SCC and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to SCC and cyclic loading. A plant specific AMP is to be evaluated.	Yes	Water Chemistry Control – Primary and Secondary , and One Time Inspection Program	Consistent with GALL Report (see SER Section 3.3.2.2.4(2))
Stainless steel high-pressure pump casing in PWR chemical and volume control system (3.3.1-9)	Cracking due to SCC and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to SCC and cyclic loading. A plant specific AMP is to be evaluated.	Yes	Water Chemistry Control – Primary and Secondary	Consistent with GALL Report (see SER Section 3.3.2.2.4(3))
High-strength steel closure bolting exposed to air with steam or water leakage. (3.3.1-10)	Cracking due to SCC, cyclic loading	Bolting Integrity. The AMP is to be augmented by appropriate inspection to detect cracking if the bolts are not otherwise replaced during maintenance.	Yes	Not applicable	Not applicable. High strength steel bolting is not used in the auxiliary systems.
Elastomer seals and components exposed to air - indoor uncontrolled (internal/external) (3.3.1-11)	Hardening and loss of strength due to elastomer degradation	A plant specific AMP is to be evaluated.	Yes	Periodic Surveillance and Preventive Maintenance	Consistent with GALL Report (see SER Section 3.3.2.2.5(1))

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Elastomer lining exposed to treated water or treated borated water (3.3.1-12)	Hardening and loss of strength due to elastomer degradation	A plant-specific AMP is to be evaluated.	Yes	Periodic Surveillance and Preventive Maintenance	Consistent with GALL Report (see SER Section 3.3.2.2.5(2))
Boral, boron steel spent fuel storage racks neutron-absorbing sheets exposed to treated water or treated borated water (3.3.1-13)	Reduction of neutron-absorbing capacity and loss of material due to general corrosion	A plant specific AMP is to be evaluated.	Yes	Boral Surveillance, and Water Chemistry Control – Primary and Secondary	Consistent with GALL Report (see SER Section 3.3.2.2.6)
Steel piping, piping component, and piping elements exposed to lubricating oil (3.3.1-14)	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis, and One-Time Inspection	Consistent with GALL Report (see SER Section 3.3.2.2.7(1))
Steel reactor coolant pump oil collection system piping, tubing, and valve bodies exposed to lubricating oil (3.3.1-15)	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis, and One-Time Inspection	Consistent with GALL Report (see SER Section 3.3.2.2.7(1))
Steel reactor coolant pump oil collection system tank exposed to lubricating oil (3.3.1-16)	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection to evaluate the thickness of the lower portion of the tank	Yes	Oil Analysis, and One-Time Inspection	Consistent with GALL Report (see SER Section 3.3.2.2.7(1))
Steel piping, piping components, and piping elements exposed to treated water (3.3.1-17)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (see SER Section 3.3.2.2.7(2))
Stainless steel and steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust (3.3.1-18)	Loss of material/general (steel only), pitting and crevice corrosion	A plant specific AMP is to be evaluated.	Yes	Periodic Surveillance and Preventive Maintenance, One-Time Inspection, and Fire Protection	Consistent with GALL Report (see SER Section 3.3.2.2.7(3))

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel (with or without coating or wrapping) piping, piping components, and piping elements exposed to soil (3.3.1-19)	Loss of material due to general, pitting, crevice, and microbiologically -influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes	Buried Piping and Tanks Inspection	Consistent with GALL Report (see SER Section 3.3.2.2.8)
Steel piping, piping components, piping elements, and tanks exposed to fuel oil (3.3.1-20)	Loss of material due to general, pitting, crevice, and microbiologically -influenced corrosion, and fouling	Fuel Oil Chemistry and One-Time Inspection	Yes	Fuel Oil Chemistry. and One-Time Inspection	Consistent with GALL Report (see SER Section 3.3.2.2.9(1))
Steel heat exchanger components exposed to lubricating oil (3.3.1-21)	Loss of material due to general, pitting, crevice, and microbiologically -influenced corrosion, and fouling	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis, and One-Time Inspection	Consistent with GALL Report (see SER Section 3.3.2.2.9(2))
Steel with elastomer lining or stainless steel cladding piping, piping components, and piping elements exposed to treated water and treated borated water (3.3.1-22)	Loss of material due to pitting and crevice corrosion (only for steel after lining/cladding degradation)	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (see SER Section 3.3.2.2.10(1))
Stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water (3.3.1-23)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (see SER Section 3.3.2.2.10(2))
Stainless steel and aluminum piping, piping components, and piping elements exposed to treated water (3.3.1-24)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry, and One-Time Inspection	Consistent with GALL Report (see SER Section 3.3.2.2.10(2))

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Copper alloy HVAC piping, piping components, piping elements exposed to condensation (external) (3.3.1-25)	Loss of material due to pitting and crevice corrosion	A plant-specific AMP is to be evaluated.	Yes	External Surfaces Monitoring, and Periodic Surveillance and Preventive Maintenance	Consistent with GALL Report (see SER Section 3.3.2.2.10(3))
Copper alloy piping, piping components, and piping elements exposed to lubricating oil (3.3.1-26)	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis, and One-Time Inspection	Consistent with GALL Report (see SER Section 3.3.2.2.10(4))
Stainless steel HVAC ducting and aluminum HVAC piping, piping components and piping elements exposed to condensation (3.3.1-27)	Loss of material due to pitting and crevice corrosion	A plant-specific AMP is to be evaluated.	Yes	Bolting Integrity, External Surfaces Monitoring, Periodic Surveillance and Preventive Maintenance, and One-Time Inspection	Consistent with GALL Report (see SER Section 3.3.2.2.10(5))
Copper alloy fire protection piping, piping components, and piping elements exposed to condensation (internal) (3.3.1-28)	Loss of material due to pitting and crevice corrosion	A plant-specific AMP is to be evaluated.	Yes	Periodic Surveillance and Preventive Maintenance	Consistent with GALL Report (see SER Section 3.3.2.2.10(6))
Stainless steel piping, piping components, and piping elements exposed to soil (3.3.1-29)	Loss of material due to pitting and crevice corrosion	A plant-specific AMP is to be evaluated.	Yes	Not applicable	Not applicable. There are no buried stainless steel components in the auxiliary systems. (see SER Section 3.3.2.2.10(7))
Stainless steel piping, piping components, and piping elements exposed to sodium pentaborate solution (3.3.1-30)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (see SER Section 3.3.2.2.10(8))

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Copper alloy piping, piping components, and piping elements exposed to treated water (3.3.1-31)	Loss of material due to pitting, crevice, and galvanic corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (see SER Section 3.3.2.2.11)
Stainless steel, aluminum and copper alloy piping, piping components, and piping elements exposed to fuel oil (3.3.1-32)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion	Fuel Oil Chemistry and One-Time Inspection	Yes	Diesel Fuel Monitoring, One-Time Inspection, Periodic Surveillance and Preventive Maintenance	Consistent with GALL Report (see SER Section 3.3.2.2.12(1))
Stainless steel piping, piping components, and piping elements exposed to lubricating oil (3.3.1-33)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis, and One-Time Inspection	Consistent with GALL Report (see SER Section 3.3.2.2.12(2))
Elastomer seals and components exposed to air - indoor uncontrolled (internal or external) (3.3.1-34)	Loss of material due to wear	A plant specific AMP is to be evaluated.	Yes	Not applicable	Not applicable (see SER Section 3.3.2.2.13)
Steel with stainless steel cladding pump casing exposed to treated borated water (3.3.1-35)	Loss of material due to cladding breach	A plant-specific AMP is to be evaluated. Reference NRC IN 94-63, "Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks."	Yes	Not applicable	Not applicable (see SER Section 3.3.2.2.14)
Boraflex spent fuel storage racks neutron-absorbing sheets exposed to treated water (3.3.1-36)	Reduction of neutron-absorbing capacity due to boraflex degradation	Boraflex Monitoring	No	Not applicable	Not applicable to PWRs (see SER Section 3.3.2.1.1)
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.3.1-37)	Cracking due to SCC, intergranular SCC	BWR Reactor Water Cleanup System	No	Not applicable	Not applicable to PWRs (see SER Section 3.3.2.1.1)

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.3.1-38)	Cracking due to SCC	BWR SCC and Water Chemistry	No	Not applicable	Not applicable to PWRs (see SER Section 3.3.2.1.1)
Stainless steel BWR spent fuel storage racks exposed to treated water > 60°C (> 140°F) (3.3.1-39)	Cracking due to SCC	Water Chemistry	No	Not applicable	Not applicable to PWRs (see SER Section 3.3.2.1.1)
Steel tanks in diesel fuel oil system exposed to air - outdoor (external) (3.3.1-40)	Loss of material due to general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	Aboveground Steel Tanks	Consistent with GALL Report
High-strength steel closure bolting exposed to air with steam or water leakage (3.3.1-41)	Cracking due to cyclic loading, SCC	Bolting Integrity	No	Not applicable	Not applicable. High-strength steel closure bolting is not used in the auxiliary systems (see SER Section 3.3.2.1.1)
Steel closure bolting exposed to air with steam or water leakage (3.3.1-42)	Loss of material due to general corrosion	Bolting Integrity	No	Not applicable	Not applicable. This line item was not used. Loss of material of steel closure bolting was addressed by other items including 3.3.1-43, 3.3.1-44 and 3.3.1-55 (see SER Section 3.3.2.1.2)
Steel bolting and closure bolting exposed to air - indoor uncontrolled (external) or air - outdoor (external) (3.3.1-43)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	Bolting Integrity	Consistent with GALL Report
Steel compressed air system closure bolting exposed to condensation (3.3.1-44)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	No	Bolting Integrity	Consistent with GALL Report

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel closure bolting exposed to air - indoor uncontrolled (external) (3.3.1-45)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Bolting Integrity	Consistent with GALL Report (See SER Section 3.3.2.1.4)
Stainless steel and stainless clad steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water > 60°C (> 140°F) (3.3.1-46)	Cracking due to SCC	Closed-Cycle Cooling Water System	No	Water Chemistry Control – Closed Cooling Water, and One-Time Inspection for Water Chemistry	Consistent with GALL Report
Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water (3.3.1-47)	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	No	Water Chemistry Control – Closed Cooling Water, and One-Time Inspection for Water Chemistry	Consistent with GALL Report
Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water (3.3.1-48)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Water Chemistry Control – Closed Cooling Water	Consistent with GALL Report
Stainless steel; steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water (3.3.1-49)	Loss of material due to microbiologically -influenced corrosion	Closed-Cycle Cooling Water System	No	Water Chemistry Control – Closed Cooling Water	Consistent with GALL Report
Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water (3.3.1-50)	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Water Chemistry Control – Closed Cooling Water, and One-Time Inspection for Water Chemistry	Consistent with GALL Report

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water (3.3.1-51)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Water Chemistry Control – Closed Cooling Water, and One-Time Inspection for Water Chemistry	Consistent with GALL Report
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water (3.3.1-52)	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Water Chemistry Control – Closed Cooling Water, and One-Time Inspection for Water Chemistry	Consistent with GALL Report
Steel compressed air system piping, piping components, and piping elements exposed to condensation (internal) (3.3.1-53)	Loss of material due to general and pitting corrosion	Compressed Air Monitoring	No	Periodic Surveillance and Preventive Maintenance	See SER Section 3.3.2.1.3
Stainless steel compressed air system piping, piping components, and piping elements exposed to internal condensation (3.3.1-54)	Loss of material due to pitting and crevice corrosion	Compressed Air Monitoring	No	One-Time Inspection	See SER Section 3.3.2.1.3
Steel ducting closure bolting exposed to air - indoor uncontrolled (external) (3.3.1-55)	Loss of material due to general corrosion	External Surfaces Monitoring	No	External Surfaces Monitoring	Consistent with GALL Report
Steel HVAC ducting and components external surfaces exposed to air - indoor uncontrolled (external) (3.3.1-56)	Loss of material due to general corrosion	External Surfaces Monitoring	No	External Surfaces Monitoring, and Periodic Surveillance and Preventive Maintenance	Consistent with GALL Report

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel piping and components external surfaces exposed to air - indoor uncontrolled (External) (3.3.1-57)	Loss of material due to general corrosion	External Surfaces Monitoring	No	External Surfaces Monitoring	Consistent with GALL Report
Steel external surfaces exposed to air - indoor uncontrolled (external), air - outdoor (external), and condensation (external) (3.3.1-58)	Loss of material due to general corrosion	External Surfaces Monitoring	No	External Surfaces Monitoring, Fire Protection, and Periodic Surveillance and Preventive Maintenance	Consistent with GALL Report
Steel heat exchanger components exposed to air - indoor uncontrolled (external) or air - outdoor (external) (3.3.1-59)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring	No	External Surfaces Monitoring, and Periodic Surveillance and Preventive Maintenance	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to air - outdoor (external) (3.3.1-60)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring	No	External Surfaces Monitoring	Consistent with GALL Report
Elastomer fire barrier penetration seals exposed to air - outdoor or air - indoor uncontrolled (3.3.1-61)	Increased hardness, shrinkage and loss of strength due to weathering	Fire Protection	No	Fire Protection	This line item was not used for auxiliary systems. (See SER Section 3.3.2.1.1)
Aluminum piping, piping components, and piping elements exposed to raw water (3.3.1-62)	Loss of material due to pitting and crevice corrosion	Fire Protection	No	One-Time Inspection, and Service Water Integrity	The components to which this line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and are listed in series 3.3.2-19-xx tables. (See SER Section 3.3.2.1.6)

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel fire rated doors exposed to air - outdoor or air - indoor uncontrolled (3.3.1-63)	Loss of material due to wear	Fire Protection	No	Fire Protection	This line item was not used for auxiliary systems. (See SER Section 3.3.2.1.1
Steel piping, piping components, and piping elements exposed to fuel oil (3.3.1-64)	Loss of material due to general, pitting, and crevice corrosion	Fire Protection and Fuel Oil Chemistry	No	Fire Protection, and Diesel Fuel Monitoring	Consistent with GALL Report
Reinforced concrete structural fire barriers - walls, ceilings and floors exposed to air - indoor uncontrolled (3.3.1-65)	Concrete cracking and spalling due to aggressive chemical attack, and reaction with aggregates	Fire Protection and Structures Monitoring Program	No	Fire Protection, and Structures Monitoring	This line item was not used for auxiliary systems. (See SER Section 3.3.2.1.1)
Reinforced concrete structural fire barriers - walls, ceilings and floors exposed to air - outdoor (3.3.1-66)	Concrete cracking and spalling due to freeze thaw, aggressive chemical attack, and reaction with aggregates	Fire Protection and Structures Monitoring Program	No	Fire Protection, and Structures Monitoring	This line item was not used for auxiliary systems. Reinforced concrete structural fire barriers are evaluated as structural components in Section 3.5 of the LRA.
Reinforced concrete structural fire barriers - walls, ceilings and floors exposed to air - outdoor or air - indoor uncontrolled (3.3.1-67)	Loss of material due to corrosion of embedded steel	Fire Protection and Structures Monitoring Program	No	Fire Protection, and Structures Monitoring	This line item was not used for auxiliary systems. (See SER Section 3.3.2.1.1)
Steel piping, piping components, and piping elements exposed to raw water (3.3.1-68)	Loss of material due to general, pitting, crevice, and microbiologically -influenced corrosion, and fouling	Fire Water System	No	Fire Water System	Consistent with GALL Report
Stainless steel piping, piping components, and piping elements exposed to raw water (3.3.1-69)	Loss of material due to pitting and crevice corrosion, and fouling	Fire Water System	No	Fire Water System	Consistent with GALL Report

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Copper alloy piping, piping components, and piping elements exposed to raw water (3.3.1-70)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion, and fouling	Fire Water System	No	Fire Water System	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to moist air or condensation (internal) (3.3.1-71)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Periodic Surveillance and Preventive Maintenance	See SER Section 3.3.2.1.6
Steel HVAC ducting and components internal surfaces exposed to condensation (internal) (3.3.1-72)	Loss of material due to general, pitting, crevice, and (for drip pans and drain lines) microbiologically -influenced corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Periodic Surveillance and Preventive Maintenance, and External Surfaces Monitoring	See SER Section 3.3.2.1.7
Steel crane structural girders in load handling system exposed to air - indoor uncontrolled (external) (3.3.1-73)	Loss of material due to general corrosion	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	No	Periodic Surveillance and Preventive Maintenance, and Structures Monitoring	This line item was not used in the auxiliary systems tables. (See SER Section 3.3.2.1.1)
Steel cranes - rails exposed to air - indoor uncontrolled (external) (3.3.1-74)	Loss of material due to Wear	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	No	Periodic Surveillance and Preventive Maintenance, and Structures Monitoring	This line item was not used. Steel crane rails are evaluated as structural components in Section 3.5.
Elastomer seals and components exposed to raw water (3.3.1-75)	Hardening and loss of strength due to elastomer degradation; loss of material due to erosion	Open-Cycle Cooling Water System	No	Periodic Surveillance and Preventive Maintenance	The components to which this line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and are listed in series 3.3.2-19-xx tables in systems other than service water. (See SER Section 3.3.2.1.5)

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel piping, piping components, and piping elements (without lining/ coating or with degraded lining/coating) exposed to raw water (3.3.1-76)	Loss of material due to general, pitting, crevice, and microbiologically -influenced corrosion, fouling, and lining/coating degradation	Open-Cycle Cooling Water System	No	Service Water Integrity Program, and Periodic Surveillance and Preventive Maintenance	Consistent with GALL Report
Steel heat exchanger components exposed to raw water (3.3.1-77)	Loss of material due to general, pitting, crevice, galvanic, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Service Water Integrity	Consistent with GALL Report
Stainless steel, nickel alloy, and copper alloy piping, piping components, and piping elements exposed to raw water (3.3.1-78)	Loss of material due to pitting and crevice corrosion	Open-Cycle Cooling Water System	No	Service Water Integrity	Consistent with GALL Report. Stainless steel and copper alloy components exposed to raw water are addressed in other items including 3.3.1-79 and 3.3.1-81.
Stainless steel piping, piping components, and piping elements exposed to raw water (3.3.1-79)	Loss of material due to pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	No	Service Water Integrity, and One-Time Inspection	Consistent with GALL Report
Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water (3.3.1-80)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion	Open-Cycle Cooling Water System	No	Service Water Integrity	Consistent with GALL Report
Copper alloy piping, piping components, and piping elements, exposed to raw water (3.3.1-81)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Service Water Integrity	Consistent with GALL Report

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Copper alloy heat exchanger components exposed to raw water (3.3.1-82)	Loss of material due to pitting, crevice, galvanic, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Service Water Integrity	Consistent with GALL Report
Stainless steel and copper alloy heat exchanger tubes exposed to raw water (3.3.1-83)	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Service Water Integrity	Consistent with GALL Report
Copper alloy > 15% Zn piping, piping components, piping elements, and heat exchanger components exposed to raw water, treated water, or closed cycle cooling water (3.3.1-84)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Selective Leaching	Consistent with GALL Report
Gray cast iron piping, piping components, and piping elements exposed to soil, raw water, treated water, or closed-cycle cooling water (3.3.1-85)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Selective Leaching	Consistent with GALL Report
Structural steel (new fuel storage rack assembly) exposed to air - indoor uncontrolled (external) (3.3.1-86)	Loss of material due to general, pitting, and crevice corrosion	Structures Monitoring Program	No	Not applicable to auxiliary systems.	This line item was not used. Structural steel of the new fuel storage rack assembly is evaluated as a structural component in Section 3.5. (See SER Section 3.3.2.1.1)
Boraflex spent fuel storage racks neutron-absorbing sheets exposed to treated borated water (3.3.1-87)	Reduction of neutron-absorbing capacity due to boraflex degradation	Boraflex Monitoring	No	Boraflex Monitoring, and Water Chemistry Control – Primary and Secondary	Consistent with GALL Report

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Aluminum and copper alloy > 15% Zn piping, piping components, and piping elements exposed to air with borated water leakage (3.3.1-88)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Boric Acid Corrosion Prevention	Consistent with GALL Report
Steel bolting and external surfaces exposed to air with borated water leakage (3.3.1-89)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Boric Acid Corrosion Prevention	Consistent with GALL Report
Stainless steel and steel with stainless steel cladding piping, piping components, piping elements, tanks, and fuel storage racks exposed to treated borated water > 60°C (> 140°F) (3.3.1-90)	Cracking due to SCC	Water Chemistry	No	Water Chemistry Control – Primary and Secondary	Consistent with GALL Report
Stainless steel and steel with stainless steel cladding piping, piping components, and piping elements exposed to treated borated water (3.3.1-91)	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Water Chemistry Control – Primary and Secondary	Consistent with GALL Report
Galvanized steel piping, piping components, and piping elements exposed to air - indoor uncontrolled (3.3.1-92)	None	None	NA	Not applicable. No Aging Effect Mechanism or AMP	Not applicable. Galvanized steel surfaces are evaluated as steel for the auxiliary systems. (See SER Section 3.3.2.1.1)

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation In GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Glass piping elements exposed to air, air - indoor uncontrolled (external), fuel oil, lubricating oil, raw water, treated water, and treated borated water (3.3.1-93)	None	None	NA	Not applicable. No Aging Effect Mechanism or AMP	Not applicable (See SER Section 3.3.2.1.1)
Stainless steel and nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.3.1-94)	None	None	NA	Not applicable. No Aging Effect Mechanism or AMP	Not applicable (See SER Section 3.3.2.1.1)
Steel and aluminum piping, piping components, and piping elements exposed to air - indoor controlled (external) (3.3.1-95)	None	None	NA	Not applicable. No Aging Effect Mechanism or AMP	Not applicable (See SER Section 3.3.2.1.1)
Steel and stainless steel piping, piping components, and piping elements in concrete (3.3.1-96)	None	None	NA	Not applicable. No Aging Effect Mechanism or AMP	Not applicable (See SER Section 3.3.2.1.1)
Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas (3.3.1-97)	None	None	NA	Not applicable. No Aging Effect Mechanism or AMP	Not applicable (See SER Section 3.3.2.1.1)
Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to dried air (3.3.1-98)	None	None	NA	Not applicable. No Aging Effect Mechanism or AMP	Not applicable (See SER Section 3.3.2.1.1)

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel and copper alloy < 15% Zn piping, piping components, and piping elements exposed to air with borated water leakage (3.3.1-99)	None	None	NA	Not applicable. No Aging Effect Mechanism or AMP	Not applicable. There are no copper alloy components exposed to air with borated water leakage in the auxiliary systems. (See SER Section 3.3.2.1.1)

The staff's review of the auxiliary systems component groups followed any one of several approaches. In one approach, documented in SER Section 3.3.2.1, the staff reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. In the second approach, documented in SER Section 3.3.2.2, the staff reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. In the third approach, documented in SER Sections 3.3A.2.3 (for IP2) and 3.3B.2.3 (for IP3), the staff reviewed AMR results for components that the applicant indicated are not consistent with, or not addressed in, the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the auxiliary systems components is documented in SER Section 3.0.3.

3.3.2.1 AMR Results Consistent with the GALL Report

LRA Section 3.3.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the auxiliary systems components:

- Aboveground Steel Tanks Program
- Bolting Integrity Program
- Boraflex Monitoring Program
- Boral Surveillance Program
- Boric Acid Corrosion Prevention Program
- Buried Piping and Tanks Inspection Program
- Diesel Fuel Monitoring Program
- External Surfaces Monitoring Program
- Fire Protection Program
- Fire Water System Program
- Flow-Accelerated Corrosion Program
- Heat Exchanger Monitoring Program
- Oil Analysis Program
- One-Time Inspection Program
- Periodic Surveillance and Preventive Maintenance Program
- Selective Leaching Program
- Service Water Integrity Program
- Water Chemistry Control - Auxiliary Systems Program

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- Water Chemistry Control - Closed Cooling Water Program
- Water Chemistry Control - Primary and Secondary Program

LRA Tables 3.3.2-1-IP2 through 3.3.2-18-IP2, 3.3.2-1-IP3 through 3.3.2-18-IP3, 3.3.2-19-1-IP2 through 3.3.2-19-44-IP2, and 3.3.2-19-1-IP3 through 3.3.2-19-65-IP3 summarize the results of AMRs for the auxiliary system components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report, where the report does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

For each AMR line item, the applicant stated how the information in the tables aligns with the information in the GALL Report. Notes A through E indicate how the AMR is consistent with the GALL Report. The staff audited these AMRs.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

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Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs.

The staff reviewed the LRA to confirm that the applicant: (a) provided a brief description of the system, components, materials, and environments; (b) stated that the applicable aging effects were reviewed and evaluated in the GALL Report; and (c) identified those aging effects for the auxiliary systems components that are subject to an AMR.

In response to RAI 2.3A.4.5-1, by letter dated January 4, 2008, the applicant revised the LRA to include several AMR line items associated with IP1 condensate storage tank and piping to the IP2 condensers which were not previously included in scope under 10 CFR 54.4(a)(3). The AMR line items added included carbon steel piping, tank and valve body with an internal environment of treated air, an external environment of outdoor air, an aging effect of loss of material, and Note A or Note A with plant-specific Note 314.

In response to RAI 2.1-1, Part (b), by letter dated February 13, 2008, the applicant revised the LRA to include several AMR line items associated with chlorination system which were not previously included within the scope of license renewal under 10 CFR 54.4(a)(2). The AMR line items added included carbon steel bolting, piping, and valve body with an internal environment of treated air, an external environment of indoor air, an aging effect of loss of material, and Note A.

In response to RAI 2.3A.2.2-1, by letter dated March 12, 2008, the applicant revised the LRA to include several AMR line items associated with the component cooling water and building vent sampling (IP3) systems which were not previously included within the scope of license renewal under 10 CFR 54.4(a)(2). The AMR line items added included stainless steel bolting, piping, tubing, filter housing and valve body with internal environments of treated water or indoor air, an external environment of indoor air, an aging effect of loss of material or "none," and Notes A or C. Also added were carbon steel bolting, flow element, heat exchanger housing, piping, strainer housing, thermowell, and valve body with an internal environment of treated water, an external environment of indoor air, an aging effect of loss or material, and Notes A, B, or C.

In response to RAI 2.2B-2, by letter dated March 12, 2008, the applicant revised the LRA to include several AMR line items associated with the hydrogen system which was not previously included within the scope of license renewal under 10 CFR 54.4(a)(2). The AMR line items added included carbon steel bolting, stainless steel bolting, stainless steel piping, stainless steel valve bodies, and copper alloy >15 percent zinc valve bodies with an internal environment of gas, an external environment of indoor air, an aging effect of loss of material (for carbon steel bolting only) or "none," and Notes A or C.

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In response to RAI 2.3.0-2, by letter dated March 12, 2008, the applicant revised the LRA to add AMR line items associated with the reactor coolant pump motor upper and lower bearing heat exchangers that were not previously identified as subject to an AMR. The AMR line items added included carbon steel heat exchanger bonnet and tubes with an internal environment of treated water, external environments of indoor air or lube oil, an aging effect of loss of material, and Notes A or D.

By letter dated April 30, 2008, the applicant amended the LRA to reflect the installation of the IP2 SBO/Appendix R diesel generator. In the amendment, the applicant revised LRA Table 3.3.2-16-IP2 to reflect the changes to the AMRs as a result of the modification. The revised AMR line items included numerous components of various materials, environments, and aging effects with Notes A through E. The staff's evaluation of the AMR line item with Note E is documented in SER Section 3.2.2.1.3.

By letter dated June 11, 2008, the applicant submitted an annual update to the LRA, which included a clarification to components included within the scope of license renewal for 10 CFR 54.4(a)(2) as a result of the regional inspections. The applicant revised several LRA tables in the 3.3.2-19-XX series to add numerous components made of carbon steel, stainless steel, gray cast iron, elastomer, and glass exposed to internal environments of treated water, treated water >140°F, indoor air, and raw water, and external environment of indoor air. The revised AMR line items included numerous aging effects with Notes A through E. The staff's evaluation of the AMR line items with Note E is documented in SER Sections 3.2.2.1.3, 3.3.2.1.3, 3.3.2.1.9, 3.3.2.1.11, 3.3.2.2.5(1), 3.3.2.2.5(2), and 3.4.2.2.1.

By letter dated June 30, 2009, the applicant submitted an annual update to the LRA, identifying changes made to the CLB that materially affect the contents of the LRA. For the plant drains system, the applicant revised LRA Tables 3.3.2-18-IP2 and 3.3.2-18-IP3 to add gray cast iron valve bodies exposed internally to indoor air with an aging effect of "loss of material," and exposed externally to indoor air with an aging effect of "none," and Notes A and E, respectively. The staff's evaluation of the AMR line item with Note E is documented in SER Section 3.2.2.1.3. For the security generator system, the applicant replaced carbon steel flexible bellows with stainless steel flexible bellows, and listed the aging effect and AMP as "none." The applicant annotated this line item with Note C.

The staff reviewed the applicant's revisions, noted above, and found that the additional AMR results are consistent with the GALL Report for these combinations of materials and environments. On the basis of its review, the staff finds that all applicable aging effects were identified, and the aging effects listed are appropriate for the combination of materials and environments identified.

On the basis of its audit and review, the staff determines that, for AMRs not requiring further evaluation, as identified in LRA Table 3.3.1, the applicant's references to the GALL Report are acceptable and no further staff review is required.

3.3.2.1.1 AMR Results Identified as Not Applicable

LRA Table 3.3.1, Line Item 36 addresses the reduction of neutron-absorbing capacity due to boraflex degradation in boraflex spent fuel storage racks neutron-absorbing sheets exposed to treated water in BWRs. The LRA states that this line item is only applicable to Boiling Water

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Reactor designs, and, therefore, it is not applicable. Since IP2 and IP3 are both PWRs, the staff finds this to be consistent with the GALL Report, and, therefore, acceptable.

LRA Table 3.3.1, Line Item 37 addresses cracking due to SCC and intergranular SCC in stainless steel piping, piping components, and piping elements exposed to treated water >60°C (>140°F) in BWRs. The LRA states that this line item is only applicable to Boiling Water Reactor designs, and, therefore, it is not applicable. Since IP2 and IP3 are both PWRs, the staff finds this to be consistent with the GALL Report, and, therefore, acceptable.

LRA Table 3.3.1, Line Item 38 addresses cracking due to SCC in stainless steel piping, piping components, and piping elements exposed to treated water >60°C (>140°F) in BWRs. The LRA states that this line item is only applicable to Boiling Water Reactor designs, and, therefore, it is not applicable. Since IP2 and IP3 are both PWRs, the staff finds this to be consistent with the GALL Report, and, therefore, acceptable.

LRA Table 3.3.1, Line Item 39 addresses cracking due to SCC in stainless steel spent fuel storage racks exposed to treated water >60°C (>140°F) in BWRs. The LRA states that this line item is only applicable to Boiling Water Reactor designs, and, therefore, it is not applicable. Since IP2 and IP3 are both PWRs, the staff finds this to be consistent with the GALL Report, and, therefore, acceptable.

LRA Table 3.3.1, Line Item 41 addresses cracking due to cyclic loading, SCC in high-strength steel closure bolting exposed to air with steam or water leakage. The LRA states that high-strength steel bolts are not used in the Non-Class 1 auxiliary systems. During the audit the staff confirmed that the bolting used in Non-Class 1 components is not high strength steel, and that no high strength steel bolts were identified by the applicant during its aging management review of auxiliary systems. The staff finds this to be consistent with the GALL Report and, therefore, acceptable.

LRA Table 3.3.1, Line Item 61 addresses increased hardness, shrinkage and loss of strength due to weathering in elastomeric seals exposed to air – outdoor or air – indoor uncontrolled. This line item was not used in the auxiliary systems tables. Fire barrier seals are evaluated as structural components in SER Section 3.5. Cracking and the change in material properties of elastomer seals are managed by the Fire Protection Program. SER Section 3.5.2.3.4 documents the staff's evaluation of this item.

LRA Table 3.3.1, Line Item 63 addresses loss of material due to wear in steel fire rated doors exposed to air – outdoor or air - indoor uncontrolled. The GALL Report recommends that loss of material due to wear of steel fire doors be managed by the Fire Protection Program. The LRA states that this line item was not used in the auxiliary systems tables. Steel fire doors are evaluated as structural components in Section 3.5, Structures and Component Supports. SER Section 3.5.2.1 documents the staff's evaluation of this item.

LRA Table 3.3.1, Line Item 65 addresses concrete cracking and spalling of reinforced concrete fire barriers (walls, ceilings, and floors) exposed to uncontrolled indoor air. The GALL Report recommends that concrete cracking and spalling be managed by the Fire Protection and Structures Monitoring Program. The LRA states that this line item was not used in the auxiliary systems tables. Reinforced concrete fire barriers are evaluated as structural components in

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Section 3.5, Structures and Component Supports. SER Sections 3.5.2.3 and 3.5.2.4 document the staff's evaluation of this item.

LRA Table 3.3.1, Line Item 66 addresses concrete cracking and spalling of reinforced concrete fire barriers (walls, ceilings, and floors) exposed to outdoor air. The GALL Report recommends that concrete cracking and spalling be managed by the Fire Protection and Structures Monitoring Program. The LRA states that this line item was not used in the auxiliary systems tables. Reinforced concrete fire barriers are evaluated as structural components in Section 3.5, Structures and Component Supports. SER Section 3.5.2.3 documents the staff's evaluation of this item.

LRA Table 3.3.1, Line Item 67 addresses loss of material due to corrosion of embedded steel of reinforced concrete fire barriers exposed to uncontrolled outdoor or indoor air. The GALL Report recommends that concrete cracking and spalling be managed by the Fire Protection and Structures Monitoring Program. The LRA states that this line item was not used in the auxiliary systems tables. Reinforced concrete fire barriers are evaluated as structural components in Section 3.5, Structures and Component Supports. SER Section 3.5.2.3 documents the staff's evaluation of this item.

LRA Table 3.3.1, Line Item 73 addresses loss of material due to general corrosion in steel crane structural girders in load handling system exposed to air- indoor uncontrolled (external). The GALL Report recommends that the loss of material due to wear be managed by the inspection of overhead heavy load and light load (related to refueling) handling systems. The LRA states that this line item was not used in the auxiliary systems tables. Steel crane structural girders are evaluated as structural components in Section 3.5, Structures and Component Supports. Loss of material for steel crane structural components is managed by the Periodic Surveillance and Preventive Maintenance and Structures Monitoring Programs using periodic visual or other NDE techniques. SER Section 3.5.2.3 documents the staff's evaluation of this item.

LRA Table 3.3.1, Line Item 74 addresses loss of material due to wear in steel crane rails exposed to uncontrolled indoor air. The GALL Report recommends that the loss of material due to wear be managed by the inspection of overhead heavy load and light load (related to refueling) handling systems. The LRA states that this line item was not used in the auxiliary systems tables. Steel crane rails are evaluated as structural components in Section 3.5, Structures and Component Supports. SER Section 3.5.2.3 documents the staff's evaluation of this item.

LRA Table 3.3.1, Line Item 86 addresses loss of material due to general, pitting, and crevice corrosion in structural steel (new fuel storage rack assembly) exposed to air – indoor uncontrolled (external). The GALL Report recommends that these aging mechanisms be managed by the Structures Monitoring Program. The LRA states that this line item was not used in the auxiliary systems tables. Structural steel of the new fuel storage rack is evaluated as a structural component in Section 3.5, Structures and Component Supports, of the LRA. The staff finds this to be consistent with the GALL Report and, therefore, is acceptable.

LRA Table 3.3.1, Line Item 92 addresses the lack of an aging effect in galvanized steel piping, piping components, and piping elements exposed to uncontrolled indoor air. Since there is no aging effect applicable to these components when exposed to indoor air, the GALL Report does

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not recommend any AMP. Therefore this line item is identified in the LRA as not applicable. Although this specific line item is not applicable, the LRA states that galvanized steel surfaces of the auxiliary systems are evaluated as steel. The staff finds this is consistent with the GALL Report and, therefore, is acceptable.

LRA Table 3.3.1, Line Item 93 addresses the lack of an aging effect in glass piping elements exposed to air, air – indoor uncontrolled (external), fuel oil, lubricating oil, raw water, treated water, and treated borated water. Since there is no aging effect applicable to these components when exposed to uncontrolled indoor air, fuel oil, lubricating oil, raw water, treated water, or treated borated water, the GALL Report does not recommend any AMP. Therefore, this line item is identified in the LRA as not applicable. The staff finds this is consistent with the GALL Report and, therefore, is acceptable.

LRA Table 3.3.1, Line Item 94 addresses the lack of an aging effect in stainless steel and nickel alloy piping, piping components, and piping elements exposed to uncontrolled indoor air (external). Since there is no aging effect applicable to these components when exposed to indoor air, the GALL Report does not recommend any AMP. In addition, the LRA states that there are no nickel alloy components exposed to uncontrolled indoor air in the auxiliary systems. The staff finds that the classification of this line item in the LRA as not applicable is consistent with the GALL Report and, therefore is acceptable.

LRA Table 3.3.1, Line Item 95 addresses the lack of an aging effect in steel and aluminum piping, piping components, and piping elements exposed to indoor controlled air (external). Since there is no aging effect applicable to these components when exposed to indoor air, the GALL Report does not recommend any AMP. The LRA also states that since all indoor air environments are conservatively considered to be uncontrolled. There are no steel or aluminum components in the auxiliary systems that are exposed to indoor controlled air. The staff finds that the classification of this line item in the LRA as not applicable is consistent with the GALL Report and, therefore is acceptable.

LRA Table 3.3.1, Line Item 96 addresses the lack of an aging effect in steel and stainless steel piping, piping components, and piping elements in concrete. Since there is no aging effect applicable to these components when exposed to concrete, the GALL Report does not recommend any AMP. The staff finds that the classification of this line item in the LRA as not applicable is consistent with the GALL Report and, therefore is acceptable.

LRA Table 3.3.1, Line Item 97 addresses the lack of an aging effect in steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas. Since there is no aging effect applicable to these components when exposed to gas, the GALL Report does not recommend any AMP. The staff finds that the classification of this line item in the LRA as not applicable is consistent with the GALL Report and, therefore is acceptable.

LRA Table 3.3.1, Line Item 98 addresses the lack of an aging effect in steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to dried air. Since there is no aging effect applicable to these components when exposed to dried air, the GALL Report does not recommend any AMP. The staff finds that the classification of this line item in the LRA as not applicable is consistent with the GALL Report and, therefore is acceptable.

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LRA Table 3.3.1, Line Item 99 addresses the lack of an aging effect in stainless steel and copper alloy <15 percent zinc piping, piping components, and piping elements exposed to air with borated water leakage . Since there is no aging effect applicable to stainless steel components when exposed to air with borated water leakage, the GALL Report does not recommend any AMP. In addition, the LRA states that there are no copper alloy components exposed to air with borated water leakage in the auxiliary systems. The staff finds that the classification of this line item in the LRA as not applicable is consistent with the GALL Report and, therefore is acceptable.

3.3.2.1.2 Loss of Material Due to General Corrosion

LRA Table 3.3.1, Line Item 42 addresses loss of material due to general corrosion in steel closure bolting exposed to air with steam or water leakage. The GALL Report recommends the Bolting Integrity AMP to manage loss of material in these components. The LRA states that this line item was not used since loss of material due to general corrosion in steel closure bolting exposed to air with steam or water leakage is addressed by other line items, including 3.3.1-43, 3.3.1-44 and 3.3.1-55. During the audit the staff questioned if bolting in the auxiliary systems at IP is exposed to air with steam or water leakage (Audit Item 219). In its response, dated December 18, 2007, the applicant stated that IP2 and IP3 do not have bolting exposed to air with leakage as a normal environment for bolted connections for auxiliary systems. The applicant further stated that if a leak occurs, it is corrected under the site corrective action or corrective maintenance programs. Therefore, as identified in Table 3.3-1, Item 3.3.1-42 was not used. The Bolting Integrity Program is applied to steel closure bolting as indicated by other items including 3.3.1-43, 3.3.1-44 and 3.3.1-55. Since IP does not have bolting exposed to air with leakage as a normal environment for bolted connections for auxiliary systems, and the applicant appropriately uses the Bolting Integrity AMP for steel closure bolting consistent with the GALL Report, the staff finds this acceptable.

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

LRA Table 3.3.1, Line Item 53 addresses loss of material due to general and pitting corrosion for steel compressed air system piping, piping components, and piping elements exposed to condensation (internal). Rather than using the Compressed Air Monitoring Program, the applicant uses the Periodic Surveillance and Maintenance Program to manage this aging effect. The staff finds that this is acceptable because the program will use periodic visual inspections or other NDE techniques to manage this aging.

By letter dated June 11, 2008, the applicant amended its LRA to state that carbon valve bodies exposed internally to condensation have an aging effect of loss of material in LRA Table 3.3.2-19-48-IP3. For these AMR line items the applicant proposed the Periodic Surveillance and Maintenance Program. These AMR line items referenced LRA Table 3.3.1, Line Item 53.

By letter dated June 12, 2009, the applicant amended its LRA to state that carbon steel filter housing, piping, tubing, trap, strainer housing, tank and valve bodies exposed internally to condensation have an aging effect of loss of material in the IP1 Station Air System. For these AMR line items the applicant proposed the Periodic Surveillance and Maintenance Program. These AMR line items referenced LRA Table 3.3.1, line item 53.

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LRA Table 3.3.1, Line Item 54 addresses loss of material due to pitting and crevice corrosion for stainless steel compressed air system piping, piping components, and piping elements exposed to condensation (internal). Rather than using the Compressed Air Monitoring Program, the applicant uses the One-Time Inspection Program to manage this aging effect. The staff finds this acceptable because visual or other NDE techniques will be used to inspect a representative sample of the internal surfaces to confirm the absence of significant loss of material.

By letter dated June 12, 2009, the applicant amended its LRA to state that stainless steel tubing, piping, strainer and valve bodies exposed internally or externally to condensation have an aging effect of loss of material in the IP1 Station Air System. For these AMR line items the applicant proposed the One-Time Inspection Program. These AMR line items referenced LRA Table 3.3.1, Line Item 54.

3.3.2.1.4 Loss of Preload Due to Thermal Effects, Gasket Creep and Self-loosening

LRA Table 3.3.1, Line Item 45 addresses loss of preload due to thermal effects, gasket creep and self-loosening of steel closure bolting exposed to uncontrolled indoor air. The GALL Report recommends the Bolting Integrity Aging Management Program to manage loss of preload in these components. The LRA states that loss of preload due to stress relaxation (creep) is not an applicable aging effect for auxiliary systems because it is only a concern for very high temperature applications (>700 °F per ASME Code, Section II, Part D, Table 4) and bolting in auxiliary systems operates at <700 °F. The LRA further states that other issues such as gasket creep and loosening that may result in pressure boundary joint leakage are improper design or maintenance issues and that improper bolting application (design) and maintenance issues are current plant operational concerns and are not related to aging effects or mechanisms that require management during the period of extended operation. In the LRA, the applicant further states that actions have been taken to address NUREG-1339, Resolution to Generic Safety Issue 29, "Bolting Degradation or Failure in Nuclear Power Plants." These actions include implementation of good bolting practices in accordance with EPRI NP-5067, Good Bolting Practices.

During the audit, the staff questioned the applicant about loss of preload (Audit Item 201). By letter dated December 18, 2007, the applicant responded to this question by taking the position that loss-of preload is event driven and not an aging effect. The staff questioned the applicant about how a loss of preload is currently managed and requested the applicant to describe (a) the operating experience with loss of bolt pre-load and (b) how the absence or loss of bolt pre-load is confirmed (Audit Item 220). In its response, dated December 18, 2007, the applicant stated that loss of preload is managed by the Bolting Integrity Program which includes preventive measures to preclude or minimize loss of preload and cracking. The applicant further stated that during the period of extended operation, the Bolting Integrity Program will be consistent with the program described in the Gall Report, Section XI.M18. As stated in this section of the GALL Report under detection of aging effects, the absence of loss of bolt preload is confirmed by visual examination during system leakage testing of all pressure-retaining Class 1, 2 and 3 components, according to Tables IWB 2500-1, IWC 2500-1, and IWD 2500-1, respectively. In addition, the applicant states that degradation of the closure bolting due to crack initiation, loss of prestress, or loss of material due to corrosion of the closure bolting would result in leakage. The extent and schedule of

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inspections, in accordance with Tables IWB 2500-1, IWC 2500-1, and IWD 2500-1, combined with periodic system walkdowns, assure detection of leakage before the leakage becomes excessive. For other pressure retaining bolting, periodic system walkdowns assure detection of leakage before the leakage becomes excessive. With regard to operating experience, the applicant stated it has been consistent with that experienced within the industry.

In a letter dated December 18, 2007, the applicant clarified Commitment 2 to specifically state that the Bolting Integrity Program manages loss of preload and loss of material for all external loading. The applicant also stated that the clarification will be incorporated into the LRA (response to Audit Questions 241 and 270). In attachment 1 to this letter, the applicant amended the LRA to incorporate this change.

The staff finds the applicant's response acceptable, because the Bolting Integrity Program includes preventive measures that preclude or minimize loss of preload. This is consistent with the GALL Report. On this basis, the staff finds the AMR results for this line item acceptable.

3.3.2.1.5 Hardening and Loss of Strength Due to Elastomer Degradation; Loss of Material Due to Erosion

LRA Table 3.3.1, Line Item 75 addresses hardening and loss of strength due to elastomer degradation; loss of material due to erosion in elastomer seals and components exposed to raw water. The GALL Report recommends that these aging effects be managed by the Open-Cycle Cooling Water System. The LRA states that the components to which this line item applies are included in scope under criterion 10 CFR 54.4(a)(2) and are listed in series 3.3.2-19-XX tables in systems other than service water. The Periodic Surveillance and Preventive Maintenance Program uses periodic visual inspections of internal and external surfaces of components to manage cracking and change of material properties in elastomeric components exposed to raw water. The staff finds the Periodic Surveillance and Preventive Maintenance Program appropriately manages the applicable aging effects for elastomer components within scope under criterion 10 CFR 54.4(a)(2), and is, therefore, acceptable.

The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.1.6 Loss of Material Due to Pitting and Crevice Corrosion

LRA Table 3.3.1, Line Item 62 addresses loss of material due to pitting and crevice corrosion for aluminum piping, piping components, and piping elements exposed to raw water. The GALL Report recommends using the Fire Protection Program to manage this aging effect. The applicant proposes using the One-Time Inspection Program and the Service Water Integrity Program to manage the aging. The staff finds this to be acceptable because the One-Time Inspection Program will use visual and other NDE techniques to determine if degradation has

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occurred and the Service Water Integrity Program uses periodic inspections to ensure that degradation is not occurring.

LRA Table 3.3.1, Line Item 71 addresses loss of material due to general, pitting, crevice, and (for drip pans and drain lines) microbiologically-influenced corrosion in steel piping, piping components, and piping elements exposed to moist air or condensation (Internal). The GALL Report states that these aging effects should be managed by inspection of internal surfaces in *miscellaneous piping and ducting components*. The LRA states that the *Periodic Surveillance* and Preventive Maintenance Program uses periodic visual inspections to manage loss of material for internal surfaces of steel ducting and components exposed to condensation. The LRA further states that the External Surfaces Monitoring Program manages loss of material for external carbon steel components of the service water system exposed to condensation, by visual inspection of external surfaces. For systems where internal carbon steel surfaces are exposed to the same environment as external surfaces, the LRA states that external surface conditions will be representative of internal surfaces. Thus, loss of material on internal carbon steel surfaces of the service water system exposed to condensation is also managed by the External Surfaces Monitoring Program. During the audit, the applicant was requested to identify and describe the applications of the External Surfaces Monitoring Program to manage loss of material for internal surfaces exposed to condensation and to justify its conclusion that the environment is the same (Audit Item 224). In its response, dated December 18, 2007, the applicant stated that the internal surfaces and external surfaces are exposed to the same environment and are subject to the same aging effects. Therefore, the condition of the external surfaces will be representative of the condition of the internal surfaces. The applicant further stated that the identification of a significant loss of material on the external surfaces will result in appropriate corrective actions to internal surfaces as well as external. In this manner, the External Surfaces Monitoring Program will manage loss of material on internal carbon steel surfaces exposed to indoor air. The staff finds this to be consistent with the GALL Report and, therefore, acceptable.

3.3.2.1.7 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

LRA Table 3.3.1, Line Item 72, addresses loss of material due to general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion of steel HVAC ducting and components internal surfaces exposed to condensation. The GALL Report recommends that the loss of material and MIC of the internal surfaces of steel HVAC ducting be managed by inspection of internal surfaces. The LRA states that loss of material on internal carbon steel surfaces of the service water system exposed to condensation is managed by the External Surfaces Monitoring Program. In response to Audit Question 224, dated December 18, 2007, the applicant stated that the internal surfaces are exposed to the same environment and subject to the same aging effects as the external surfaces. Based on its review of the applicant's response, the staff agrees that the external surfaces will be representative of the condition of the internal surfaces.

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3.3.2.1.8 Hardening and Loss of Strength Due To Elastomer Degradation; Loss Of Material Due To Erosion

By letter dated June 12, 2009, the applicant amended its LRA to state that elastomer expansion joints in the Circulating Water System and the Wash Water System exposed to internally to raw water have the aging effects of cracking and change in material properties.

LRA Table 3.3.1, Line Item 75 addresses hardening and loss of strength due to elastomer degradation; loss of material due to erosion in elastomer seals and components exposed to raw water. The GALL Report recommends that these aging effects be managed by the Open-Cycle Cooling Water System. The Periodic Surveillance and Preventive Maintenance Program uses periodic visual inspections of internal and external surfaces of components to manage cracking and change of material properties in elastomeric components exposed to raw water. The staff finds the Periodic Surveillance and Preventive Maintenance Program appropriately manages the applicable aging effects for elastomer components, and is therefore acceptable.

The staff evaluated the applicant's claim of consistency with the GALL Report. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.1.9 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion, Fouling, and Lining/Coating Degradation

LRA Table 3.3.1, Line Item 76 addresses loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining/coating degradation in steel piping, piping components, and piping elements (without lining/coating or with degraded lining/coating) exposed to raw water. The GALL Report recommends that these aging effects be managed by the Open-Cycle Cooling Water System.

By letter dated June 11, 2008, the applicant amended LRA Table 3.3.2-19-31-IP2 to state that carbon steel pump casings exposed internally to raw water with the aging effect of loss of material will be managed by Periodic Surveillance and Preventive Maintenance Program.

By letter dated June 12, 2009, the applicant amended its LRA to state that carbon steel nozzles, valve bodies and piping in the Wash Water System exposed to internally to raw water have the aging effect of loss of material. Furthermore, for the river water service system the applicant amended its LRA to state that carbon steel piping and valve bodies and gray cast iron pump casings exposed internally to raw water have the aging effect of loss of material.

The applicant proposes to manage the effects of aging using the Periodic Surveillance and Preventive Maintenance Program. The staff's review of the Periodic Surveillance and Preventive Maintenance Program is documented in SER Section 3.0.3.3.7. The Periodic Surveillance and Preventive Maintenance Program enhancements add new activities to the plant's preventive maintenance and surveillance programs, which generally implement preventive maintenance and surveillance testing activities through repetitive tasks or routine monitoring of plant operations. On the basis of its review, the staff finds that because these

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components will be inspected periodically for loss of material, the aging effect for these component/environment combinations will be effectively managed by this aging management program.

The staff evaluated the applicant's claim of consistency with the GALL Report. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.1.10 Loss of Material Due to Pitting and Crevice Corrosion, and Fouling

LRA Table 3.3.1, Line Item 79, addresses loss of material due to pitting and crevice corrosion, and fouling of stainless steel piping, piping components, and piping elements exposed to raw water. The GALL Report recommends that this aging effect for these components be managed by the Open-Cycle Cooling Water System AMP. The LRA states that loss of material for some stainless steel piping, piping components, and piping elements will be managed by the One-Time Inspection Program. The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.9. The One-Time Inspection Program uses visual or other NDE techniques to confirm the absence of significant loss of material. The staff finds that use of the One-Time Inspection Program to detect loss of material in stainless steel piping, piping components and piping elements exposed to raw water is acceptable.

By letter dated June 12, 2009, the applicant amended its LRA to state that stainless steel flex hose, pump casing, tubing and valve bodies in the wash water system exposed to internally or externally to raw water have the aging effects of loss of material. Furthermore, for the river water service system the applicant amended its LRA to state that stainless steel tubing and valve bodies exposed internally to raw water have the aging effect of loss of material.

LRA Table 3.3.1, Line Item 79 addresses loss of material due to pitting and crevice corrosion, and fouling in Stainless steel piping, piping components, and piping elements exposed to raw water. The GALL Report recommends that these aging effects be managed by the Open-Cycle Cooling Water System.

The applicant proposes to manage the effects of aging using the Periodic Surveillance and Preventive Maintenance Program. The staff's review of the Periodic Surveillance and Preventive Maintenance Program is documented in SER Section 3.0.3.3.7. The Periodic Surveillance and Preventive Maintenance Program enhancements add new activities to the plant's preventive maintenance and surveillance programs, which generally implement preventive maintenance and surveillance testing activities through repetitive tasks or routine monitoring of plant operations. On the basis of its review, the staff finds that because these components will be inspected periodically for loss of material, the aging effect for these component/environment combinations will be effectively managed by this aging management program.

The staff evaluated the applicant's claim of consistency with the GALL Report. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent. Therefore, the staff concludes that the

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applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.1.11 Loss of Material due to Pitting and Crevice Corrosion

By letter dated June 11, 2008, the applicant amended its LRA to state that for stainless steel heat exchanger housings exposed internally to treated borated water with an aging effect of loss of material will be managed by the Water Chemistry Control – Primary and Secondary Program in LRA Table 3.3.2-19-5-IP2. The staff noted that the applicant referenced LRA Table 3.3.1, Line Item 3.3.1-91.

LRA Table 3.3.1, Line Item 91 addresses loss of material due to pitting and crevice corrosion for stainless steel and steel with stainless steel cladding piping, piping components and piping elements exposed to treated borated water. The staff noted that the GALL Report recommends a program that corresponds to GALL AMP XI.M 2, "Water Chemistry," for aging management. The staff's evaluation of the Water Chemistry Control – Primary and Secondary Program is documented in SER Section 3.0.3.2.17. The staff determined that the applicant's Water Chemistry Control – Primary and Secondary Program is consistent with GALL AMP XI.M2. The staff finds the applicant's use of the Water Chemistry Control – Primary and Secondary Program to be consistent with the recommendations of the GALL Report.

Based on its review of the program identified above, the staff determines that the applicant's proposed program is acceptable for managing the aging effect in the applicable components. The staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.3.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the auxiliary system components and provides information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- reduction of heat transfer due to fouling
- cracking due to SCC
- cracking due to SCC and cyclic loading
- hardening and loss of strength due to elastomer degradation
- reduction of neutron-absorbing capacity and loss of material due to general corrosion
- loss of material due to general, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion

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- loss of material due to general, pitting, crevice, microbiologically-influenced corrosion and fouling
- loss of material due to pitting and crevice corrosion
- loss of material due to pitting, crevice, and galvanic corrosion
- loss of material due to pitting, crevice, and microbiologically-influenced corrosion
- loss of material due to wear
- loss of material due to cladding breach
- QA for aging management of nonsafety-related components

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.3.2.2. The staff's review of the applicant's further evaluation follows.

3.3.2.2.1 Cumulative Fatigue Damage

Fatigue is an age-related degradation mechanism caused by cyclic stressing of a component by either mechanical or thermal stresses. SRP-LR Section 3.3.2.2.1 states that fatigue is a TLAA as defined in 10 CFR 54.3 and that TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). This TLAA is addressed separately in Section 4.3, "Metal Fatigue Analysis" or Section 4.7, "Other Plant-Specific Time-Limited Aging Analyses" of the SRP-LR.

LRA Section 3.3.2.2.1 states that TLAAs are evaluated in accordance with 10 CFR 54.21(c) and that the evaluation of this TLAA is addressed in Section 4.3.2. This is consistent with SRP-LR Section 3.3.2.2.1 and is, therefore, acceptable.

3.3.2.2.2 Reduction of Heat Transfer Due to Fouling

The staff reviewed LRA Section 3.3.2.2.2 against the criteria in SRP-LR Section 3.3.2.2.2.

LRA Section 3.3.2.2.2 addresses reduction of heat transfer due to fouling in stainless steel heat exchanger tubes exposed to treated water, stating that this aging effect is not applicable because at IP, there are no stainless steel heat exchanger tubes exposed to treated water in the auxiliary systems with an intended function of heat transfer.

SRP-LR Section 3.3.2.2.2 states that reduction of heat transfer due to fouling may occur in stainless steel heat exchanger tubes exposed to treated water.

The staff confirmed that there are no stainless steel heat exchanger tubes exposed to treated water in the auxiliary systems with an intended function of heat transfer.

Based on the above, the staff concludes that SRP-LR Section 3.3.2.2.2 criteria do not apply.

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3.3.2.2.3 Cracking Due to Stress Corrosion Cracking

The staff reviewed LRA Section 3.3.2.2.3 against the criteria in SRP-LR Section 3.3.2.2.3.

(1) LRA Section 3.3.2.2.3 addresses cracking due to SCC in the stainless steel components of a BWR standby liquid control (SLC) system, stating that this aging effect is not applicable to IP, which are PWRs.

SRP-LR Section 3.3.2.2.3 states that cracking due to SCC could occur in the stainless steel piping, piping components, and piping elements of the BWR standby liquid control system that are exposed to sodium pentaborate solution greater than 60 °C (140 °F).

IP2 and IP3 are PWRs and do not have SLC systems. Based on the above, the staff concludes that this item is not applicable to IP.

(2) LRA Section 3.3.2.2.3 addresses cracking due to SCC in stainless steel and stainless steel clad heat exchanger components exposed to treated water greater than 140 °F, stating that this aging effect is not applicable because for IP, the only stainless steel heat exchanger components in the auxiliary systems exposed to treated water greater than 140 °F are in the steam generator secondary side sample coolers.

SRP-LR Section 3.3.2.2.3 states that cracking due to SCC may occur in stainless steel and stainless clad steel heat exchanger components exposed to treated water greater than 60 °C (140 °F).

During the audit the staff requested the applicant to describe how cracking due to SCC in the secondary side sample coolers was addressed in the LRA (Audit Item 214). In its response, dated December 18, 2007, the applicant states that the steam generator secondary side sample coolers are included in scope for 54.4(a)(2) for potential spatial interaction. Although the tube side of the heat exchanger can experience temperatures above 140 °F, it has no intended function because the potential for spatial interaction is prevented by the shell. In addition, the shell side of the coolers does not experience temperatures above 140 °F.

The staff agrees with the applicant that the tube side of the heat exchanger is not with the scope of license renewal because there is no spatial interaction as a result of the presence of the shell, and the shell side of the coolers is not within scope of license renewal because they do not reach a high enough temperature for SCC to occur.

(3) LRA Section 3.3.2.2.3 addresses cracking due to SCC in stainless steel diesel engine exhaust piping exposed to diesel exhaust, stating that this aging effect is not applicable because at IP, the stainless steel exhaust components are not subject to significant moisture accumulation that would allow cracking to occur.

SRP-LR Section 3.3.2.2.3 states that cracking due to SCC may occur in stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust.

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During the audit, the staff confirmed that the stainless steel exhaust components are not subject to significant moisture accumulation that would allow cracking to occur. In addition, the staff requested the applicant to define the intended function of the diesel exhaust piping for license renewal and to state if the piping was subject to aging management under any credited AMP (Audit Item 215). In its response, dated December 18, 2007, the applicant stated that stainless steel piping exposed to diesel exhaust has a pressure boundary intended function, and that exhaust system components are inspected for loss of material under the Periodic Surveillance and Preventive Maintenance Program at least once every six years during the period of extended operation. The GALL Report identifies aging effects for this material/environment combination of stress corrosion cracking and loss of material. As discussed, insignificant moisture accumulation is present to allow cracking to occur. The aging effect of concern is a loss of material which will be inspected for periodically during the extended period of operation. The staff finds that this approach is consistent with the GALL Report and is therefore acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.3 criteria. For those line items that apply to LRA Section 3.3.2.2.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.4 Cracking Due to Stress Corrosion Cracking and Cyclic Loading

The staff reviewed LRA Section 3.3.2.2.4 against the criteria in SRP-LR Section 3.3.2.2.4.

(1) LRA Section 3.3.2.2.4 addresses cracking due to SCC and cyclic loading in stainless steel PWR nonregenerative heat exchanger components exposed to treated borated water greater than 140 °F in the chemical and volume control system, stating that the Water Chemistry Control - Primary and Secondary Program manages this aging effect. The program is augmented by the One-Time Inspection Program to verify the absence of cracking by visual and volumetric NDE techniques. Absence of tube and tubesheet cracking is also verified by monitoring of reactor coolant system leakage and radiation levels in the component cooling water system. Temperature monitoring, a much less sensitive technique, is not used.

SRP-LR Section 3.3.2.2.4 states that cracking due to SCC and cyclic loading may occur in stainless steel PWR nonregenerative heat exchanger components exposed to treated borated water greater than 60 °C (140 °F) in the chemical and volume control system. The existing AMP monitors and controls primary water chemistry in PWRs to manage the aging effects of cracking due to SCC. However, control of water chemistry does not preclude cracking due to SCC and cyclic loading; therefore, the effectiveness of water chemistry control programs should be verified to ensure that cracking does not occur. The GALL Report recommends that a plant-specific AMP be evaluated to verify the absence of cracking due to SCC and cyclic loading to ensure that these aging effects are adequately managed. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water and eddy current testing of tubes.

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During the audit, the staff asked the applicant to identify the specific component inspections currently included in the existing program that are credited for license renewal (Audit Item 52). In its response, dated December 18, 2007, the applicant stated that the existing site eddy current heat exchanger inspection program includes safety-related and nonsafety-related heat exchangers. The GALL Report recommends that this testing be augmented by temperature and radioactivity monitoring of the shell side water. The staff verified that the applicant's program confirms the absence of cracking by monitoring leakage of the RCS and the radiation levels in the component cooling water system. The applicant's method of verifying the absence of cracking due to SCC and cyclic loading is equivalent to the approach recommended in GALL Report, and is, therefore, acceptable.

(2) LRA Section 3.3.2.2.4 addresses cracking due to SCC and cyclic loading in stainless steel PWR regenerative heat exchanger components exposed to treated borated water greater than 140 °F, stating that the Water Chemistry Control - Primary and Secondary Program manages this aging effect. The regenerative heat exchanger is of all-welded construction and inspections are not possible. The Water Chemistry Control - Primary and Secondary Program is augmented by the One-Time Inspection Program to verify the absence of cracking by visual and volumetric NDE techniques with components in similar environments.

SRP-LR Section 3.3.2.2.4 states that cracking due to SCC and cyclic loading may occur in stainless steel PWR regenerative heat exchanger components exposed to treated borated water greater than 60 °C (140 °F). The existing AMP monitors and controls primary water chemistry in PWRs to manage the aging effects of cracking due to SCC. However, control of water chemistry does not preclude cracking due to SCC and cyclic loading; therefore, the effectiveness of water chemistry control programs should be verified to ensure that cracking does not occur. The GALL Report recommends that a plant-specific AMP be evaluated to verify the absence of cracking due to SCC and cyclic loading to ensure that these aging effects are adequately managed.

The staff confirmed that the Water Chemistry Control – Primary and Secondary Program manages cracking of stainless steel regenerative heat exchanger components exposed to treated borated water and that the all-welded construction of the heat exchanger negates the possibility of inspection. The absence of cracking will be determined by the One-Time Inspection Program which includes the use of visual and volumetric NDE techniques of components in similar environments. The staff finds that the use of the One-Time inspection program is consistent with the GALL Report recommendation to verify the absence of cracking due to SCC and cyclic loading, and is therefore acceptable.

(3) LRA Section 3.3.2.2.4 addresses cracking due to SCC and cyclic loading in the stainless steel pump casing of PWR high-pressure pumps in the chemical and volume control system (CVCS), stating that the Water Chemistry Control - Primary and Secondary program manages loss of material for the pump casing. CVCS stainless steel charging pump casings are exposed to treated borated water below the 140 °F threshold for SCC; consequently, they do not specifically credit the Water Chemistry Control – Primary and Secondary Program to manage cracking due to SCC. The Periodic Surveillance and Preventive Maintenance Program manages charging pump cracking

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due to cyclic loading by visual inspections of external casing surfaces for signs of cracking or leakage during the regularly scheduled quarterly pump surveillances.

SRP-LR Section 3.3.2.2.4 states that cracking due to SCC and cyclic loading may occur in the stainless steel pump casing for the PWR high-pressure pumps in the chemical and volume control system. The existing AMP monitors and controls primary water chemistry in PWRs to manage the aging effects of cracking due to SCC. However, control of water chemistry does not preclude cracking due to SCC and cyclic loading; therefore, the effectiveness of water chemistry control programs should be verified to ensure that cracking does not occur. The GALL Report recommends that a plant-specific AMP be evaluated to verify the absence of cracking due to SCC and cyclic loading to ensure that these aging effects are adequately managed.

The staff confirmed that loss of material for the CVCS pump casing is adequately managed by the Water Chemistry Control – Primary and Secondary program. The staff also verified that stainless steel CVCS charging pump casings are exposed to treated borated water that is below the 140°F threshold for SCC and that the absence of cracking due to SCC and cyclic loading is verified by the Periodic Surveillance and Preventive Maintenance Program, which includes visual inspections of external casing surfaces for signs of cracking or leakage during the regularly scheduled quarterly pump surveillances. The staff finds that the applicant's approach is consistent with the GALL Report, and is, therefore, acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.4 criteria. For those line items that apply to LRA Section 3.3.2.2.4, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.5 Hardening and Loss of Strength Due to Elastomer Degradation

The staff reviewed LRA Section 3.3.2.2.5 against the criteria in SRP-LR Section 3.3.2.2.5.

(1) LRA Section 3.3.2.2.5 addresses cracking and change in material properties due to elastomer degradation in elastomer flexible connections of auxiliary and other systems exposed to air - indoor, stating that the Periodic Surveillance and Preventive Maintenance Program manages these aging effects by periodic visual inspections and physical manipulation of the flexible connections for whether the components have experienced aging that would affect performance of intended functions.

SRP-LR Section 3.3.2.2.5 states that hardening and loss of strength due to elastomer degradation may occur in elastomer seals and components of heating and ventilation systems exposed to air - indoor uncontrolled (internal/external). The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

By letter dated June 11, 2008, the applicant amended LRA Table 3.3.2-19-9-IP3 to state that elastomer expansion joints exposed externally to air-indoor with an aging effect of

cracking and change in material properties will be managed by the Periodic Surveillance and Maintenance Program. The applicant referenced LRA Table 3.3.1, Line Item 3.3.1-11.

The staff confirmed that cracking and change in material properties due to elastomer degradation in elastomer flexible connections of auxiliary and other systems exposed to air – indoor, are managed by the Periodic Surveillance and Preventive Maintenance Program. The staff also verified that the AMP includes periodic visual inspections to detect the effects of aging before they could affect a component's ability to accomplish its intended function.

(2) LRA Section 3.3.2.2.5 addresses cracking and change in material properties due to elastomer degradation in auxiliary system components, stating that the Periodic Surveillance and Preventive Maintenance Program manages them by periodic visual inspections of a representative sample of interior and exterior elastomer surfaces for whether the components have experienced aging that would affect performance of intended functions.

SRP-LR Section 3.3.2.2.5 states that hardening and loss of strength due to elastomer degradation may occur in elastomer linings of the filters, valves, and ion exchangers in spent fuel pool cooling and cleanup systems (BWR and PWR) exposed to treated water or treated borated water. The GALL Report recommends that a plant-specific AMP be evaluated to determine and assess the qualified life of the linings in the environment to ensure that these aging effects are adequately managed.

By letter dated June 11, 2008, the applicant amended LRA Table 3.3.2-19-9-IP3 to state that elastomer expansion joints exposed internally to treated water with an aging effect of cracking and change in material properties will be managed by the Periodic Surveillance and Maintenance Program. The applicant referenced LRA Table 3.3.1, Line Item 3.3.1-12.

The staff confirmed that change in material properties of elastomer exposed to treated water is managed by the Periodic Surveillance and Preventive Maintenance Program. The staff also verified that the AMP includes periodic visual inspections of a representative sample of interior and exterior elastomer surfaces to detect the effects of aging before they could affect a component's ability to accomplish its intended function.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.5 criteria. For those line items that apply to LRA Section 3.3.2.2.5, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.3.2.2.6 Reduction of Neutron-Absorbing Capacity and Loss of Material Due to General Corrosion

The staff reviewed LRA Section 3.3.2.2.6 against the criteria in SRP-LR Section 3.3.2.2.6.

LRA Section 3.3.2.2.6 addresses reduction of neutron-absorbing capacity and loss of material due to general corrosion in Boral spent fuel storage racks exposed to a treated borated water environment, stating that the Boral Surveillance Program uses coupon samples to manage these aging effects by periodically monitoring physical and chemical properties of the absorber material. The Boral Surveillance Program is supplemented by the Water Chemistry Control - Primary and Secondary Program.

SRP-LR Section 3.3.2.2.6 states that reduction of neutron-absorbing capacity and loss of material due to general corrosion may occur in the neutron-absorbing sheets of BWR and PWR spent fuel storage racks exposed to treated water or treated borated water. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The staff confirmed that reduction of neutron-absorbing capacity and loss of material due to general corrosion in Boral spent fuel storage racks exposed to a treated borated water environment is adequately managed by the Boral Surveillance Program and Water Chemistry Control - Primary and Secondary Program. The staff also verified that the program includes the use of periodic coupon samples to monitor the physical and chemical properties of the absorber material.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.6 criteria. For those line items that apply to LRA Section 3.3.2.2.6, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

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

The staff reviewed LRA Section 3.3.2.2.7 against the criteria in SRP-LR Section 3.3.2.2.7.

(1) LRA Section 3.3.2.2.7(1) addresses steel piping and components in auxiliary systems exposed to lubricating oil and managed by the Oil Analysis Program, which periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits and preserve an environment not conducive to corrosion. The One-Time Inspection Program will use visual inspection or nondestructive examination of representative samples to confirm the effectiveness of the Oil Analysis Program in managing aging effects for components that credit it. Steel piping components and tanks of the reactor coolant pump oil collection system are not exposed continuously to a lubricating oil environment maintained by the Oil Analysis Program and do not credit it for managing loss of material. Instead these components are managed by the One-Time Inspection Program, which will use visual or volumetric NDE techniques to inspect a representative sample of the internal surfaces for significant corrosion.

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SRP-LR Section 3.3.2.2.7 states that loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, and piping elements, including the tubing, valves, and tanks in the reactor coolant pump oil collection system, exposed to lubricating oil (as part of the fire protection system). The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lubricating oil program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation. In addition, corrosion may occur at locations in the reactor coolant pump oil collection tank where water from wash-downs may accumulate; therefore, the effectiveness of the program should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material due to general, pitting, and crevice corrosion, including determination of the thickness of the lower portion of the tank. A one-time inspection is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff confirmed that the Oil Analysis Program and One-Time Inspection Program will manage the loss of material due to general, pitting, and crevice corrosion in steel piping and related components of auxiliary systems exposed to lubricating oil. The staff also verified that the Oil Analysis Program includes periodic sampling and analysis to ensure contaminants are maintained within acceptable limits, and that the effectiveness of this program will be confirmed by the One-Time Inspection Program which includes visual inspections or non-destructive examinations to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

The staff also verified that the effects of aging on steel piping components and tanks of the reactor coolant pump oil collection system will be adequately managed. The tanks and piping components are not continuously exposed to a lubricating oil environment. Loss of material in these components is managed by the One-Time Inspection Program which includes visual inspections and NDE techniques to inspect a representative sample of the internal surfaces to assure there is no significant corrosion. During an audit, the staff asked the applicant to identify what actions will be taken if degradation is discovered by the One-Time Inspection Program (Audit Item 218). In its response, dated December 18, 2007, the applicant stated that, in addition to verifying the effectiveness of an AMP, the One-Time Inspection Program is utilized to confirm the absence of an aging effect where either (a) an aging effect is not expected to occur but there is insufficient data to completely rule it out, or (b) an aging effect is expected to progress very slowly. For the RCP oil collection system, the applicant stated that the One-Time Inspection Program will confirm that either the aging effect is not occurring, or the aging effect is occurring very slowly as not to affect component intended functions. In either event, the One-Time Inspection Program serves as the means of detecting aging effects and triggering additional action in response to any adverse findings. The staff confirmed that any unacceptable inspection findings identified during the One-Time Inspection

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Program will be evaluated in accordance with the site corrective action process to determine the need for subsequent (including periodic) inspections and for monitoring and trending the results.

Since a one time inspection of RCP oil collection system components after over 30 years of operation will provide valid information regarding whether ongoing periodic inspections through the period of extended operation is warranted, the staff finds that this is an acceptable method of ensuring that the intended functions of RCP oil collection system components will be maintained during the period of extended operation.

(2) LRA Section 3.3.2.2.7 addresses loss of material due to general, pitting, and crevice corrosion in steel components in the BWR reactor water cleanup and shutdown cooling systems exposed to treated water, stating that this aging effect is not applicable to IP, which are PWRs.

SRP-LR Section 3.3.2.2.7 states that loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, and piping elements in the BWR reactor water cleanup and shutdown cooling systems exposed to treated water.

IP2 and IP3 are PWRs and do not have reactor water cleanup and shutdown cooling systems. This item is not applicable to IP.

(3) LRA Section 3.3.2.2.7(3) addresses loss of material due to general (steel only) pitting and crevice corrosion for carbon steel and stainless steel diesel exhaust piping and components exposed to diesel exhaust in the EDG, Appendix R diesel generator, and security generator systems, stating that the Periodic Surveillance and Preventive Maintenance Program manages this aging effect for these components by periodic visual inspections. Additionally, the One-Time Inspection Program will inspect a representative sample of the internal surfaces of EDG system stainless steel components by visual or volumetric NDE techniques. The Fire Protection Program by visual inspections manages loss of material from fire protection system carbon steel diesel exhaust piping and components. These inspections in the Periodic Surveillance and Preventive Maintenance, One-Time Inspection, and Fire Protection programs will manage the aging effect of loss of material so component intended functions will not be affected.

SRP-LR Section 3.3.2.2.7 states that loss of material due to general (steel only), pitting, and crevice corrosion may occur in steel and stainless steel diesel exhaust piping, piping components, and piping elements exposed to diesel exhaust. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff confirmed that the Periodic Surveillance and Preventive Maintenance, One-Time Inspection, and Fire Protection Programs will adequately manage the loss of material due to general (steel only) pitting and crevice corrosion for carbon steel and stainless steel diesel exhaust piping and components exposed to diesel exhaust in the EDG, Appendix R Diesel Generator, and security generator systems. Specifically, loss of material is managed by periodic visual inspections performed under the Periodic

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Surveillance and Preventive Maintenance Program. For stainless steel components of the emergency diesel generator systems, the effectiveness of the Periodic Surveillance and Preventive Maintenance Program is verified by the One-time Inspection Program to ensure that loss of material is not occurring, and that the component's intended function will be maintained during the period of extended operation. Loss of material in carbon steel diesel exhaust piping and components of the Appendix R Diesel Generator is managed by the Fire Protection Program which includes visual inspections of the diesel exhaust piping and components. The staff verified that the One-Time Inspection and Fire Protection Programs will manage the loss of material such that the intended function of the Appendix R Diesel Generator exhaust piping components will not be affected.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.7 criteria. For those line items that apply to LRA Section 3.3.2.2.7, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.8 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.3.2.2.8 against the criteria in SRP-LR Section 3.3.2.2.8.

LRA Section 3.3.2.2.8 addresses loss of material due to general, pitting, and crevice corrosion, and MIC for carbon steel (with or without coating or wrapping) piping and components buried in soil in the auxiliary systems, stating that the Buried Piping and Tanks Inspection Program manages this aging effect by (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel components. Buried components will be inspected when excavated during maintenance. There will be inspections within ten years before the period of extended operation and within the first ten years of the period unless opportunistic inspections occur within these ten-year periods. This program will manage the aging effect of loss of material so component intended functions will not be affected.

SRP-LR Section 3.3.2.2.8 states that loss of material due to general, pitting, and crevice corrosion, and MIC may occur in steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. Buried piping and tanks inspection programs rely on industry practice, frequency of pipe excavation, and operating experience to manage the effects of loss of material from general, pitting, and crevice corrosion and MIC. The effectiveness of the buried piping and tanks inspection program should be verified to evaluate an applicant's inspection frequency and operating experience with buried components, ensuring that loss of material does not occur.

The staff confirmed that the Buried Piping and Tanks Inspection Program will adequately manage the loss of material due to general, pitting, and crevice corrosion, and MIC which may occur in steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. The staff also verified that the effectiveness of this AMP will be confirmed by inspection of buried components when excavated during maintenance. In

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addition, an inspection will be performed within ten years of entering the period of extended operation and within ten years after entering the period of extended operation, unless an opportunistic inspection occurred within these ten-year periods.

During the audit the staff requested the applicant to describe the operating experience it had in the area of handling buried steel piping, piping components, piping elements, and tanks (with or without coating or wrapping) exposed to soil and how this plant specific and industry operating experience is planned to be evaluated and utilized in the developing this program (Audit Item 242). In its response, dated December 18, 2007, the applicant stated that since 2000, two condition reports were initiated as a result of underground leaks, and that the piping in both cases was nonsafety-related and not in the scope of license renewal. The applicant also stated that no other buried piping repair or replacement was identified during its review of operating experience and that the Buried Piping and Tanks Inspection Program will be implemented consistent with the corresponding program described in the Gall Report, Section XI.M34, Buried Piping and Tanks Inspection.

Based on the program identified above, the staff concludes that the applicant's program meets SRP-LR Section 3.3.2.2.8 criteria. For those line items that apply to LRA Section 3.3.2.2.8, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.9 Loss of Material Due to General, Pitting, Crevice, Microbiologically-Influenced Corrosion and Fouling

The staff reviewed LRA Section 3.3.2.2.9 against the criteria in SRP-LR Section 3.3.2.2.9.

(1) LRA Section 3.3.2.2.9 (1) addresses loss of material due to general, pitting, and crevice corrosion, and MIC for carbon steel piping and components exposed to fuel oil, stating that the Diesel Fuel Monitoring Program manages these components by sampling and monitoring fuel oil quality for whether it remains within the limits specified by the ASTM standards. Maintaining parameters within limits prevents significant loss of material. The One-Time Inspection Program will use visual inspection or NDE of representative samples to confirm the effectiveness of the Diesel Fuel Monitoring Program in managing aging effects for components that credit it.

SRP-LR Section 3.3.2.2.9 states that loss of material due to general, pitting, and crevice corrosion, MIC, and fouling may occur in steel piping, piping components, piping elements, and tanks exposed to fuel oil. The existing AMP relies on fuel oil chemistry programs to monitor and control fuel oil contamination to manage loss of material due to corrosion or fouling. Corrosion or fouling may occur at locations where contaminants accumulate. The effectiveness of fuel oil chemistry programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material due to general, pitting, and crevice corrosion, MIC, and fouling to verify the effectiveness of fuel oil chemistry programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

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The staff confirmed that loss of material due to general, pitting, crevice, MIC, and fouling of steel piping, piping components, piping elements, and tanks exposed to fuel oil was managed by the Diesel Fuel Monitoring Program, and that the AMP monitors and controls contamination of fuel oil within limits specified in ASTM standards. In addition, the staff confirmed that the effectiveness of the Diesel Fuel Monitoring Program will be verified by the One-Time Inspection Program, which includes measures to confirm that unacceptable degradation of a component is not occurring and its intended function will be maintained during the period of extended operation. This approach is consistent with the GALL Report and is, therefore, acceptable.

(2) LRA Section 3.3.2.2.9 addresses loss of material due to general, pitting, and crevice corrosion, and MIC for carbon steel heat exchanger components exposed to lubricating oil, stating that the Oil Analysis Program manages this aging effect by periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits and preserve an environment not conducive to corrosion. The One-Time Inspection Program will use visual inspections or NDEs of representative samples to confirm the effectiveness of the Oil Analysis Program in managing aging effects for components that credit it.

SRP-LR Section 3.3.2.2.9 states that loss of material due to general, pitting, and crevice corrosion, MIC, and fouling may occur in steel heat exchanger components exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of lubricating oil programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff confirmed that loss of material due to general, pitting, and crevice corrosion, MIC, and fouling in steel heat exchanger components exposed to lubricating oil is adequately managed by the existing Oil Analysis Program which includes periodic sampling and analysis to maintain contaminants within acceptable limits. In addition, the staff confirmed that the effectiveness of the Oil Analysis Program will be verified by the One-Time Inspection Program, which includes measures to confirm that corrosion is not occurring and that component intended functions will be maintained during the period of extended operation. This approach is consistent with the GALL Report and is, therefore, acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.9 criteria. For those line items that apply to LRA Section 3.3.2.2.9, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.3.2.2.10 Loss of Material Due to Pitting and Crevice Corrosion

The staff reviewed LRA Section 3.3.2.2.10 against the criteria in SRP-LR Section 3.3.2.2.10.

(1) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in steel piping with elastomer lining exposed to treated borated water, stating that this aging effect is not applicable to IP, which are PWRs.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in BWR and PWR steel piping with elastomer lining or stainless steel cladding that are exposed to treated water and treated borated water if the cladding or lining is degraded.

The staff confirmed that there are no elastomer-lined steel components within the scope of license renewal for auxiliary systems. This item does not apply to IP.

(2) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in stainless steel and aluminum piping, piping components, and piping elements and in heat exchanger components of stainless steel and of steel with stainless steel cladding exposed to treated water, stating that in the auxiliary systems there are no aluminum components exposed to treated water. The applicant compares aging management results for loss of material in stainless steel auxiliary system components exposed to treated water to the GALL Report lines for the ESF and steam and power conversion (S&PC) systems considering PWR water chemistry programs because the corresponding line for auxiliary systems considers only BWR chemistry. Consistent with the GALL Report lines for the ESF and S&PC systems, the Water Chemistry Control – Primary and Secondary Program manages loss of material due to pitting and crevice corrosion for stainless steel components exposed to treated water. The One-Time Inspection Program will confirm effectiveness of the program by an inspection of a representative sample of components crediting it, including those in areas of stagnant flow and other susceptible locations.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in stainless steel and aluminum piping, piping components, piping elements, and for stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water. The existing AMP monitors and controls reactor water chemistry to manage the aging effects of loss of material from pitting and crevice corrosion. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause pitting or crevice corrosion; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material from pitting and crevice corrosion to verify the effectiveness of water chemistry control programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

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The staff confirmed that there are no aluminum piping components exposed to treated water in the auxiliary systems and that the loss of material due to pitting and crevice corrosion of stainless steel piping, piping components, piping elements, and stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water is adequately managed by the existing Water Chemistry Control Primary – Secondary Program which monitors and controls reactor water chemistry. In addition, the staff confirmed that the effectiveness of the Water Chemistry Program will be verified by the One-Time Inspection Program, which includes measures to confirm that corrosion is not occurring and that component intended functions will be maintained during the period of extended operation. This approach is consistent with the GALL Report and is, therefore, acceptable.

(3) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion for copper alloy components exposed to condensation (external) in the HVAC and other systems, stating that the External Surfaces Monitoring and Periodic Surveillance and Preventive Maintenance programs manage this aging effect by periodic visual inspections and other NDE techniques so component intended functions will not be affected.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in copper alloy heating, ventilation, and air conditioning (HVAC) piping, piping components, and piping elements exposed to condensation (external). The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

By letter dated June 12, 2009, the applicant amended its LRA to state that copper alloy tubing exposed externally to condensation has the aging effect of loss of material in the Service Water System. For these AMR line items the applicant proposed the External Surfaces Monitoring Program.

The staff confirmed that loss of material due to pitting and crevice corrosion for copper alloy components exposed to condensation (external) in the HVAC and other systems is adequately managed by the existing External Surfaces Monitoring and Periodic Surveillance and Preventive Maintenance AMPs. The staff also verified that these programs include periodic visual inspections and NDE techniques to confirm that the intended function of components is not affected. This approach is consistent with the GALL Report and is, therefore, acceptable.

(4) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion for copper alloy components exposed to lubricating oil in auxiliary systems, stating that the Oil Analysis Program manages this aging effect by periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits and preserve an environment not conducive to corrosion. The One-Time Inspection Program will use visual inspections or NDEs of representative samples to confirm the effectiveness of the Oil Analysis Program in managing aging effects for components that credit it.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in copper alloy piping, piping components, and piping elements

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exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of lubricating oil programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff confirmed that the existing Oil Analysis Program adequately manages loss of material in copper alloy piping components exposed to lubricating oil by periodic sampling and analysis to maintain oil contaminants within acceptable limits. In addition, the staff confirmed that the effectiveness of the Oil Analysis Program will be verified by the One-Time Inspection Program, which includes measures to confirm that corrosion is not occurring and that component intended functions will be maintained during the period of extended operation. This approach is consistent with the GALL Report and is, therefore, acceptable.

(5) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion for aluminum piping and components and stainless steel components exposed to condensation, stating that this aging effect requires management for HVAC and other systems. The Bolting Integrity, External Surfaces Monitoring, Periodic Surveillance and Preventive Maintenance, and One-Time Inspection programs will manage loss of material in aluminum or stainless steel components exposed internally or externally to condensation by periodic visual inspection with the Periodic Surveillance and Preventive Maintenance Program using other NDE techniques as appropriate to manage loss of component material.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in HVAC aluminum piping, piping components, and piping elements and stainless steel ducting and components exposed to condensation. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

By letter dated June 12, 2009, the applicant amended its LRA to state that stainless steel bolting that is externally exposed to condensation has the aging effect of loss of material in the Service Water System. For this AMR line item the applicant proposed the Bolting Integrity Program. In the same letter the applicant amended its LRA to state that stainless steel piping, tubing and valve bodies exposed externally to condensation have an aging effect of loss of material in the Service Water System. For these AMR line items the applicant proposed the External Surfaces Monitoring Program.

The staff confirmed that the Bolting Integrity, External Surfaces Monitoring, One-Time Inspection, and Periodic Surveillance and Preventive Maintenance AMPs adequately manage the loss of material due to pitting and crevice corrosion for aluminum piping and components and stainless steel components exposed to condensation. The staff also

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verified that these programs include periodic visual inspections and NDE techniques to manage loss of component material and confirm that their intended function is not affected. This approach is consistent with the GALL Report and is, therefore, acceptable.

(6) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in copper alloy fire protection system piping, piping components, and piping elements exposed to internal condensation, stating that at IP, there are no copper alloy components exposed to condensation in the fire protection systems. However, this item can be applied to copper alloy components exposed to internal condensation in other systems. The Periodic Surveillance and Preventive Maintenance Program will manage loss of material in copper alloy components exposed internally to condensation, through the use of periodic visual inspections or other NDE techniques.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in copper alloy fire protection system piping, piping components, and piping elements exposed to internal condensation. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

By letter dated June 12, 2009, the applicant amended its LRA to state that copper alloy >15% Zn heat exchanger tubes that are internally exposed to condensation have the aging effect of loss of material in the Instrument Air System. For these AMR line items the applicant proposed the Periodic Surveillance and Preventive Maintenance Program. In the same letter the applicant amended its LRA to state that copper alloy tubing and valve bodies that are internally exposed to condensation have the aging effect of loss of material in the IP1 Station Air System. For these AMR line items the applicant proposed the Periodic Surveillance and Preventive Maintenance Program.

The staff confirmed that there are no copper alloy components exposed to condensation in the fire protection systems and that loss of material due to pitting and crevice corrosion in copper alloy components of other systems that are exposed to internal condensation is adequately managed by the Periodic Surveillance and Preventive Maintenance Program which includes periodic visual inspections and NDE techniques to manage loss of component material and confirm that the intended function of components is not affected. This approach is consistent with the GALL Report and is, therefore, acceptable.

(7) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in stainless steel piping, piping components, and piping elements exposed to soil, stating that this aging effect is not applicable because at IP, there are no stainless steel piping components exposed to soil in the auxiliary systems.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements exposed to soil.

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The staff verified that there are no stainless steel piping components exposed to soil in the auxiliary systems. This item is not applicable to IP.

(8) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in stainless steel piping, piping components, and piping elements of the BWR Standby Liquid Control System that are exposed to sodium pentaborate solution, stating that this aging effect is not applicable to IP, which are PWRs.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements of the BWR standby liquid control system exposed to sodium pentaborate solution.

IP2 and IP3 are PWRs and do not have Standby Liquid Control Systems. The staff agrees that this item is not applicable to IP.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.10 criteria. For those line items that apply to LRA Section 3.3.2.2.10, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.11 Loss of Material Due to Pitting, Crevice, and Galvanic Corrosion

The staff reviewed LRA Section 3.3.2.2.11 against the criteria in SRP-LR Section 3.3.2.2.11.

LRA Section 3.3.2.2.11 addresses loss of material in copper alloy auxiliary system components exposed to a BWR treated water environment, stating that this aging effect is not applicable to IP, which are PWRs.

SRP-LR Section 3.3.2.2.11 states that loss of material due to pitting, crevice, and galvanic corrosion may occur in copper alloy piping, piping components, and piping elements exposed to treated water.

This item pertains to loss of material in copper alloy auxiliary system components exposed to a BWR treated water environment. IP2 and IP3 are PWRs. The staff agrees that this item is not applicable to IP.

Based on the above, the staff concludes that SRP-LR Section 3.3.2.2.11 criteria do not apply.

3.3.2.2.12 Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.3.2.2.12 against the criteria in SRP-LR Section 3.3.2.2.12.

(1) LRA Section 3.3.2.2.12 addresses loss of material due to pitting and crevice corrosion, and MIC in stainless steel and copper alloy piping and components exposed to fuel oil, stating that the Diesel Fuel Monitoring Program manages this aging effect for most of these components. There are no aluminum components exposed to fuel oil in the auxiliary systems. The Diesel Fuel Monitoring Program samples and monitors fuel oil

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quality for whether it remains within the limits specified by ASTM standards. Maintaining parameters within limits prevents significant loss of material. The One-Time Inspection Program will use visual inspections or NDEs of representative samples to confirm the effectiveness of the Diesel Fuel Monitoring Program in managing aging effects for components that credit it. The Periodic Surveillance and Preventive Maintenance Program will manage loss of material for the stainless steel components of the emergency fuel oil trailer transfer tank by periodic visual inspections.

SRP-LR Section 3.3.2.2.12 states that loss of material due to pitting and crevice corrosion, and MIC may occur in stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to fuel oil. The existing AMP relies on the fuel oil chemistry program for monitoring and control of fuel oil contamination to manage loss of material due to corrosion; however, corrosion may occur at locations where contaminants accumulate and the effectiveness of fuel oil chemistry control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the fuel oil chemistry control program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff confirmed that there are no aluminum components exposed to fuel oil in the auxiliary systems. In addition, the staff verified that the loss of material due to pitting and crevice corrosion, and MIC in stainless steel and copper alloy piping, piping components, and piping elements exposed to fuel oil is managed by the Diesel Fuel Monitoring Program and that the program includes sampling and monitoring of fuel oil to ensure it remains within limits specified in ASTM standards. In addition, the staff confirmed that the effectiveness of the Diesel Fuel Monitoring Program will be verified by the One Time Inspection Program, which includes measures to confirm that loss of material is not occurring and that component intended functions will be maintained during the period of extended operation. For the stainless steel components of the emergency fuel oil trailer transfer tank, loss of material will be managed by periodic visual inspections performed in accordance with the Periodic Surveillance and Preventive Maintenance Program. This approach is consistent with the GALL Report and is, therefore, acceptable.

(2) LRA Section 3.3.2.2.12 addresses loss of material due to pitting and crevice corrosion, and MIC in most stainless steel piping and components exposed to lubricating oil, stating that the Oil Analysis Program manages this aging effect by periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits and preserve an environment not conducive to corrosion. The One-Time Inspection Program will use visual inspections or NDEs of representative samples to confirm the effectiveness of the Oil Analysis Program in managing aging effects for components that credit it. Stainless steel piping components of the reactor coolant pump oil collection system are not exposed continuously to a lubricating oil environment maintained by the Oil Analysis Program and do not credit it for managing loss of material. Instead the One-Time Inspection Program manages these components by using visual or volumetric NDE techniques to inspect a representative sample of the internal surfaces for significant corrosion.

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SRP-LR Section 3.3.2.2.12 states that loss of material due to pitting, crevice, and MIC may occur in stainless steel piping, piping components, and piping elements exposed to lubricating oil. The existing program periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of lubricating oil programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff confirmed that loss of material due to pitting, crevice, and MIC in most stainless steel piping and components exposed to lubricating oil is managed by the Oil Analysis Program which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits. In addition, the staff confirmed that the effectiveness of the Oil Analysis Program will be verified by the One Time Inspection Program, which includes measures to confirm that loss of material is not occurring and that component intended functions will be maintained during the period of extended operation.

Since stainless steel piping components of the reactor coolant pump oil collection system are not continuously exposed to a lubricating oil environment the Oil Analysis Program is not credited to manage the effects of aging. For these components, the staff verified that the absence of significant corrosion will be confirmed by the One-Time Inspection Program which includes NDE techniques to inspect a representative sample of the internal surfaces.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.12 criteria. For those line items that apply to LRA Section 3.3.2.2.12, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.13 Loss of Material Due to Wear

The staff reviewed LRA Section 3.3.2.2.13 against the criteria in SRP-LR Section 3.3.2.2.13.

LRA Section 3.3.2.2.13 addresses loss of material due to wear in the elastomer seals and components exposed to air - indoor uncontrolled (internal or external), stating that this aging effect is not applicable because at IP, in the auxiliary systems, the expansion joints are fixed at both ends and do not contact any other components such that wear could occur.

SRP-LR Section 3.3.2.2.13 states that loss of material due to wear may occur in the elastomer seals and components exposed to air - indoor uncontrolled (internal or external). The GALL Report recommends further evaluation to ensure that the aging effect is adequately managed.

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The staff confirmed that expansion joints in the auxiliary system are fixed at both ends and do not contact any other components. Because of this configuration, the staff agrees that that wear in the elastomer seals can not occur. However, change in material properties and cracking of elastomer components are managed by the Periodic Surveillance and Preventive Maintenance Program. Since wear can not occur, loss of material due to wear in the elastomer seals is not applicable to IP auxiliary systems.

Based on the above, the staff concludes that SRP-LR Section 3.3.2.2.13 criteria do not apply.

3.3.2.2.14 Loss of Material Due to Cladding Breach

The staff reviewed LRA Section 3.3.2.2.14 against the criteria in SRP-LR Section 3.3.2.2.14.

LRA Section 3.3.2.2.14 addresses cracking due to underclad cracking in PWR steel charging pump casings with stainless steel cladding exposed to treated borated water, stating that this aging effect is not applicable because the charging pump casings are not clad but made of stainless steel.

SRP-LR Section 3.3.2.2.14 states that loss of material due to cladding breach (also referred to as underclad cracking may occur in PWR steel charging pump casings with stainless steel cladding exposed to treated borated water. The GALL Report references IN 94-63 and recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff confirmed that the charging pump casings at IP are made of stainless steel and are not clad. This item is not applicable to IP.

Based on the above, the staff concludes that SRP-LR Section 3.3.2.2.14 criteria do not apply.

3.3.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program.

3.3A.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In LRA Tables 3.3.2-1-IP2 through 3.3.2-18-IP2 and 3.3.2-19-1-IP2 through 3.3.2-19-44-IP2, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.3.2-1-IP2 through 3.3.2-18-IP2 and 3.3.2-19-1-IP2 through 3.3.2-19-44-IP2, the applicant indicated, via Notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component,

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material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.3A.2.3.1 Service Water System—Summary of Aging Management Review—LRA Table 3.3.2-2-IP2

The staff reviewed LRA Table 3.3.2-2-IP2, which summarizes the results of AMR evaluations for the service water system component groups.

The LRA table referenced Note F for titanium material used in heat exchanger shells and tubes internally and externally exposed to raw water are subject to cracking, fouling, and loss of material which are managed by the Service Water Integrity Program. The staff's review of the Service Water Integrity Program is documented in SER Section 3.0.3.1.14. Titanium components are not addressed in the GALL Report. However, as stated in the Metals Handbook Desk Edition, copyright 1985, by the American Society for Metals, titanium is a corrosion resistant material; therefore, the applicant is conservative in addressing the aging effects of concern for titanium heat exchanger components. The Service Water Integrity Program inspects components for erosion, corrosion, and biofouling to confirm the heat transfer capability of safety-related heat exchangers cooled by service water. Chemical treatment with biocides and sodium hypochlorite and periodic cleaning and flushing of loops infrequently used are methods for controlling fouling within the heat exchangers and managing loss of material in service water components.

On the basis of its review, including the applicant's plant-specific operating experience, the staff finds that the aging effects of cracking, fouling, and loss of material of titanium material used in heat exchanger shells and tubes exposed to raw water will be adequately managed by the Service Water Integrity Program.

The LRA table also referenced Note F for titanium heat exchanger tubes externally exposed to treated water with loss of material as the aging effect, and Water Chemistry Control – Primary and Secondary Program as the AMP. The staff's evaluation of this program is documented in SER Section 3.0.3.2.17. The program includes periodic monitoring and control of known detrimental contaminants such as chlorides, fluorides, dissolved oxygen, and sulfate concentrations below the levels known to result in loss of material or cracking. Water chemistry control is in accordance with industry guidelines such as EPRI TR-105714 for primary water chemistry, and EPRI TR-102134 for secondary water chemistry. The One-Time Inspection Program for Water Chemistry utilizes inspections or NDEs of representative samples to verify that the Water Chemistry Control – Primary and Secondary Program has been effective at managing aging effects. Because chemistry will be monitored, and the One-Time Inspection Program will verify the effectiveness of the water chemistry control, the staff finds the applicant's AMR results for this material/environment combination acceptable.

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The LRA table referenced Note F for titanium heat exchanger shell externally exposed to condensation with no aging effect and no AMP. The staff notes that in LRA Table 3.3.2-9-IP2, the applicant uses Note F for the same material/environment combination, but cites an aging effect of loss of material and states that it will be managed by the Periodic Surveillance and Preventive Maintenance Program. This appears to be a discrepancy. This was identified as Open Item 3.3-1.

By letter dated January 27, 2009, the applicant stated that LRA Table 3.3.2-2-IP2 is correct for the titanium heat exchanger shell externally exposed to condensation with no aging effect and no AMP, and that LRA Table 3.3.2-9-IP2 was corrected to be consistent with Table 3.3.2-2-IP2. According to the Metals Handbook Desk Edition, copyright 1985, by the American Society for Metals, titanium is extremely resistant to corrosion in many aggressive environments. The Metals Handbook also states that resistance to general corrosion has been ascribed to a thin, inert film that forms rapidly on the surface when titanium is exposed to air and to passive films that form on the surface in certain aggressive media. Because titanium is a highly corrosion resistant material, and the environment (condensation) is not corrosive or aggressive, the staff finds the applicant's AMR results to be acceptable. Thus, Open Item 3.3-1, with respect to the different aging effects for the same environment, is closed.

The LRA table referenced Note G for nickel alloy valve bodies externally exposed to condensation having an aging effect of loss of material and using the External Surfaces Monitoring Program to manage the effects of aging. SER Section 3.0.3.2.5 documents the staff's review of the External Surfaces Monitoring Program. While the GALL Report does not contain this specific material/environment combination, a similar material/environment combinations exists in GALL Report with loss of material as the aging effect that use the External Surfaces Monitoring AMP to manage the effects of aging (e.g., GALL Report Tables V.C, V.E, and VII.I, Line items V.C-2, V.E-10, VII.I-11, respectively). The External Surfaces Monitoring Program manages aging effects through visual inspection of external surfaces for evidence of material loss. Because periodic inspections of the external surfaces of the valve bodies will be performed, the staff finds the applicant's AMR results acceptable.

The LRA table referenced Note H for copper alloy >15 percent zinc (inhibited) heat exchanger tubes exposed to treated water (external) with an aging effect of loss of material-wear managed by the Service Water Integrity Program. As noted above, the program includes component inspections for erosion, corrosion, and biofouling to verify the heat transfer capability of safety-related heat exchangers cooled by service water. Because the heat exchanger tubes will be periodically inspected for loss of material, the staff finds the applicant's AMR results acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.2 Component Cooling Water System—Summary of Aging Management Review—LRA Table 3.3.2-3-IP2

The staff reviewed LRA Table 3.3.2-3-IP2, which summarizes the results of AMR evaluations for the component cooling water system component groups.

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The LRA table referenced Note F for aluminum bronze material used in a heat exchanger tubesheet internally exposed to raw water and externally exposed to treated water with the aging effect being loss of material. The AMPs for the raw water environment are the Selective Leaching and Service Water Integrity Programs, and the AMPs for the treated water environment are the Selective Leaching and the Water Chemistry Control-Closed Cooling Water Programs. The staff's review of these programs is documented in SER Sections 3.0.3.1.13 (Selective Leaching Program), 3.0.3.1.14 (Service Water Integrity Program), and 3.0.3.2.16 (Water Chemistry Control-Closed Cooling Water Program).

Loss of material in both environments will be managed by the Selective Leaching Program which will include a one-time visual inspection, hardness measurement (where feasible based on form and configuration) or other industry-accepted mechanical inspection techniques of selected components that may be susceptible to selective leaching to determine whether loss of material due to selective leaching has occurred and whether the process will affect component ability to perform intended functions through the period of extended operation.

The Service Water Integrity Program will also manage the loss of material for the raw water (internal) environment. The Service Water Integrity Program inspects components for erosion, corrosion, and biofouling to confirm the heat transfer capability of safety-related heat exchangers cooled by service water. Chemical treatment with biocides and sodium hypochlorite and periodic cleaning and flushing of loops infrequently used are methods for controlling fouling within the heat exchangers and managing loss of material in service water components.

The GALL Report does not address components made of aluminum bronze material specifically. However, in Table IX.C of the GALL Report, aluminum bronze material is addressed in the discussion of copper alloy components. Table IX.C states that aluminum bronze < 8 percent aluminum components are resistant to SCC, selective leaching and pitting and crevice corrosion, and aluminum bronze components > 8 percent aluminum may be susceptible to the aforementioned aging effects. The applicant conservatively assumed that the aluminum bronze contains > 8 percent aluminum, which implies that SCC is a potential aging effect.

The Water Chemistry Control-Closed Cooling Water Program will manage the loss of material for the treated water (external) environment as well as SCC. The Water Chemistry Control - Closed Cooling Water Program includes preventive measures that manage loss of material, cracking, or fouling for components in closed cooling water systems. This program also includes performance of periodic visual inspections which are capable of detecting SCC.

The staff finds that the applicant's AMR results for aluminum bronze material credit appropriate AERMs and AMPs. The staff's review of the referenced AMPs has verified that the aging effect identified will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation and is therefore acceptable.

The LRA table referenced Note H for heat exchanger (tubes) constructed from copper alloy >15 percent zinc (inhibited) exposed to treated water (external) having the aging effect loss of material–wear that is managed by the Heat Exchanger Monitoring and the Service Water Integrity AMPs. The aging effect identified in the GALL Report for this material/environment is loss of material, which is addressed by another line item in LRA Table 3.3.2-3-IP2. The aging

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effect identified in the LRA is in addition to that prescribed by the GALL Report. The Heat Exchanger Monitoring Program uses visual or other NDE techniques to inspect heat exchangers for loss of material. The Service Water Integrity Program inspects components for erosion, corrosion, and biofouling to confirm the heat transfer capability of safety-related heat exchangers cooled by service water. Chemical treatment with biocides and sodium hypochlorite and periodic cleaning and flushing of loops infrequently used are methods for controlling fouling within the heat exchangers and managing loss of material in SW components. The staff's review of the referenced AMPs has verified that the aging effect identified will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation and is therefore acceptable.

The LRA table referenced Note H for stainless steel heat exchanger (tubes) exposed to treated water (external) with an aging effect of loss of material-wear that is managed by the Heat Exchanger Monitoring Program. The aging effect identified in the GALL Report for this material/environment is loss of material, which is addressed by another line item in LRA Table 3.3.2-3-IP2. The aging effect identified in the LRA is in addition to that prescribed by the GALL Report. The Heat Exchanger Monitoring Program uses visual or other NDE techniques to inspect heat exchangers for loss of material. The staff's review of the referenced AMP has verified that the aging effect identified will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation and is therefore acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.3 Chemical and Volume Control System—Summary of Aging Management Review—LRA Table 3.3.2-6-IP2

The staff reviewed LRA Table 3.3.2-6-IP2, which summarizes the results of AMR evaluations for the chemical and volume control system component groups.

The LRA table referenced Note H for heat exchanger (tubes) constructed from copper alloy externally exposed to lube oil and stainless steel externally exposed to treated water, with an aging effect of loss of material–wear managed by the Heat Exchanger Monitoring AMP. The aging effect identified in the LRA is in addition to that prescribed by the GALL Report. The staff's evaluation of the Heat Exchanger Monitoring Program is documented in SER Section 3.0.3.3.3. This program uses visual inspections or other NDE techniques of heat exchangers for loss of material. Because the heat exchanger tubes will be periodically inspected for loss of material, the staff finds the applicant's AMR results acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.3A.2.3.4 Primary Makeup Water System—Summary of Aging Management Review—LRA Table 3.3.2-7-IP2

The staff reviewed LRA Table 3.3.2-7-IP2, which summarizes the results of AMR evaluations for the primary makeup water system component groups.

The applicant referenced Note G for the stainless steel bolting exposed to outdoor air (external) with the aging effect of loss of material with aging managed with the Bolting Integrity Program

The staff evaluated the Bolting Integrity Program in Section 3.0.3.2.2. This program is recommended in Table 3, Item 43, of the GALL Report to manage the loss of material due to general, pitting, and crevice corrosion in steel bolting exposed to outdoor air (external). Based on the above, the staff finds that the aging effect of the loss of material in these components will be adequately managed by using the Bolting Integrity Program.

The applicant referenced Note G for stainless steel heat exchanger tubes exposed to steam (internal) subjected to cracking and loss of material with aging managed by the Water Chemistry Control-Primary and Secondary. Stainless steel heat exchanger tubes are not specifically addressed in the GALL Report. However, stainless steel piping is with AERMs of cracking and loss of material which is consistent with the applicant's AMR review. The staff's review of the Water Chemistry Control-Primary and Secondary is documented in SER Section 3.0.3.2.17. The Water Chemistry Control - Primary and Secondary Program manages aging effects caused by corrosion and cracking mechanisms. The program monitors and controls reactor water chemistry based on EPRI TR-105714, Revision 5, "Pressurized Water Reactor Primary Water Chemistry Guidelines," and TR-102134, Revision 6, "Pressurized Water Reactor Secondary Chemistry Guidelines." On the basis of its review, the staff found that appropriate AERMs are identified for stainless steel heat exchanger tubes exposed to steam (internal), and that because these components will be inspected periodically, the aging effects of cracking and loss of material will be effectively managed by the Water Chemistry Control-Primary and Secondary.

The applicant referenced Note G for stainless steel tank, piping, and valve bodies exposed to outdoor air (external) with the aging effect of loss of material managed by the External Surfaces Monitoring Program. Stainless steel exposed to outdoor air (external) is not specifically addressed in the GALL Report. However, in Table IX.C of the GALL states that stainless steel material is susceptible to a variety of aging effects and mechanisms, including loss of material due to pitting and crevice corrosion, and cracking due to stress corrosion cracking. The external environment of interest, outdoor air, would not induce SCC in stainless steel material. However, uncontrolled air might result in condensation, therefore, loss of material is an appropriate aging effect to consider. The External Surfaces Monitoring Program inspects external surfaces of components subject to aging management review. The staff's review of the referenced AMP has verified that the aging effect identified will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation and is therefore acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be

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adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.5 Heating, Ventilation and Air Conditioning Systems—Summary of Aging Management Review—LRA Table 3.3.2-8-IP2

The staff reviewed LRA Table 3.3.2-8-IP2, which summarizes the results of AMR evaluations for the HVAC systems component groups.

The applicant referenced Note G for aluminum damper housing exposed to outdoor air (external) with an aging effect of loss of material and an aging management program of External Surfaces Monitoring Program. The staff agrees that the use of the External Surfaces Monitoring Program to manage the loss of material for aluminum damper housing exposed to outdoor air (external) is appropriate because these material/environment combinations exist for other systems in the GALL Report with the same aging management program prescribed.

The applicant referenced Note G for stainless steel ducts, copper alloy tubing, stainless steel tubing, and stainless steel valve bodies exposed to air-indoor (internal) with no aging effects and no aging management program required. These material/environment combinations are similar to combinations in the GALL Report (e.g., Table VII.J, Line Items J-3 and J-18) that indicate there are no aging effects and no AMP is required. Therefore, the staff finds the applicant's AMR results acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.6 Containment Cooling and Filtration System—Summary of Aging Management Review—LRA Table 3.3.2-9-IP2

The staff reviewed LRA Table 3.3.2-9-IP2, which summarizes the results of AMR evaluations for the containment cooling and filtration system component groups.

The LRA table, as amended by letter dated January 27, 2009, referenced Note F for titanium material used in a heat exchanger header externally exposed to condensation with the aging effect and AMP listed as "none," and internally exposed to raw water with the aging effect of loss of material to be managed by the Service Water Integrity Program. Titanium components are not addressed in the GALL Report. As noted in SER Section 3.3A.2.3.1, titanium is highly resistant to corrosion. Therefore, the applicant is conservative in addressing the potential aging effect of loss of material for internal exposure of the heat exchanger header. The staff's review of the Service Water Integrity Program is documented in SER Section 3.0.3.1.14. The Service Water Integrity Program inspects components for erosion, corrosion, and biofouling to confirm the heat transfer capability of safety-related heat exchangers cooled by service water. Chemical treatment with biocides and sodium hypochlorite and periodic cleaning and flushing of loops infrequently used are methods for controlling fouling within the heat exchangers and managing loss of material in service water components.

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On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of material for titanium heat exchanger headers exposed to condensation (external) and raw water (internal) will be effectively managed by the Periodic Surveillance and Preventive Maintenance Program and the Service Water Integrity Program, respectively.

For stainless steel heat exchanger tubes exposed to condensation (external) the LRA table referenced Notes G and H. For Note G the aging effect is fouling managed by the Service Water Integrity program and for Note H the aging effect of loss of material due to wear which is managed by Periodic Surveillance and Preventive Maintenance Program. Stainless steel components are addressed in the GALL Report with an aging effect of loss of material, therefore, the LRA is conservative in also considering fouling and loss of material due to wear. The Service Water Integrity Program will inspect components for erosion, corrosion, and biofouling to confirm the heat transfer capability of safety-related heat exchangers cooled by service water. Chemical treatment with biocides and sodium hypochlorite and periodic cleaning and flushing of loops infrequently used are methods for controlling fouling within the heat exchangers and managing loss of material in service water components. The Periodic Surveillance and Preventive Maintenance Program will inspect the heat exchanger tubes for loss of material.

On the basis of its review, the staff found that, because these components will be inspected periodically, the aging effect of fouling for stainless steel heat exchanger tubes exposed to condensation (external) will be effectively managed by the Service Water Integrity Program, and the aging effect of loss of material due to wear will be adequately managed by Periodic Surveillance and Preventive Maintenance Program.

The LRA table referenced Note G for copper alloy tubing and copper alloy >15 percent zinc valve bodies exposed to air-indoor (internal) having no aging effect and require no aging management program. The staff agrees that there is no aging effect and no AMP required for copper alloy tubing and copper alloy >15 percent zinc exposed to air-indoor (internal) because these material/environment combinations exist for other systems in the GALL Report that indicate there are no aging effects and no AMP is required.

The LRA table referenced Note H for copper alloy heat exchanger fins exposed to condensation (external) having the aging effect of fouling which is managed by the Service Water Integrity Program. The staff finds the use of the Service Water Integrity Program to manage the effects of fouling acceptable because the program will use inspections to monitor for fouling and will chemically treat the heat exchanger fins to prevent fouling.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.3A.2.3.7 Control Room HVAC System—Summary of Aging Management Review—LRA Table 3.3.2-10-IP2

The staff reviewed LRA Table 3.3.2-10-IP2, which summarizes the results of AMR evaluations for the control room HVAC system component groups.

The LRA table referenced Note G for stainless steel bolting exposed to outdoor air (external) having the aging effects of loss of material which is managed by the Bolting Integrity Program and by the External Surfaces Monitoring Program. The staff's review of the Bolting Integrity Program is documented in SER Section 3.0.3.2.2 and the External Surfaces Monitoring Program is documented in Section 3.0.3.2.5. The Bolting Integrity Program is recommended in Table 3, Item 43, of the GALL Report to manage the loss of material due to general, pitting, and crevice corrosion in steel bolting exposed to outdoor air (external). The External Surfaces Monitoring Program inspects the external surfaces of components subject to an aging management review for loss of material. Based on the above, the staff finds that the aging effect of the loss of material in these components will be adequately managed by using the Bolting Integrity and External Surfaces Monitoring Programs.

The LRA table referenced Note G for elastomer duct flexible connectors exposed to outdoor air (external) and subject to change in material properties and cracking which is managed by the Periodic Surveillance and Preventive Maintenance Program. The staff's evaluation of this program is documented in SER Section 3.0.3.3.7. The GALL Report identifies change in material property as the aging effect for the same material/environment for other systems. The aging effect of cracking is in addition to that prescribed by the GALL Report. The Periodic Surveillance and Preventive Maintenance Program will visually inspect and manually flex a representative sample of duct flexible connections to manage cracking and change in material properties. Based on the above the staff finds that the aging effects will be adequately managed and therefore acceptable.

The LRA table referenced Note G for copper alloy heat exchanger tubes exposed to outdoor air (external) and condensation (external) and have the aging effect of fouling and loss of material which is managed by the Periodic Surveillance and Preventive Maintenance Program. The Periodic Surveillance and Preventive Maintenance program will visually inspect a representative sample of control room HVAC air cooled condensers and evaporators to manage loss of material and fouling. Based on the above the staff finds that the aging effects will be adequately managed and therefore acceptable.

The LRA table referenced Note G for copper alloy piping, tubing and valve bodies exposed to outdoor air (external) with an aging effect of loss of material which is managed by the External Surfaces Monitoring Program. The GALL Report identifies an aging effect of loss of material for copper components exposed to condensation which is a conservative approximation of outdoor air. The staff finds the External Surfaces Monitoring program acceptable to mange the loss of material because the external surfaces will be inspected.

The LRA table referenced Note G for aluminum valve bodies are exposed to treated air (internal) which have no aging effect and no AMP is required The staff agrees that there is no aging effect and no AMP required for aluminum valve bodies exposed to treated air (internal) because these material/environment combinations exist for other systems in the GALL Report that indicate there are no aging effects and no AMP is required.

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The LRA table referenced Note G for aluminum heat exchanger fins externally exposed to outdoor air with an aging effect of fouling. The applicant proposed to manage this aging effect for this material/environment combination using the Periodic Surveillance and Preventive Maintenance Program. This program uses periodic visual and other NDEs to inspect the components that are within the scope

On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect for these component/environment combinations will be effectively managed by the Bolting Integrity Program, the External Surfaces Monitoring Program, and the Periodic Surveillance and Preventive Maintenance Program.

The LRA table referenced Note H for aluminum heat exchanger fins exposed to condensation (external) with the aging effect of fouling which is managed by the Periodic Surveillance and Preventive Maintenance Program. The Periodic Surveillance and Preventive Maintenance Program will visually inspect a representative sample of control room HVAC air cooled condensers and evaporators to manage loss of material and fouling. Based on the above the staff finds that the aging effects will be adequately managed and therefore acceptable.

The LRA table referenced Note I and plant-specific Note 306, which states "Changes of material properties and cracking in elastomers are results of exposure to ultra-violet light or elevated temperatures (> 95 °F). The interior surfaces of these components are not exposed to ultra-violet light and are part of the air intake that is not exposed to elevated temperatures." The combination is duct flexible connection/elastomer/air–indoor (internal)/none/none. The staff finds that the applicant's AMR result is appropriate because the elastomer flexible duct connections are not exposed to ultra-violet light or elevated temperatures.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.8 Fire Protection - Water System—Summary of Aging Management Review—LRA Table 3.3.2-11-IP2

The staff reviewed LRA Table 3.3.2-11-IP2, which summarizes the results of AMR evaluations for the fire protection - water system component groups.

The LRA table referenced Note G for stainless steel bolting exposed to outdoor air (external) with the aging effect of loss of material which is managed by the Bolting Integrity Program which is reviewed in SER Section 3.0.3.2.2. The Bolting Integrity Program is recommended in Table 3, Item 43, of the GALL Report, Volume 1, to manage the loss of material due to general, pitting, and crevice corrosion in steel bolting exposed to outdoor air (external). Based on the above, the staff finds that the aging effect of the loss of material in these components will be adequately managed by using the Bolting Integrity Program.

The LRA table referenced Note G for copper alloy >15 percent zinc nozzle exposed to air-indoor (internal) which has no aging effect and lists no AMP. This material/environment is

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similar to other material/environment combinations in the GALL Report (e.g., Table VII.J, Line Item J-3) for which there is no AERM or AMP. Therefore, the staff agrees that there is no aging effect and no AMP required for copper alloy >15 percent zinc nozzle exposed to air-indoor (internal). The staff finds the applicant's AMR results acceptable.

The LRA table referenced Note G for carbon steel tank exposed to concrete (external) with the aging effect of loss of material which is managed by the Aboveground Steel Tank Program. SER Section 3.0.3.2.1 documents the staff's evaluation of the Aboveground Steel Tanks Program. Steel components exposed to concrete are addressed in the GALL Report with no aging effect identified; therefore, the LRA is conservative in assuming an aging effect of loss of material. The staff finds that use of the Aboveground Steel Tanks Program to manage the loss of material for the carbon steel tank exposed to concrete is acceptable because periodic tank inspections are conducted to monitor for loss of material, and thickness measurements of locations that are inaccessible for external visual inspection, such as tank bottom surfaces are performed. Such inspections will ensure that loss of material does not occur.

The LRA table referenced Note H carbon steel expansion joints, carbon steel piping, and carbon steel silencer exposed to exhaust gas (internal) with the aging effect of cracking-fatigue which is managed by the Fire Protection Program. The GALL Report identifies an aging effect for this material/environment combination of loss of material which is addressed by another line item in Table 3.3.2-11-IP2. The aging effect identified in the LRA is in addition to that prescribed by the GALL Report. The staff's review of the Fire Protection Program is documented in SER Section 3.0.3.2.7. The diesel-driven fire pump inspection requires periodic testing and inspection of the pump and its driver so diesel engine subsystems can perform their intended functions. Because periodic testing and inspections will be conducted to manage the effects of aging, the staff finds the applicant's AMR results acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.9 Fire Protection - Carbon Dioxide, Halon, and RCP Oil Collection Systems—Summary of Aging Management Review—LRA Table 3.3.2-12-IP2

The staff reviewed LRA Table 3.3.2-12-IP2, which summarizes the results of AMR evaluations for the fire protection - carbon dioxide, halon, and RCP oil collection systems component groups.

The LRA table referenced Note G for copper alloy flame arrestor and nozzle internally exposed to air-indoor, with no aging effect and no AMP given. The staff finds the applicant's results acceptable because other sections of the GALL Report give the same aging effect and AMP for a similar material/environment combination (e.g., GALL Report Table VII.J, Line Item VII.J-3).

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

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3.3A.2.3.10 Fuel Oil System—Summary of Aging Management Review—LRA Table 3.3.2-13-IP2

The staff reviewed LRA Table 3.3.2-13-IP2, which summarizes the results of AMR evaluations for the fuel oil system component groups.

The LRA table referenced Note G for carbon steel tanks exposed to concrete (external) with an aging effect of loss of material which is managed by the Aboveground Steel Tanks Program. SER Section 3.0.3.2.1 documents the staff's evaluation of the Aboveground Steel Tanks Program. Steel components exposed to concrete are addressed in the GALL Report with no aging effect identified; therefore, the applicant is conservative in assuming an aging effect of loss of material. The staff finds that use of the Aboveground Steel Tanks Program to manage the loss of material for the carbon steel tank exposed to concrete is acceptable because periodic tank inspections are conducted to monitor for loss of material, and thickness measurements of locations that are inaccessible for external visual inspection, such as tank bottom surfaces are performed. Such inspections will ensure that loss of material does not occur.

The LRA table referenced Note G for carbon steel heat exchanger tubes exposed to air-indoor (external) with an aging effect of fouling which is managed by the Periodic Surveillance and Preventive Maintenance Program. The GALL Report prescribes an aging effect of loss of material for this material/environment combination which is addressed by another line item in Table 3.3.2-13-IP2. The aging effect of fouling is in addition to that prescribed by the GALL Report. The staff's evaluation of the Periodic Surveillance and Preventive Maintenance is documented in SER Section 3.0.3.3.7. The program will use visual or other NDE techniques to inspect the fuel oil cooler for the SBO/Appendix R diesel generator to manage fouling. Based on the above, the staff finds that because the aging effect fouling will be adequately managed by using the Periodic Surveillance and Preventive Maintenance Program, the applicant's AMR result is acceptable.

The LRA table referenced Note G for carbon steel heat exchanger tubes exposed to fuel oil (internal) with an aging effect of fouling managed by the Diesel Fuel Monitoring Program. The GALL Report prescribes an aging effect of loss of material for this material/environment combination which is addressed by another line item in Table 3.3.2-13-IP2. The aging effect of fouling is in addition to that prescribed by the GALL Report. The Diesel Fuel Monitoring Program is an existing program that entails sampling to ensure that adequate diesel fuel quality is maintained to prevent loss of material and fouling in fuel systems. The One-Time Inspection Program describes inspections planned to verify the effectiveness of the Diesel Fuel Monitoring Program. Based on the above, the staff finds that because the aging effect fouling will be adequately managed by using the Diesel Fuel Monitoring Program, the applicant's AMR result is acceptable.

The LRA table referenced Note G for stainless steel tanks exposed to outdoor air (external) with an aging effect of loss of material managed by the Periodic Surveillance and Preventive Maintenance Program. The GALL Report states that stainless steel components are subject to loss of material and SCC, which would not be induced in an air environment; therefore, the aging effect addressed in the LRA is consistent with the GALL Report. The AMP will use visual or other NDE techniques to inspect internal and external surfaces of the emergency fuel oil trailer transfer tank and associated valves for loss of material. Based on the above, the staff

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finds that because the aging effect loss of material will be adequately managed by using the Periodic Surveillance and Preventive Maintenance Program, the applicant's AMR result is acceptable.

The LRA table referenced Note G for stainless steel valve bodies exposed to outdoor air (external) with an aging effect of loss of material managed by the External Surface Monitoring Program and the Periodic Surveillance and Preventive Maintenance Program. The GALL Report states that stainless steel components are subject to loss of material and SCC, which would not be induced in an air environment; therefore, the aging effect addressed in the LRA is consistent with the GALL Report. The Periodic Surveillance and Preventive Maintenance Program will use visual or other NDE techniques to inspect internal and external surfaces of the emergency fuel oil trailer transfer tank and associated valves for loss of material. On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect for these component/environment combinations will be effectively managed by the External Surface Monitoring Program and the Periodic Surveillance and Preventive Maintenance Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.11 Emergency Diesel Generator System—Summary of Aging Management Review—LRA Table 3.3.2-14-IP2

The staff reviewed LRA Table 3.3.2-14-IP2, which summarizes the results of AMR evaluations for the emergency diesel generator system component groups.

The LRA table referenced Note F for titanium material used in heat exchanger tubes. Titanium heat exchanger tubes exposed to lube oil (external) have the aging effect of fouling and loss of material which will be managed by the Oil Analysis Program. The Oil Analysis Program is discussed in SER Section 3.0.3.2.12. Titanium components are not addressed in the GALL Report. However, titanium is a corrosion resistant material; therefore, the applicant is conservative in addressing the aging effects of concern for titanium in the Emergency Diesel Generator System. The Oil Analysis Program is an existing program that maintains oil systems free of contaminants (primarily water and particulates) thereby preserving an environment that is not conducive to loss of material, cracking, or fouling. Activities include sampling and analysis of lubricating oil for detrimental contaminants, water, and particulates. The One-Time Inspection Program will be used to verify the effectiveness of the Oil Analysis program. Based on the above, the staff finds that the aging effects of fouling and loss of material will be adequately managed by using the Oil Analysis Program.

The LRA table referenced Note F for titanium heat exchanger tubes exposed to raw water (internal) having aging effects of fouling and loss of material which will be managed using the Service Water Integrity Program. The staff's review of the Service Water Integrity Program is documented in SER Section 3.0.3.1.14. The program includes component inspections for erosion, corrosion, and biofouling to verify the heat transfer capability of safety related heat exchangers cooled by service water. Chemical treatment using biocides and sodium

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hypochlorite and periodic cleaning and flushing of infrequently used loops are methods used to control fouling within the heat exchangers and to manage loss of material in service water components. Based on the above, the staff finds that the aging effect of fouling will be adequately managed by using the Service Water Integrity Program. The staff notes that in LRA Table 3.3.2-2-IP2, the applicant uses Note F for the same material/environment combination but cites cracking as an additional aging effect. The staff determined that this appeared to be a discrepancy. This was identified as part of Open Item 3.3-1.

By letter dated January 27, 2009, the applicant stated that the reason for the difference in aging effects is because the titanium tubes in LRA Table 3.3.2-14-IP2 for the emergency diesel generator are ASTM SB-338 Grade 2 titanium. The applicant further explained that as specified in the EPRI Mechanical Tools, and the Metals Handbook, Ninth Edition, Volume 13, grades 1, 2, 7, 11, and 12 of titanium and its alloys are virtually immune to SCC except in a few specific environments (such as anhydrous methanol/halide solutions, red fuming nitric acid (HNO3), and liquid cadmium). The applicant determined that since these tubes are exposed to raw water, cracking was not identified as an aging effect requiring management in LRA Table 3.3.2-14-IP2 (diesel generator system). However, because the applicant did not identify the grade of titanium installed in the service water system, it conservatively identified cracking as an aging effect requiring management in LRA Table 3.3.2-2-IP2 (service water system). Because the applicant did identify the grade of titanium in the diesel generator system, and that grade is not susceptible to cracking when exposed to an internal environment of raw water, the staff finds the applicant's AMR results to be acceptable. Therefore, Open Item 3.3-1 is closed.

The LRA table referenced Note F for titanium heat exchanger tubes exposed to treated water (external) have the aging effect of fouling and loss of material which will be managed by the Water Chemistry Control – Closed Cooling Water Program. The staff's review of the Water Chemistry Control – Closed Cooling Water Program is documented in SER Section 3.0.3.2.16. The Water Chemistry Control – Closed Cooling Water Program is an existing program that includes preventive measures that manage loss of material, cracking, or fouling for components in closed cooling water systems including emergency diesel generator cooling. The One-Time Inspection Program for Water Chemistry utilizes inspections or non-destructive evaluations of representative samples to verify that the Water Chemistry Control – Closed Cooling Water Program has been effective at managing aging effects. Based on the above, the staff finds that the aging effects of fouling and loss of material will be adequately managed by using the Water Chemistry Control – Closed Cooling Water Program.

The LRA table reference Note F for titanium heat exchanger tubes exposed to treated water (external) are also subject to the aging effect of loss of material – wear which will be managed by the Service Water Integrity Program. The staff's evaluation of this program is documented in SER Section 3.0.3.1.14. The program includes component inspections for erosion, corrosion, and biofouling to verify the heat transfer capability of safety-related heat exchangers cooled by service water. Chemical treatment using biocides and sodium hypochlorite and periodic cleaning and flushing of infrequently used loops are methods used to control fouling within the heat exchangers and to manage loss of material in service water components. Based on the above, the staff finds that the aging effect of loss of material-wear will be adequately managed by using the Service Water Integrity Program.

The LRA table referenced Note G for stainless steel duct exposed to air-indoor (internal) having no aging effect and no aging management program required. This material/environment is

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similar to other material/environment combinations in the GALL Report (e.g., Table VII.J, Line Item J-15) for which there is no AERM or AMP. Therefore, the staff agrees that there is no aging effect and no AMP required for stainless steel duct exposed to air-indoor (internal). The staff finds the applicant's AMR results acceptable.

The LRA table referenced Note G for copper alloy >15 percent zinc heat exchanger tubes exposed to air-indoor (external) with an aging effect of fouling, and valve bodies exposed to treated water (internal) with an aging effect of loss of material, which are managed by the Periodic Surveillance and Preventive Maintenance Program. The staff's evaluation of this program is documented in SER Section 3.0.3.3.7. The Periodic Surveillance and Preventive Maintenance Program will use visual or other NDE techniques to inspect a representative sample of EDG air intake and aftercooler components to manage fouling and loss of material, and EDG cooling water makeup supply valves to manage loss of material. Based on the above, the staff finds that the aging effect of fouling will be adequately managed by using the Periodic Surveillance and Preventive Maintenance Program.

The LRA table also referenced Note G and plant-specific Note 305 for copper alloy >15 percent zinc valve body internally exposed to treated water with an aging effect of loss of material. Note 305 states that "[t]his treated water environment includes water that has been treated but is not maintained by a chemistry control program, such as water from the city water system. There is no environment in the GALL Report that will support a useful comparison for this line." The applicant proposes to use the Periodic Surveillance and Preventive Maintenance Program to manage loss of material for copper alloy in this treated water environment. SER Section 3.0.3.3.7 documents the staff's evaluation of this program. For the city water system, as described in the Periodic Surveillance and Preventive Maintenance Program, the applicant will use visual or other NDE techniques to inspect a representative sample of the internals of city water system components exposed to treated water to manage the aging effect. The staff finds that that visual or NDE techniques are adequate for detecting loss of material in piping systems exposed to treated water. According to the GALL Report (Table IX.C), "[c]opper-zinc alloys >15% zinc are susceptible to stress corrosion cracking, selective leaching (except for inhibited brass), and pitting and crevice corrosion." However, as explained in the Metals Handbook Desk Edition, copyright 1985, by the American Society for Metals, SCC most commonly occurs in brass that is exposed to ammonia or amines. In order for SCC to occur, both tensile stress and a specific chemical species have to be present at the same time. Removal of either the stress or the chemical can prevent cracking. Since ammonia is not added to the city water system, the staff finds that SCC is not an aging effect likely to occur in the city water system. Based on the above, the staff finds the applicant's AMR results acceptable.

The LRA table referenced Note H for stainless steel expansion joint and valve body, and carbon steel silencer and piping, all exposed to an internal environment of exhaust gas, with an aging effect of "cracking-fatigue," and the AMP as "TLAA – metal fatigue." Note H indicates that the aging effect is not identified in the GALL Report for the component/material/environment combination. The staff's evaluation of the metal fatigue TLAAs is documented in SER Section 4.3.2. During an audit, the staff questioned the applicant about these AMR results, to gain a better understanding of the conditions and how cracking would be managed (Audit Item 232). In its response, dated December 18, 2007, the applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential

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consequences. On this basis, the staff finds the applicant's AMR results to be acceptable for these combinations.

The LRA table referenced Note H for stainless steel piping, strainer, thermowell, tubing, and valve body exposed to an internal or external environment of lube oil with an aging effect of cracking, and the Oil Analysis Program as the AMP. The staff's evaluation of the Oil Analysis Program is documented in SER Section 3.0.3.2.12. The staff determined that the aging effect of cracking is an appropriate aging effect to manage for the above combination because contaminants in the oil such as water and chlorides can cause cracking of stainless steel. The Oil Analysis Program maintains oil systems free of contaminants (primarily water and particulates) to preserve an environment that is not conducive to loss of material, cracking, or fouling. Because the AMP manages cracking, the staff finds that the aging effect of cracking will be adequately managed during the period of extended operation.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.12 Security Generator System—Summary of Aging Management Review—LRA Table 3.3.2-15-IP2

The staff reviewed LRA Table 3.3.2-15-IP2, which summarizes the results of AMR evaluations for the security generator system component groups.

The LRA table referenced Note G for copper alloy >15 percent zinc heat exchanger tubes exposed to air-indoor (external) with an aging effect of fouling which can lead to a loss of material. The applicant proposed to manage this material/environment/aging effect combination with the Periodic Surveillance and Preventive Maintenance Program. The staff's evaluation of this program is documented in SER Section 3.0.3.3.7. This program will use visual or other NDE techniques to inspect the surface condition of the radiator tubes and fins to manage loss of material on external surfaces. On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect for these component/environment combinations will be effectively managed by the Periodic Surveillance and Preventive Maintenance Program.

The LRA table referenced Note H for aluminum heat exchanger fins exposed to air-indoor (external) with the aging effect fouling which will be managed by the Periodic Surveillance and Preventive Maintenance Program. The staff's evaluation of this program is documented in SER Section 3.0.3.3.7. This program will use visual or other NDE techniques to inspect the surface condition of the radiator tubes and fins to manage loss of material on external surfaces. The GALL Report, Table VII.J, Line Item J-1 addresses aluminum piping components exposed to indoor air with no aging effect identified; therefore, the LRA is conservative relative to the GALL Report. On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect for these component/environment combinations will be effectively managed by the Periodic Surveillance and Preventive Maintenance Program.

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The LRA table referenced Note H for stainless steel flexible bellows and carbon steel piping, silencer, turbocharger housing, and valve body exposed to an internal environment of exhaust gas with an aging effect of "cracking-fatigue," and an AMP of Periodic Surveillance and Preventive Maintenance. Note H indicates that the aging effect is not identified in the GALL Report for the component/material/environment combination. The staff's evaluation of the Periodic Surveillance and Preventive Maintenance is documented in SER Section 3.0.3.3.7. During an audit, the staff questioned the applicant about these AMR results, to gain a better understanding of the conditions and how cracking would be managed (Audit Item 232). In its response, dated December 18, 2007, the applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. On this basis, the staff finds the applicant's AMR results to be acceptable for these combinations.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.13 SBO/Appendix R Diesel Generator System—Summary of Aging Management Review—LRA Table 3.3.2-16-IP2

The staff reviewed LRA Table 3.3.2-16-IP2, which summarizes the results of AMR evaluations for the SBO/Appendix R diesel generator system component groups.

By letter dated April 30, 2008, the applicant amended the LRA to reflect the installation of the IP2 SBO/Appendix R diesel generator. In the amendment, the applicant revised LRA Table 3.3.2-16-IP2 to reflect the changes to the AMRs as a result of the modification. The staff's review of the revised Table 3.3.2-16-IP2 is provided below.

The LRA table referenced Note F for plastic filter housings and piping exposed to air-indoor both internally and externally with no AERM or AMP. Organic materials such as plastic are not subject to aging effects if ambient air is <95 °F as indicated in Table IX.D of the GALL Report. Therefore, the staff finds that applicant's AMR results acceptable for this material/environment combination.

The LRA table referenced Note G and plant-specific Note 305 for carbon steel heat exchanger bonnet and shell, and stainless steel heat exchanger tubes exposed to an internal environment of treated water. The aging effects listed for these material/environment combinations include loss of material, fouling (stainless steel only), and cracking (stainless steel only). Note 305 states "This treated water environment includes water that has been treated but is not maintained by a chemistry control program, such as water from the city water system. There is no environment in the GALL Report that will support a useful comparison for this line." The applicant credits the Periodic Surveillance and Preventive Maintenance Program to manage loss of material, fouling, and cracking for carbon steel and stainless steel in this environment. The staff finds the applicant's AMR results to be appropriate. For the city water system, as described in the Periodic Surveillance and Preventive Maintenance Program, the applicant will

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use visual or other NDE techniques to inspect a representative sample of the internals of city water system components exposed to treated water to manage the aging effect. The staff finds that that visual or NDE techniques are adequate for detecting loss of material, fouling, and cracking in piping systems exposed to treated water.

The LRA table referenced Note G for stainless steel heat exchanger tubes exposed to an external environment of air-indoor with an aging effect of fouling. The applicant proposed to manage this aging effect by the Periodic Surveillance and Preventive Maintenance Program. The staff's review of this program is documented in SER Section 3.0.3.3.7. The GALL Report identifies no aging effect for stainless steel heat exchanger tubes exposed to indoor air (e.g., GALL Report Table V.F, Item V.F-12); therefore, postulation of the aging effect identified in the LRA is conservative. The Periodic Surveillance and Preventive Maintenance Program will use visual or other NDE techniques to inspect the external surface of heat exchanger tubes and fins to manage fouling. On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect for these component/environment combinations will be effectively managed by the Periodic Surveillance and Preventive Maintenance Program.

The LRA referenced Note H for carbon steel heat exchanger fins exposed to an external environment of air-indoor with an aging effect of fouling. The applicant proposed to manage this combination by the Periodic Surveillance and Preventive Maintenance Program, The staff's review of this program is documented in SER Section 3.0.3.3.7. The Periodic Surveillance and Preventive Maintenance Program will use visual or other NDE techniques to inspect the external surface of heat exchanger tubes and fins to manage fouling. On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect for these component/environment combinations will be effectively managed by the Periodic Surveillance and Preventive Maintenance Program.

The LRA table referenced Note H for stainless steel heat exchanger tubes exposed to treated water >140 °F (internal) with an aging effect of loss of material–wear which is managed by the Heat Exchanger Monitoring Program. The staff's review of this program is documented in SER Section 3.0.3.3.3. The GALL Report identifies cracking and SCC as aging effects for stainless steel heat exchanger components exposed to treated water >140 °F (e.g., Table VII.E3, Item VII.E3-2). The Heat Exchanger Monitoring Program inspects heat exchangers for loss of material through visual or other non-destructive examination. Although the applicant does not cite cracking and SCC as the applicable aging effects requiring management, the Heat Exchanger Monitoring Program uses NDE methods, such as eddy current testing (ECT) or ultrasonic testing (UT), to determine loss of material due to wear and to detect cracking. On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect for these component/environment combinations will be effectively managed by the Heat Exchanger Monitoring Program.

The LRA referenced Note H for stainless steel heat exchanger tubes exposed to lube oil (external) with an aging effect of cracking managed by the Oil Analysis Program. The staff's evaluation of this program is documented in SER Section 3.0.3.2.12. The staff determined that the aging effect of cracking is an appropriate aging effect to manage for the above combination because contaminates in the oil such as water and chlorides can cause cracking of stainless steel. The Oil Analysis Program maintains oil systems free of contaminants (primarily water and particulates) to preserve an environment that is not conducive to loss of material, cracking, or

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fouling. Because the AMP manages cracking, the staff finds that the aging effect of cracking will be adequately managed during the period of extended operation.

The LRA table referenced Note H for carbon steel piping and silencer exposed to an internal environment of exhaust gas with an aging effect "cracking-fatigue" and the AMP as "TLAA – metal fatigue." The staff's evaluation of the metal fatigue TLAAs is documented in SER Section 4.3.2. During an audit, the staff questioned the applicant about these AMR results, to gain a better understanding of the conditions and how cracking would be managed (Audit Item 232). In its response, dated December 18, 2007, the applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. On this basis, the staff finds the applicant's AMR results to be acceptable for these combinations.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.14 City Water System—Summary of Aging Management Review—LRA Table 3.3.2-17-IP2

The staff reviewed LRA Table 3.3.2-17-IP2, which summarizes the results of AMR evaluations for the city water system component groups.

The LRA table referenced Note G and plant-specific Note 305 for carbon steel piping, tank, and valve body, gray cast iron piping and valve body, copper alloy tubing, and copper alloy >15 percent zinc valve body exposed to an internal environment of treated water. The aging effect listed for these material/environment combinations is loss of material. Note 305 states "[t]his treated water environment includes water that has been treated but is not maintained by a chemistry control program, such as water from the city water system. There is no environment in the GALL Report that will support a useful comparison for this line." The applicant credits the Periodic Surveillance and Preventive Maintenance Program to manage loss of material for carbon steel, copper alloy, and gray cast iron in this treated water environment. SER Section 3.0.3.3.7 documents the staff's evaluation of this program. For the city water system, as described in the Periodic Surveillance and Preventive Maintenance Program, the applicant will use visual or other NDE techniques to inspect a representative sample of the internals of city water system components exposed to treated water to manage the aging effect. The staff finds that that visual or NDE techniques are adequate for detecting loss of material in piping systems exposed to treated water. According to the GALL Report (Table IX.C), "[c]opper-zinc alloys >15% zinc are susceptible to stress corrosion cracking, selective leaching (except for inhibited brass), and pitting and crevice corrosion." However, as explained in the Metals Handbook Desk Edition, copyright 1985, by the American Society for Metals, SCC most commonly occurs in brass that is exposed to ammonia or amines. In order for SCC to occur, both tensile stress and a specific chemical species have to be present at the same time. Removal of either the stress or the chemical can prevent cracking. Since ammonia is not added to the city water system, the staff finds that SCC is not an aging effect likely to

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occur in the city water system. Based on the above, the staff finds the applicant's AMR results acceptable.

The LRA table referenced Note G for carbon steel tanks exposed to concrete (external) with an aging effect of loss of material to be managed by the Aboveground Steel Tanks Program. According to the GALL Report Table IX.B, steel tanks with bottoms in a soil or concrete environment have general corrosion as the aging effect for the interface between soil or concrete and the bottom of the tank. Degradation of the tank bottoms in these aboveground steel tanks can be managed by the GALL AMP XI.M29 "Aboveground Steel Tanks." Because the applicant proposes to manage loss of material using its Aboveground Steel Tanks Program which is consistent with guidance in the GALL Report, the staff finds the applicant's AMR results to be acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.15 Plant Drains—Summary of Aging Management Review—LRA Table 3.3.2-18-IP2

The staff reviewed LRA Table 3.3.2-18-IP2, which summarizes the results of AMR evaluations for the plant drains component groups.

The LRA referenced Note G for stainless steel bolting and piping exposed to an external environment of outdoor air, with the aging effect of loss of material. The applicant proposed to manage the aging of the bolting and the piping by the Bolting Integrity Program and the External Surfaces Monitoring Program, respectively. The staff's evaluation of these programs is documented in SER Sections 3.0.3.2.2 and 3.0.3.2.5, respectively. The GALL Report states that stainless steel components are subject to loss of material and SCC, which would not be induced by an air environment. The Bolting Integrity Program conducts inspections of bolting in accordance with the ASME Section XI, Tables IWB 2500-1, IWC 2500-1 and IWD 2500-1, using visual techniques to inspect for leakage, loss of material, cracking, and loss of preload/loss of prestress. The External Surfaces Monitoring Program uses periodic plant system inspections and walkdowns to monitor for material degradation and leakage. On the basis of its review, the staff finds that, because these components will be inspected periodically for loss of material, the aging effect for these component/environment combinations will be effectively managed by the respective programs.

In a letter dated June 30, 2009, the applicant added drain piping and float valve to LRA Table 3.3.2-18-IP2. These additional AMR line items reference Note F for plastic piping exposed to indoor air on the internal surface, and exposed to indoor air or soil on the external surface. The aging effect and AMP are listed as "none." No aging effect would be expected because there are no stressors for plastics for the named environments. Typical stressors are exposure to UV radiation, high temperatures, and oxidizing conditions. In addition, the staff notes that plastic piping is used extensively in gas distribution systems and is exposed to soil with no adverse effects caused by the soil, which poses a more aggressive environment than indoor air. The staff has not identified any age-related industry experience for plastic material in

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indoor air and soil environments. Therefore, the staff finds the applicant's AMR results to be appropriate.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.16 Auxiliary Steam System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-1-IP2

The staff reviewed LRA Table 3.3.2-19-1-IP2, which summarizes the results of AMR evaluations for the auxiliary steam system component groups.

The LRA table referenced Note G for flex joint, piping, tubing, valve body/stainless steel/ steam (internal)/cracking–fatigue/TLAA–metal fatigue. The table also referenced Note F for valve body/CASS/steam (internal)/cracking–fatigue/TLAA–metal fatigue. The staff's evaluation of the metal fatigue TLAAs is documented in SER Section 4.3.2. The staff questioned the applicant about these AMR results, to gain a better understanding of the conditions and how cracking would be managed (Audit Item 233). In its response, dated December 18, 2007, the applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences.

The LRA table referenced Note G for copper alloy valve body exposed to an internal environment of steam and an aging effect of loss of material. The applicant proposed to manage loss of material for this material/environment combination using the Water Chemistry Control–Primary and Secondary Program. The staff's evaluation of this program is documented in SER Section 3.0.3.2.17. As stated in GALL Report Table IX.C, copper alloy is resistant to stress corrosion cracking, selective leaching and pitting and crevice corrosion. The Water Chemistry Control - Primary and Secondary Program includes periodic monitoring and control of known detrimental contaminants such as chlorides, fluorides, dissolved oxygen, and sulfate concentrations below the levels known to result in loss of material or cracking. The staff questioned the applicant about whether or not the One-Time Inspection is also credited to verify the effectiveness of the Water Chemistry Control - Primary and Secondary (Audit Item 72). In its response dated December 18, 2007, the applicant confirmed that the One-Time Inspection will be used to verify the effectiveness of the Water Chemistry Programs. On this basis, the staff finds the applicant's AMR results to be acceptable for these combinations.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.3A.2.3.17 Chemical Feed System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-3-IP2

The staff reviewed LRA Table 3.3.2-19-3-IP2, which summarizes the results of AMR evaluations for the chemical feed system component groups.

The LRA table referenced Note G and plant-specific Note 318 for stainless steel components (e.g., piping, pump casing, valve body) exposed to an internal environment of treated water with an aging effect of loss of material. The applicant proposed to manage loss of material for this material/environment combination using the One-Time Inspection Program. Note 318 states "[t]his treated water environment includes chemical solutions used to control primary and secondary system water chemistry or as an additive for containment spray." The above material/environment combination is similar to other combinations in the GALL Report (e.g., Table VIII.B, Line Item B1-4 and Table VIII.G Line Item G-32) which recommend water chemistry control augmented by a one-time inspection to verify the effectiveness of the water chemistry., Because the water chemistry is controlled by plant procedures and will be verified by the One-Time Inspection Program, the staff finds the applicant's AMR result acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.18 Condensate System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-4-IP2

The staff reviewed LRA Table 3.3.2-19-4-IP2, which summarizes the results of AMR evaluations for the condensate system component groups.

The LRA table referenced Note H for stainless steel components (e.g., expansion joint, piping, valve body) with an internal environment of steam and an aging effect of cracking-fatigue. The applicant credits TLAA-metal fatigue as the means for managing aging. The staff's evaluation of the metal fatigue TLAAs is documented in SER Section 4.3.2. During an audit, the staff questioned the applicant about the TLAA for expansion joints (Audit Item 233). By letter dated December 18, 2007, the applicant revised the AMR table, on the basis that, by design, an expansion joint can accommodate displacement without significant stress. The applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. The staff finds the applicant's AMR results to be acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.3A.2.3.19 City Water System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-7-IP2

The staff reviewed LRA Table 3.3.2-19-7-IP2, which summarizes the results of AMR evaluations for the city water system component groups.

The LRA table referenced Note G and plant-specific Note 305 for carbon steel filter housing, piping, pump casing, strainer housing, and tank; copper alloy piping and tubing; copper alloy >15 percent zinc valve body; and gray cast iron valve body all exposed to an internal environment of treated water. The aging effect listed for these material/environment combinations is loss of material. The applicant credits the Periodic Surveillance and Preventive Maintenance Program to manage loss of material for the above material/environment combinations. As documented in SER Section 3.3A.2.3.14, the staff determined that visual or NDE techniques are adequate for detecting loss of material in the city water system components exposed to treated water.

For stainless steel tubing and CASS valve body exposed to treated water, the applicant proposed the One-Time Inspection Program to managing the loss of material. The staff's evaluation of this program is documented in SER Section 3.0.3.1.9. This program also uses NDE techniques to monitor for loss of material. The staff verified that the One-Time Inspection Program includes monitoring of the internal surfaces of city water system stainless steel and CASS components containing treated water. Based on the above, the staff finds that the applicant's AMR results are acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.20 Emergency Diesel Generator System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-9-IP2

The staff reviewed LRA Table 3.3.2-19-9-IP2, which summarizes the results of AMR evaluations for the emergency diesel generator system component groups.

The LRA table referenced Note G and plant-specific Note 305 for stainless steel piping and valve body exposed to treated water. The applicant proposed the One-Time Inspection Program to managing the loss of material. The staff's evaluation of this program is documented in SER Section 3.0.3.1.9. This program uses NDE techniques to monitor for loss of material. The staff verified that the One-Time Inspection Program includes monitoring of the emergency diesel generator system stainless steel components containing treated water. Based on the above, the staff finds that the applicant's AMR results are acceptable.

The LRA table referenced Note H for stainless steel or carbon steel piping and valve body exposed to an internal environment of condensation with an aging effect of cracking-fatigue, and cites the AMP as TLAA-metal fatigue. The staff's evaluation of the metal fatigue TLAAs is documented in SER Section 4.3.2. The staff questioned the applicant about these AMR results,

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to gain a better understanding of the conditions and how cracking would be managed (Audit Item 233). In its response, dated December 18, 2007, the applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. On this basis, the staff finds the applicant's AMR results to be acceptable for these combinations.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.21 Fresh Water Cooling System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-13-IP2

The staff reviewed LRA Table 3.3.2-19-13-IP2, which summarizes the results of AMR evaluations for the fresh water cooling system component groups.

The LRA table referenced Note G and plant-specific Note 305 for carbon steel compressor housing, heat exchanger shell, piping, pump casing, tank, and valve body; copper alloy valve body; and copper alloy >15 percent zinc valve body all of which are exposed to an internal environment of treated water. The aging effect listed for these material/environment combinations is loss of material. The applicant credits the Periodic Surveillance and Preventive Maintenance Program to manage loss of material for the above material/environment combinations. As noted in earlier sections of this SER, the staff determined that visual or NDE techniques are adequate for detecting loss of material in water system components exposed to treated water.

For stainless steel piping and valve body exposed to treated water, the applicant proposed the One-Time Inspection Program to manage the loss of material. The staff's evaluation of this program is documented in SER Section 3.0.3.1.9. This program also uses NDE techniques to monitor for loss of material. The staff verified that the One-Time Inspection Program includes monitoring of the internal surfaces of fresh water cooling system stainless steel components containing treated water. Based on the above, the staff finds that the applicant's AMR results are acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.3A.2.3.22 House Service Boiler System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-16-IP2

The staff reviewed LRA Table 3.3.2-19-16-IP2, which summarizes the results of AMR evaluations for the house service boiler system component groups.

The LRA table referenced Note G for copper alloy >15 percent zinc valve body exposed to an internal environment of steam with an aging effect of loss of material. The applicant proposed to manage loss of material for this material/environment combination using the Water Chemistry Control – Auxiliary Systems Program. The staff's evaluation of this program is documented in SER Section 3.0.3.3.8. This program manages loss of material in copper alloy components by monitoring the pH and dissolved oxygen content in the treated water. Such monitoring is effective in reducing loss of material. As stated in the LRA, the applicant will use the One-Time Inspection Program for water chemistry which utilizes inspections or NDE of representative samples to verify that the Water Chemistry Control – Auxiliary Systems Program has been effective at managing aging effects. Because the aforementioned AMPs will manage loss of material, the staff finds the applicant's AMR results acceptable.

The LRA table referenced Note G for stainless steel tubing and valve body exposed to an internal environment of steam with an aging effect of cracking–fatigue. The applicant listed TLAA–metal fatigue as the means to manage cracking due to fatigue. The staff's evaluation of the metal fatigue TLAAs is documented in SER Section 4.3.2. During an audit, the staff questioned the applicant about the TLAA for expansion joints (Audit Item 233). In its response, dated December 18, 2007, the applicant provided its explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. On this basis, the staff finds the applicant's AMR results to be acceptable for these combinations.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.23 Heating, Ventilation and Air Conditioning System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-17-IP2

The staff reviewed LRA Table 3.3.2-19-17-IP2, which summarizes the results of AMR evaluations for the HVAC system component groups.

The LRA table referenced Note G for stainless steel valve body exposed to an internal environment of steam with an aging effect of cracking-fatigue. As explained in the above section, the staff concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. On this basis, the staff finds the applicant's AMR results to be acceptable for these combinations.

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On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.24 Instrument Air System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-18-IP2

The staff reviewed LRA Table 3.3.2-19-18-IP2, which summarizes the results of AMR evaluations for the instrument air system component groups.

The LRA table referenced Note G for copper alloy valve body exposed to an internal environment of treated air. The applicant stated that there are no aging effects and no AMP is needed. A similar material/environment/aging effect/AMP combination exists in GALL Report Table VII.J line J-3; therefore, the staff finds the applicant's AMR result acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

3.3A.2.3.25 Main Steam System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-23-IP2

The staff reviewed LRA Table 3.3.2-19-23-IP2, which summarizes the results of AMR evaluations for the main steam system component groups.

The LRA table referenced Note H for stainless steel components (e.g., expansion joint, piping, valve body) with an internal environment of steam and an aging effect of cracking-fatigue. The applicant credits TLAA-metal fatigue as the means for managing aging. The staff's evaluation of the metal fatigue TLAAs is documented in SER Section 4.3.2. During an audit, the staff questioned the applicant about the TLAA for expansion joints (Audit Item 233). By letter dated December 18, 2007, the applicant revised the AMR table, on the basis that, by design, an expansion joint can accommodate displacement without significant stress. The applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of an intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. The staff finds the applicant's AMR results to be acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.3A.2.3.26 Miscellaneous System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-24-IP2

The staff reviewed LRA Table 3.3.2-19-24-IP2, which summarizes the results of AMR evaluations for the miscellaneous system component groups.

The LRA table referenced Note G and plant-specific Note 305 for carbon steel piping and valve body exposed to an internal environment of treated water with an aging effect of loss of material. The applicant credits the Periodic Surveillance and Preventive Maintenance Program to manage loss of material for the above material/environment combination. As noted in earlier sections of this SER, the staff determined that visual or NDE techniques are adequate for detecting loss of material in water system components exposed to treated water. Therefore, the staff finds the applicant's AMR result acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.27 Post-Accident Containment Air Sampling System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-26-IP2

The staff reviewed LRA Table 3.3.2-19-26-IP2, which summarizes the results of AMR evaluations for the post-accident containment air vent system component groups.

The LRA referenced Note G for stainless steel gas analyzer, piping, tank, and valve body with an internal environment of air-indoor and no aging effect or AMP cited. A similar material/environment/aging effect/AMP combination exists in GALL Report Table VIII.I Line Item I-10. Because no aging effects are expected for this material/environment combination, the staff finds the applicant's AMR result acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

3.3A.2.3.28 Post-Accident Containment Air Vent System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-27-IP2

The staff reviewed LRA Table 3.3.2-19-27-IP2, which summarizes the results of AMR evaluations for the post-accident containment air vent system component groups.

The LRA table referenced Note G for stainless steel filter housing, piping, and valve body exposed to an internal environment of air-indoor. The aging effect and AMP are listed as "none." The GALL Report contains similar line items for this material/environment combination

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for which the aging effect and AMP are listed as "none" (e.g., Table VII.J, Line Items VII.J-15, VII.J-18, VII.J-20). Therefore, the staff finds the applicant's AMR results acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

3.3A.2.3.29 Primary Sampling System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-28-IP2

The staff reviewed LRA Table 3.3.2-19-28-IP2, which summarizes the results of AMR evaluations for the primary sampling system component groups.

The LRA table referenced Note F for plastic piping and valve body exposed to an internal environment of treated water and an external environment of air-indoor. The aging effect and AMP are listed as "none." No aging effect would be expected because there are no stressors for plastics for the named environments. Typical stressors are exposure to UV radiation, high temperatures, and oxidizing conditions. Therefore, the staff finds the applicant's AMR results to be appropriate.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

3.3A.2.3.30 Reactor Coolant System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-30-IP2

The staff reviewed LRA Table 3.3.2-19-30-IP2, which summarizes the results of AMR evaluations for the reactor coolant system component groups.

The LRA table referenced Note F and plant-specific Note 313 for carbon steel tank exposed to an internal environment of treated borated water. The applicant listed the aging effect as loss of material and proposed to manage this aging effect with the Periodic Surveillance and Preventive Maintenance Program. The staff's review of this program is documented in SER Section 3.0.3.3.7. Note 313 states "[t]he tank is steel with a corrosion-resistant coating on the wetted surfaces (AMERCOAT 55 System)." The use of the Periodic Surveillance and Preventive Maintenance Program for the material/environment combination is appropriate because the tank will be periodically inspected using visual inspection or other NDE methods to detect loss of material. Therefore, the staff finds the applicant's AMR result acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.3A.2.3.31 Boiler Blowdown System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-34-IP2

The staff reviewed LRA Table 3.3.2-19-34-IP2, which summarizes the results of AMR evaluations for the boiler blowdown system component groups.

The LRA table referenced Note I, and plant specific Note 310, which states "[t]hese components remain at high temperature during normal operation which precludes moisture condensation and the resulting corrosion." The components referenced are carbon steel bolting, piping, tanks, and valve bodies exposed to an external environment of indoor air with no aging effect or AMP. A similar material/environment/aging effect/AMP combination exists in GALL Report Table VII.J Line Item J-20. The environment in this GALL Report line item is controlled indoor air which means that the air is controlled for humidity. The applicant stated that the components remain at high temperatures which results in low humidity. Because these two environments are similar, the staff finds the applicant's AMR result acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

3.3A.2.3.32 Secondary Sampling System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-38-IP2

The staff reviewed LRA Table 3.3.2-19-38-IP2, which summarizes the results of AMR evaluations for the secondary sampling system component groups.

The LRA table referenced Note G for stainless steel piping; valve body exposed to an internal environment of steam. The aging effect listed was cracking–fatigue, and the management method was given as TLAA–metal fatigue. The staff's evaluation of the metal fatigue TLAAs is documented in SER Section 4.3.2. The staff questioned the applicant about these AMR results, to gain a better understanding of the conditions and how cracking would be managed (Audit Item 233). In its response, dated December 18, 2007, the applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. On this basis, the staff finds the applicant's AMR results to be acceptable for these combinations.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.3A.2.3.33 Service Water System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-39-IP2

The staff reviewed LRA Table 3.3.2-19-39-IP2, which summarizes the results of AMR evaluations for the service water system component groups.

The LRA table referenced Note F for plastic piping and valve bodies exposed to external condensation and raw water internally. No aging effect or AMP was identified. No aging effect would be expected because there are no stressors for plastics exposed externally to condensation or raw water internally. Typical stressors are exposure to UV radiation, exposure to high temperatures, and exposure to oxidizing conditions. Therefore, the staff finds the applicant's AMR results to be appropriate.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

3.3A.2.3.34 Main Turbine System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-41-IP2

The staff reviewed LRA Table 3.3.2-19-41-IP2, which summarizes the results of AMR evaluations for the water main turbine system component groups.

The LRA referenced Note I, and plant specific Note 310, which states "[t]hese components remain at high temperature during normal operation which precludes moisture condensation and the resulting corrosion." The component referenced is a carbon steel turbine housing externally exposed to indoor air with no aging effect or aging management program. A similar material/environment/aging effect/AMP combination exists in GALL Report Table VII.J line Item J-20. The environment in this GALL Report line item is controlled indoor air which means that the air is controlled for humidity. The applicant stated that the components remain at high temperatures which results in low humidity. Because these two environments are similar, the staff finds the applicant's AMR result acceptable.

3.3A.2.3.35 Water Treatment Plant System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-43-IP2

The staff reviewed LRA Table 3.3.2-19-43-IP2, which summarizes the results of AMR evaluations for the water treatment plant system component groups.

The LRA table referenced Note F for plastic piping exposed to air-indoor externally and treated water internally. No aging effect or AMP is identified. No aging effect would be expected because there are no stressors for plastics exposed externally to air-indoor or treated water internally. Typical stressors are exposure to UV radiation, exposure to high temperatures, and exposure to oxidizing conditions. Therefore, the staff finds the applicant's AMR results to be appropriate.

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The LRA table referenced Note G and plant-specific Note 305, which states "This treated water environment includes water that has been treated but is not maintained by a chemistry control program, such as water from the city water system. There is no environment in the GALL Report that will support a useful comparison for this line." The applicant credits the Periodic Surveillance and Preventive Maintenance AMP to manage loss of material for carbon steel and gray cast iron in this treated water environment. The staff's evaluation of this program is documented in SER Section 3.0.3.3.7. As noted in earlier sections of this SER, the staff determined that visual or NDE techniques are adequate for detecting loss of material in water system components exposed to treated water.

For stainless steel piping and valve body exposed to treated water, the applicant proposed the One-Time Inspection Program to manage the loss of material. The staff's evaluation of this program is documented in SER Section 3.0.3.1.9. This program also uses NDE techniques to monitor for loss of material. The staff verified that the One-Time Inspection Program includes monitoring of the internal surfaces of the water treatment plant system stainless steel components containing treated water. Based on the above, the staff finds that the applicant's AMR results are acceptable.

By letter dated January 4, 2008, the applicant revised its LRA to include an AMR line item for carbon steel tank with an external environment of concrete, an aging effect of "loss of material," and Note G. The applicant credits the Aboveground Steel Tanks Program to manage the loss of material for this carbon steel tank exposed to an external environment of concrete. SER Section 3.0.3.2.1 documents the staff's evaluation of the Aboveground Steel Tanks Program. The staff finds that use of the Aboveground Steel Tanks Program to manage the loss of material for the carbon steel tank exposed to concrete is acceptable because periodic tank inspections are conducted to monitor for loss of material, and thickness measurements of locations that are inaccessible for external visual inspection, such as tank bottom surfaces are performed. Such inspections will ensure that loss of material does not occur.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated, for those components that have associated aging effects, that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3A.2.3.36 Chlorination System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-44-IP2

In response to RAI 2.1-1, part (b), dated February 13, 2008, the applicant revised the LRA to add the chlorination system to the scope of license renewal. In addition, the applicant added LRA Table 3.3.2-19-44-IP2, which summarizes the results of AMR evaluations for the chlorination system component groups. The staff reviewed LRA Table 3.3.2-19-44-IP2.

The LRA table referenced Note G and plant specific Not 305 for carbon steel piping and valve bodies exposed to treated water (internal) with an aging effect of loss of material to be managed by the Periodic Surveillance and Preventive Maintenance Program. SER Section 3.0.3.3.7 documents the staff's evaluation of the Periodic Surveillance and Preventive Maintenance Program. As noted in earlier sections of this SER, the staff determined that visual

or NDE techniques are adequate for detecting loss of material in water system components exposed to treated water. Therefore, the staff finds the applicant's AMR result acceptable.

3.3B.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In LRA Tables 3.3.2-1-IP3 through 3.3.2-18-IP3 and 3.3.2-19-1-IP3 through 3.3.2-19-62-IP3, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.3.2-1-IP3 through 3.3.2-18-IP3 and 3.3.2-19-1-IP3 through 3.3.2-19-62-IP3, the applicant indicated, via notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, Note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

For component type, material, and environment combinations not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is documented in the following sections.

3.3B.2.3.1 Service Water System—Summary of Aging Management Review—LRA Table 3.3.2-2-IP3

The staff reviewed LRA Table 3.3.2-2-IP3, which summarizes the results of AMR evaluations for the service water system component groups.

The LRA referenced Note G for glass indicator exposed to condensation (external) with no aging effect or aging management program. In Table IX.D of the GALL Report, condensation on the surfaces of systems with temperatures below the dew point is considered raw water. A similar line item exists in GALL Report Table VII.J, Line Item J-11 for the material/environment combination of glass/raw water. Because these combinations are similar, and the GALL Report does not identify an aging effect or AMP for the combination, the staff finds the applicant's AMR result acceptable.

The LRA table referenced Note G for nickel alloy valve bodies exposed to condensation (external) with an aging effect of loss of material managed by the External Surfaces Monitoring Program. As documented in SER Section 3.3A.2.3.1, the staff finds that use of the External Surfaces Monitoring Program to conduct periodic plant system inspections and walkdowns for evidence of material loss of the external surfaces of the valve bodies is acceptable.

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The LRA table referenced Note H for heat exchanger (tubes) constructed from copper alloy >15 percent zinc (inhibited) exposed to treated water (external) subject to loss of material-wear which will be managed by the Heat Exchanger Monitoring AMP. The staff reviewed the Heat Exchanger Monitoring Program in SER Section 3.0.3.3.3. The aging effect identified in the GALL Report for this material/environment is loss of material, which is addressed by another line item in LRA Table 3.3.2-2-IP3. The aging effect identified in the LRA is in addition to that prescribed by the GALL Report. The Heat Exchanger Monitoring Program uses visual or other NDE techniques to inspect heat exchangers for loss of material. The staff's review of the referenced AMP has verified that the aging effect identified will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, and is therefore acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.2 Component Cooling Water System—Summary of Aging Management Review—LRA Table 3.3.2-3-IP3

The staff reviewed LRA Table 3.3.2-3-IP3, which summarizes the results of AMR evaluations for the component cooling water system component groups.

Three (3) groups reference Note H for copper alloy >15 percent zinc (inhibited) and stainless steal heat exchanger (tubes) exposed to treated water with the aging effect of loss of material-wear with the aging managed using the Heat Exchanger Monitoring Program and the Service Water Integrity Program. The staff's review of the Heat Exchanger Monitoring Program is documented in SER Section 3.0.3.3.3, and the Service Water Integrity Program is documented in SER Section 3.0.3.1.14. As stated in SER Section 3.3A.2.3.2, the staff finds that because these components will be inspected periodically, the aging effect for these material/environment combinations will be effectively managed by the Heat Exchanger Monitoring Program and the Service Water Integrity Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.3 Chemical and Volume Control System—Summary of Aging Management Review—LRA Table 3.3.2-6-IP3

The staff reviewed LRA Table 3.3.2-6-IP3, which summarizes the results of AMR evaluations for the chemical and volume control system component groups.

The LRA table referenced Note H for heat exchanger (tubes) constructed from copper alloy externally exposed to lube oil and stainless steel externally exposed to treated water, with an aging effect of loss of material–wear managed by the Heat Exchanger Monitoring AMP. The

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aging effect identified in the LRA is in addition to that prescribed by the GALL Report. The staff's evaluation of the Heat Exchanger Monitoring Program is documented in SER Section 3.0.3.3.3. This program uses visual inspections or other NDE techniques of heat exchangers for loss of material. Because the heat exchanger tubes will be periodically inspected for loss of material, the staff finds the applicant's AMR results acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.4 Primary Makeup Water System—Summary of Aging Management Review—LRA Table 3.3.2-7-IP3

The staff reviewed LRA Table 3.3.2-7-IP3, which summarizes the results of AMR evaluations for the primary makeup water system component groups.

The LRA Table referenced Note G for stainless steel bolting externally exposed to outdoor air with the aging effect of loss of material, and the Bolting Integrity Program listed as the AMP. The staff's review of the Bolting Integrity Program is documented in SER Section 3.0.3.2.2. The program periodically inspects closure bolting for signs of leakage that may be due to crack initiation, loss of preload, or loss of material due to corrosion. The program also includes preventive measures to preclude or minimize loss of preload and cracking. The applicant uses plant procedures that address material and lubricant selection, design standards, and good bolting maintenance practices consistent with EPRI guidance. By controlling the material (i.e., the maximum yield strength), the applicant stated that it has not experienced SCC of pressure boundary bolting. On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of material for stainless steel bolting exposed to outdoor will be effectively managed by the Bolting Integrity Program.

The LRA table referenced Note G for stainless steel heat exchanger tubes internally exposed to steam with the aging effects of cracking and loss of material, and the Water Chemistry Control-Primary and Secondary listed as the AMP. The staff's review of the Water Chemistry Control-Primary and Secondary is documented in SER Section 3.0.3.2.17. This program manages aging effects caused by corrosion and cracking mechanisms. The program monitors and controls reactor water chemistry based on EPRI TR-105714, Revision 5, "Pressurized Water Reactor Primary Water Chemistry Guidelines," and TR-102134, Revision 6, "Pressurized Water Reactor Secondary Chemistry Guidelines." On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of material for stainless steel heat exchanger tubes exposed to steam (internal) will be effectively managed by the Water Chemistry Control-Primary and Secondary.

The LRA table also referenced Note G for stainless steel tank and stainless steel valve bodies externally exposed to outdoor air with the aging effect of loss of material managed by the External Surfaces Monitoring Program. As stated in SER Section 3.3A.2.3.4, an environment of uncontrolled air might result in condensation, therefore, loss of material is an appropriate aging effect to consider. The External Surfaces Monitoring Program inspects external surfaces of components subject to aging management review for loss of material. The staff's review of the

referenced AMP is documented in SER Section 3.0.3.2.5, and has verified that loss of material will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation and is therefore acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.5 Heating, Ventilation and Air Conditioning Systems—Summary of Aging Management Review—LRA Table 3.3.2-8-IP3

The staff reviewed LRA Table 3.3.2-8-IP3, which summarizes the results of AMR evaluations for the HVAC systems component groups.

The LRA referenced Note G for aluminum damper and fan housings externally exposed to outdoor air, with an aging effect of loss of material, and the External Surfaces Monitoring Program listed as the AMP. As stated in SER Section 3.3A.2.3.4, an environment of uncontrolled air might result in condensation, therefore, loss of material is an appropriate aging effect to consider. As stated in SER Section 3.3A.2.3.5, because the applicant will perform periodic inspections of the housings to monitor for loss of material, the staff finds the applicant's AMR results acceptable.

The LRA table also referenced Note G for copper alloy tubing, and stainless steel ducts, tubing, and valve bodies internally exposed to air-indoor. The aging effect and AMP listed for these material/environment combinations were listed as "none." As stated in SER Section 3.3A.2.3.5, because these material/environment combinations are similar to combinations in the GALL Report (e.g., Table VII.J, Line Items J-3 and J-18), the staff finds the applicant's AMR results acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.6 Containment Cooling and Filtration System—Summary of Aging Management Review—LRA Table 3.3.2-9-IP3

The staff reviewed LRA Table 3.3.2-9-IP3, which summarizes the results of AMR evaluations for the containment cooling and filtration system component groups.

The LRA table referenced Note G for stainless steel heat exchanger tubes externally exposed to condensation with an aging effect of fouling, and the Service Water Integrity Program listed as the AMP. The staff's review of the Service Water Integrity Program is documented in SER Section 3.0.3.1.14. On the basis of its review, the staff finds that, because the stainless steel heat exchanger tubes exposed to condensation (external) will be inspected periodically, the

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aging effect for this component/environment combination will be effectively managed by the Service Water Integrity Program.

The LRA table referenced Note G for stainless steel moisture separators and copper alloy tubing externally exposed to air-indoor. The aging effect and AMP listed for these material/environment combinations are "none." These material/environment combinations are similar to combinations in the GALL Report (e.g., Table VII.J, Line Items J-3 and J-15), therefore, the staff finds the applicant's AMR results acceptable.

The LRA table also referenced Note H for copper alloy heat exchanger fins exposed to condensation (external) having the aging effect of fouling which is managed by the Service Water Integrity Program, and stainless steel heat exchanger tubes exposed to condensation (external) with the aging effect of loss of material-wear which is managed by the Periodic Surveillance and Preventive Maintenance Program. The staff's evaluation of these programs is documented in SER Sections 3.0.3.1.14 and 3.0.3.3.7, respectively. The staff finds the use of the Service Water Integrity Program to manage the effects of fouling acceptable because the program will use inspections to monitor for fouling and will chemically treat the heat exchanger fins to prevent fouling. As noted in earlier sections of this SER, the staff determined that visual or NDE techniques are adequate for detecting loss of material in water system components exposed to water or like environments (e.g., condensation). Therefore, the staff finds the applicant's AMR results acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.7 Control Room HVAC System—Summary of Aging Management Review—LRA Table 3.3.2-10-IP3

The staff reviewed LRA Table 3.3.2-10-IP3, which summarizes the results of AMR evaluations for the control room HVAC system component groups.

The LRA table referenced Note G for stainless steel bolting exposed to outdoor air (external) having the aging effect of loss of material which is managed by the Bolting Integrity Program and by the External Surfaces Monitoring Program. The staff's review of the Bolting Integrity Program is documented in SER Section 3.0.3.2.2 and the External Surfaces Monitoring Program is documented in Section 3.0.3.2.5. The Bolting Integrity Program is recommended in Table 3, Item 43, of the GALL Report to manage the loss of material due to general, pitting, and crevice corrosion in steel bolting exposed to outdoor air (external). The External Surfaces Monitoring Program inspects the external surfaces of components subject to an aging management review for loss of material. Based on the above, the staff finds that because the aging effect of the loss of material in these components will be adequately managed by using the Bolting Integrity Program, the applicant's AMR results are acceptable.

The LRA table referenced Note G for stainless steel filter housing internally exposed to air-indoor with an aging effect and AMP listed as "none." This material/environment combination is similar to combinations in the GALL Report (e.g., Table VII.J, Line Items J-15 and J-18),

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whereby the aging effect and AMP are given as "none"; therefore, the staff finds the applicant's AMR results acceptable.

The LRA table also referenced Note G for copper alloy heat exchanger tubes exposed to outdoor air (external) having the aging effect of fouling and loss of material which is managed by the Periodic Surveillance and Preventive Maintenance Program. As stated in SER Section 3.3A.2.3.7, use of the Periodic Surveillance and Preventive Maintenance program using visual inspections or other NDEs is adequate to manage loss of material and fouling for the above component/material/environment. Therefore, the staff finds the applicant's AMR results acceptable.

The LRA table referenced Note G for copper alloy piping, tubing and valve bodies exposed to outdoor air (external) with an aging effect of loss of material which is managed by the External Surfaces Monitoring Program. The GALL Report identifies an aging effect of loss of material for copper components exposed to condensation which is a conservative approximation of outdoor air. As noted above, the External Surfaces Monitoring Program uses periodic inspections to monitor for loss of material on external surfaces. Therefore, the staff finds the applicant's AMR results acceptable because the external surfaces will be periodically inspected.

The LRA table referenced Note G for aluminum valve bodies are exposed to treated air (internal) which have no aging effect and no AMP is required This material/environment is similar to other material/environment combinations in the GALL Report (e.g., Table VII.J, Line Item J-1). Therefore, the staff agrees that there is no aging effect and no AMP required for aluminum valve bodies exposed to treated air (internal). The staff finds the applicant's AMR result acceptable.

The LRA table referenced Note G for aluminum heat exchanger fins externally exposed to outdoor air with an aging effect of fouling. The applicant proposed to manage this aging effect for this material/environment combination using the Periodic Surveillance and Preventive Maintenance Program. As stated in SER Section 3.3A.2.3.7, the Periodic Surveillance and Preventive Maintenance Program will visually inspect a representative sample of control room HVAC air cooled condensers and evaporators to manage loss of material and fouling. Based on the above the staff finds that the aging effects will be adequately managed and therefore is acceptable.

The LRA table referenced Note H for aluminum heat exchanger fins exposed to condensation (external) with the aging effect of fouling which is managed by the Periodic Surveillance and Preventive Maintenance Program. As stated above, the staff finds that use of the Periodic Surveillance and Preventive Maintenance program to visually inspect a representative sample of control room HVAC air cooled condensers and evaporators to manage loss of material and fouling is acceptable.

The LRA table referenced Note I and plant-specific Note 306, which states "Changes of material properties and cracking in elastomers are results of exposure to ultra-violet light or elevated temperatures (> 95 °F). The interior surfaces of these components are not exposed to ultra-violet light and are part of the air intake that is not exposed to elevated temperatures." The combination is duct flexible connection/elastomer/air–indoor (internal)/none/none. The staff finds that the applicant's AMR result is appropriate because the elastomer flexible duct connections are not exposed to ultra-violet light or elevated temperatures.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.8 Fire Protection - Water System—Summary of Aging Management Review—LRA Table 3.3.2-11-IP3

The staff reviewed LRA Table 3.3.2-11-IP3, which summarizes the results of AMR evaluations for the fire protection - water system component groups.

The LRA table referenced Note G for stainless steel bolting exposed to outdoor air (external) with the aging effect of loss of material which is managed by the Bolting Integrity Program which is reviewed in SER Section 3.0.3.2.2. The Bolting Integrity Program is recommended in Table 3, Item 43, of the GALL Report to manage the loss of material due to general, pitting, and crevice corrosion in steel bolting exposed to outdoor air (external). Based on the above, the staff finds that the aging effect of the loss of material in these components will be adequately managed by using the Bolting Integrity Program.

The LRA table referenced Note G for copper alloy >15 percent zinc nozzle exposed to air-indoor (internal) which has no aging effect and no aging management program is required. As stated in SER Section 3.3A.2.3.8, this material/environment is similar to other material/environment combinations in the GALL Report (e.g., Table VII.J, Line Item J-3). Therefore, the staff finds the applicant's AMR results acceptable.

The LRA table referenced Note G for carbon steel tank exposed to concrete (external) with the aging effect of loss of material which is managed by the Aboveground Steel Tank Program. SER Section 3.0.3.2.1 documents the staff's evaluation of the Aboveground Steel Tanks Program. Steel components exposed to concrete are addressed in the GALL Report with no aging effect identified; therefore, the LRA is conservative in assuming an aging effect of loss of material. The staff finds that use of the Aboveground Steel Tanks Program to manage the loss of material for the carbon steel tank exposed to concrete is acceptable because periodic tank inspections are conducted to monitor for loss of material, and thickness measurements of locations that are inaccessible for external visual inspection, such as tank bottom surfaces are performed. Such inspections will ensure that loss of material does not occur.

The LRA table referenced Note H carbon steel expansion joints, piping, and silencer exposed to exhaust gas (internal) with the aging effect of cracking-fatigue which is managed by the Fire Protection Program. The GALL Report identifies an aging effect for this material/environment combination of loss of material which is addressed by another line item in Table 3.3.2-11-IP3. The aging effect identified in the LRA is in addition to that prescribed by the GALL Report. The staff's review of the Fire Protection Program is documented in SER Section 3.0.3.2.7. The diesel-driven fire pump inspection requires periodic testing and inspection of the pump and its driver so diesel engine subsystems can perform their intended functions. Because periodic testing and inspections will be conducted to manage the effects of aging, the staff finds the applicant's AMR results acceptable.

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On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.9 Fire Protection - Carbon Dioxide, Halon, and RCP Oil Collection Systems—Summary of Aging Management Review—LRA Table 3.3.2-12-IP3

The staff reviewed LRA Table 3.3.2-12-IP3, which summarizes the results of AMR evaluations for the fire protection - carbon dioxide, halon, and RCP oil collection systems component groups.

The LRA table referenced Note G for copper alloy filter and flame arrestor internally exposed to indoor air, with no aging effect and no AMP given. The staff finds the applicant's results acceptable because other sections of the GALL Report give the same aging effect and AMP for a similar material/environment combination (e.g., GALL Report Table VII.J, Line Item VII.J-3).

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

3.3B.2.3.10 Emergency Diesel Generator System—Summary of Aging Management Review—LRA Table 3.3.2-14-IP3

The staff reviewed LRA Table 3.3.2-14-IP3, which summarizes the results of AMR evaluations for the emergency diesel generator system component groups.

The LRA table referenced Note G for stainless steel duct exposed to air-indoor (internal) having no aging effect and no aging management program required. Based on precedence from prior license renewal reviews, the staff agrees that there is no aging effect and no AMP is required.

The LRA table referenced Note G for copper alloy >15 percent zinc heat exchanger tubes exposed to air-indoor (external) with an aging effect of fouling, and valve bodies exposed to treated water (internal) with an aging effect of loss of material, which are managed by the Periodic Surveillance and Preventive Maintenance Program. The staff's evaluation of this program is documented in SER Section 3.0.3.3.7. As documented in SER Section 3.3A.2.3.11, the staff finds that because the aging effect of fouling will be adequately managed by using the Periodic Surveillance and Preventive Maintenance Program, the applicant's AMR results are acceptable.

The LRA table also referenced Note G and plant-specific Note 305 for copper alloy >15 percent zinc valve body internally exposed to treated water with an aging effect of loss of material. Note 305 states that "[t]his treated water environment includes water that has been treated but is not maintained by a chemistry control program, such as water from the city water system. There is no environment in the GALL Report that will support a useful comparison for this line." The applicant proposes to use the Periodic Surveillance and Preventive Maintenance Program to manage loss of material for copper alloy in this treated water environment. SER Section 3.0.3.3.7 documents the staff's evaluation of this program. The staff's evaluation of this

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material/environment/aging effect/AMP combination is documented in SER Section 3.3A.2.3.11. Based on the above, the staff finds the applicant's AMR results acceptable.

The LRA table referenced Note H for stainless steel expansion joint and carbon steel silencer and piping, all exposed to an internal environment of exhaust gas, with an aging effect of "cracking-fatigue," and the AMP as "TLAA – metal fatigue." Note H indicates that the aging effect is not identified in the GALL Report for the component/material/environment combination. The staff's evaluation of the metal fatigue TLAAs is documented in SER Section 4.3.2. During an audit, the staff questioned the applicant about these AMR results, to gain a better understanding of the conditions and how cracking would be managed (Audit Item 232). In its response, dated December 18, 2007, the applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. On this basis, the staff finds the applicant's AMR results to be acceptable for these combinations.

The LRA table referenced Note H for stainless steel piping, strainer, thermowell, tubing, and valve body exposed to an internal or external environment of lube oil with an aging effect of cracking, and the Oil Analysis Program as the AMP. The staff's evaluation of the Oil Analysis Program is documented in SER Section 3.0.3.2.12. The staff determined that the aging effect of cracking is an appropriate aging effect to manage for the above combination because contaminants in the oil such as water and chlorides can cause cracking of stainless steel. The Oil Analysis Program maintains oil systems free of contaminants (primarily water and particulates) to preserve an environment that is not conducive to loss of material, cracking, or fouling. Because the AMP manages cracking, the staff finds that the aging effect of cracking will be adequately managed during the period of extended operation.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.11 Security Generator System—Summary of Aging Management Review—LRA Table 3.3.2-15-IP3

The staff reviewed LRA Table 3.3.2-15-IP3, which summarizes the results of AMR evaluations for the security generator system component groups.

The LRA table referenced Note H for aluminum heat exchanger fins exposed to air-indoor (external) with the aging effect fouling which will be managed by the Periodic Surveillance and Preventive Maintenance Program. The staff's evaluation of this program is documented in SER Section 3.0.3.3.7. This program will use visual or other NDE techniques to inspect the surface condition of the radiator tubes and fins to manage loss of material on external surfaces. The staff's evaluation of this material/environment/aging effect/AMP combination is documented in SER Section 3.3A.2.3.12. Therefore, the staff finds the applicant's AMR results acceptable.

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The LRA table, as amended by letter dated June 30, 2009, referenced Note H for carbon steel piping, silencer, and valve body, and stainless steel flexible bellows exposed to an internal environment of exhaust gas with an aging effect of "cracking-fatigue," and an AMP of Periodic Surveillance and Preventive Maintenance. Note H indicates that the aging effect is not identified in the GALL Report for the component/material/environment combination. The staff's evaluation of the Periodic Surveillance and Preventive Maintenance is documented in SER Section 3.0.3.3.7. The staff's evaluation of this material/environment/aging effect/AMP combination is documented in SER Section 3.3A.2.3.12. Therefore, the staff finds the applicant's AMR results acceptable.

By letter dated June 30, 2009, the applicant submitted an annual update to the LRA, identifying changes made to the CLB that materially affects the contents of the LRA. The applicant changed the material for the heat exchanger bonnets from copper alloy greater than 15 percent zinc to fiberglass. The applicant referenced Note F for these components exposed externally to indoor air, with the aging effect and aging management program listed as "none." For the fiberglass heat exchanger bonnet exposed to treated water, the applicant listed the aging effect and AMP as "none." The staff notes that fiberglass has excellent resistance to indoor air and is commonly used for insulation (J.F. Malloy, "Thermal Insulation," Van Nostrand Reinhold Company, Copyright 1969). The staff also notes that fiberglass has excellent resistance to water and is commonly used for boat hulls. On the basis that the fiberglass liner is located in the in an environment in which the radioactivity level is negligible, the staff finds that fiberglass will not have any aging effects requiring management in indoor air and treated water.

In the letter dated June 30, 2009, the applicant changed the material for heat exchanger tubes from copper alloy greater than 15 percent zinc to aluminum exposed to internally to treated water and externally to indoor air with an intended function of heat transfer. The applicant listed the aging effect as fouling for exposure to indoor air and proposed the Periodic Surveillance and Preventive Maintenance Program to manage this aging effect. The applicant also listed the aging effect of fouling for exposure to treated water and proposed the Water Chemistry Control – Closed Cooling Water Program. For both entries, the applicant listed Note F, which states this material is not in the GALL Report for this component. The staff's evaluation of these AMPs is documented in SER Sections 3.0.3.3.7 and 3.0.3.2.16, respectively. The staff notes that fouling of the exterior of the heat exchanger tubing could occur by the accumulation of dust, and is an effect that can satisfactorily be managed by the PSPM Program, which performs periodic visual inspections during surveillance and maintenance activities for those components within the scope of license renewal. The staff notes that although fouling of aluminum in treated water is not expected, it can effectively be managed using the Water Chemistry Control – Closed Cooling Water program, which includes chemistry activities that monitor and control closed cooling water chemistry using industry guidelines for closed cooling water. Based on its review, the staff determines that due to activities performed as part of PSPM Program and the Water Chemistry Control – Closed Cooling Water Program, the aging effect of fouling will be adequately managed for aluminum exposed to indoor air and closed cycle cooling water. Therefore, the staff finds the applicant's AMR results acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.3B.2.3.12 Appendix R Diesel Generator System—Summary of Aging Management Review—LRA Table 3.3.2-16-IP3

The staff reviewed LRA Table 3.3.2-16-IP3, which summarizes the results of AMR evaluations for the Appendix R diesel generator system component groups.

The LRA table referenced Note G for aluminum heat exchanger fins externally exposed to outdoor air; copper alloy heat exchanger fins externally exposed to air-indoor; and copper alloy >15 percent zinc and copper alloy >15 percent zinc (inhibited) heat exchanger tubes externally exposed to air-indoor and outdoor air, respectively. The aging effect and AMP listed for the above material/environment combinations is fouling and the Periodic Surveillance and Preventive Maintenance Program. The staff's review of the Periodic Surveillance and Preventive Maintenance Program is documented in SER Section 3.0.3.3.7. This program uses periodic visual inspections or other NDEs to inspect the internal surface condition of the engine turbocharger and aftercooler housing including external surfaces of tubes and fins to manage loss of material and fouling. Because these components will be periodically inspected for loss of material and fouling, the staff finds the applicant's results acceptable.

The LRA table also referenced Note G for copper alloy >15 percent zinc (inhibited) heat exchanger tubes and stainless steel valve bodies externally exposed to outdoor air with an aging effect of loss of material which is to be managed by the External Surfaces Monitoring Program. The staff's review of the program is documented in SER Section 3.0.3.2.5. This program will use periodic plant system inspections and walkdowns to monitor for material degradation and leakage. Because these components will be periodically inspected for loss of material, the staff finds the applicant's results acceptable.

The LRA referenced Note H for stainless steel valve body internally exposed to lube oil with an aging effect of cracking managed by the Oil Analysis Program. The staff's evaluation of this program is documented in SER Section 3.0.3.2.12. As documented in SER Section 3.3A.2.3.13, the staff determined that the aging effect of cracking is an appropriate aging effect to manage for the above combination because contaminates in the oil such as water and chlorides can cause cracking of stainless steel. The Oil Analysis Program maintains oil systems free of contaminants (primarily water and particulates) to preserve an environment that is not conducive to loss of material, cracking, or fouling. Because the AMP manages cracking, the staff finds that the aging effect of cracking will be adequately managed during the period of extended operation.

The LRA table referenced Note H for carbon steel expansion joint, piping, and silencer exposed to an internal environment of exhaust gas with an aging effect "cracking-fatigue" and the AMP as Periodic Surveillance and Preventive Maintenance. During an audit, the staff questioned the applicant about these AMR results, to gain a better understanding of the conditions and how cracking would be managed (Audit Item 232). In its response, dated December 18, 2007, the applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. On this basis, the staff finds the applicant's AMR results to be acceptable for these combinations.

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On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.13 City Water System—Summary of Aging Management Review—LRA Table 3.3.2-17-IP3

The staff reviewed LRA Table 3.3.2-17-IP3, which summarizes the results of AMR evaluations for the city water system component groups.

The LRA table referenced Note G and plant-specific Note 305 for carbon steel piping and valve body, gray cast iron piping, copper alloy tubing, and copper alloy >15 percent zinc valve body exposed to an internal environment of treated water. The aging effect listed for these material/environment combinations is loss of material. Note 305 states "[t]his treated water environment includes water that has been treated but is not maintained by a chemistry control program, such as water from the city water system. There is no environment in the GALL Report that will support a useful comparison for this line." The applicant credits the Periodic Surveillance and Preventive Maintenance Program to manage loss of material for carbon steel, copper alloy, and gray cast iron in this treated water environment. SER Section 3.0.3.3.7 documents the staff's evaluation of this program. The staff's evaluation of the above component/material/environment/aging effect/AMP combination is documented in SER Section 3.3A.2.3.14. As documented in that section, the staff finds the applicant's AMR results acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.14 Plant Drains—Summary of Aging Management Review—LRA Table 3.3.2-18-IP3

The staff reviewed LRA Table 3.3.2-18-IP3, which summarizes the results of AMR evaluations for the plant drains component groups.

The LRA table referenced Note G for stainless steel bolting and piping exposed to an external environment of outdoor air, with the aging effect of loss of material. The applicant proposed to manage the aging of the bolting and the piping by the Bolting Integrity Program and the External Surfaces Monitoring Program, respectively. The staff's evaluation of these programs is documented in SER Sections 3.0.3.2.2 and 3.0.3.2.5, respectively. The staff's evaluation of the above material/environment combinations is documented in SER Section 3.3A.2.3.15. As stated in that section, the staff finds that, because these components will be inspected periodically for loss of material, the aging effect for these component/environment combinations will be effectively managed by the respective programs.

In a letter dated June 30, 2009, the applicant added drain piping and float valve to LRA Table 3.3.2-18-IP3. These additional AMR line items reference Note F for plastic piping

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exposed to indoor air on the internal surface, and exposed to indoor air or soil on the external surface. The aging effect and AMP are listed as "none." No aging effect would be expected because there are no stressors for plastics for the named environments. Typical stressors are exposure to UV radiation, high temperatures, and oxidizing conditions. In addition, the staff notes that plastic piping is used extensively in gas distribution systems and is exposed to soil with no adverse effects caused by the soil, which poses a more aggressive environment than indoor air. The staff has not identified any age-related industry experience for plastic material in indoor air and soil environments. Therefore, the staff finds the applicant's AMR results to be acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.15 Ammonia / Morpholine Addition System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-1-IP3

The staff reviewed LRA Table 3.3.2-19-1-IP3, which summarizes the results of AMR evaluations for the ammonia / morpholine addition system component groups.

The LRA table referenced Note G and plant-specific Note 318 for stainless steel piping and valve bodies exposed to an internal environment of treated water with loss of material as the aging effect. The applicant proposed the One-Time Inspection Program as the AMP. Note 318 states "[t]his treated water environment includes chemical solutions used to control primary and secondary system water chemistry or as an additive for containment spray." The One-Time Inspection Program is credited to confirm the absence of loss of material. The above material/environment combination is similar to other combinations in the GALL Report (e.g., Table VIII.B, Line Item B1-4 and Table VIII.G Line Item G-32) which recommend water chemistry control augmented by a one-time inspection to verify the effectiveness of the water chemistry. Because the water chemistry is controlled by plant procedures and will be verified by the One-Time Inspection Program, the staff finds the applicant's AMR result acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.16 Auxiliary Steam and Condensate Return System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-2-IP3

The staff reviewed LRA Table 3.3.2-19-2-IP3, which summarizes the results of AMR evaluations for the auxiliary steam and condensate return system component groups.

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The LRA table referenced Note G for stainless steel tubing and valve bodies exposed to an internal environment of steam with an aging effect of cracking-fatigue. The applicant referenced this combination as a metal fatigue TLAA. The staff's evaluation of the metal fatigue TLAAs is documented in SER Section 4.3.2. During an audit, the staff questioned the applicant about these AMR results, to gain a better understanding of the conditions and how cracking would be managed (Audit Item 233). In its response, dated December 18, 2007, the applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. Therefore, the staff finds the applicant's AMR results acceptable.

The LRA table referenced Note G for copper alloy >15 percent zinc valve body exposed to an internal environment of steam with an aging effect of loss of material which will be managed by the Water Chemistry Program-Primary and Secondary Program. The staff's evaluation of this program is documented in SER Section 3.0.3.2.17. The program includes periodic monitoring and control of known detrimental contaminants such as chlorides, fluorides, dissolved oxygen, and sulfate concentrations below the levels known to result in loss of material or cracking. Water chemistry control is in accordance with industry guidelines such as EPRI TR-105714 for primary water chemistry, and EPRI TR-102134 for secondary water chemistry. The One-Time Inspection Program for Water Chemistry utilizes inspections or NDEs of representative samples to verify that the Water Chemistry Control – Primary and Secondary Program has been effective at managing aging effects. Because chemistry will be monitored, and the One-Time Inspection Program will verify the effectiveness of the water chemistry control, the staff finds the applicant's AMR results for this material/environment combination acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.17 Boron and Layup Chemical Addition System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-3-IP3

The staff reviewed LRA Table 3.3.2-19-3-IP3, which summarizes the results of AMR evaluations for the boron and layup chemical addition system component groups.

The LRA table referenced Note G and plant-specific Note 318 for stainless steel piping, pump casing, sight glass, tank, tubing, and valve body exposed to an internal environment of treated water. The applicant proposed the One-Time Inspection program to manage the aging effect of loss of material. As stated above in SER Section 3.3B.2.3.15, the One-Time Inspection Program is credited to confirm the absence of loss of material. The above material/environment combination is similar to other combinations in the GALL Report (e.g., Table VIII.B, Line Item B1-4 and Table VIII.G Line Item G-32) which recommend water chemistry control augmented by a one-time inspection to verify the effectiveness of the water chemistry. Because the water chemistry is controlled by plant procedures and will be verified by the One-Time Inspection Program, the staff finds the applicant's AMR result acceptable.

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On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.18 Condenser Air Removal System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-4-IP3

The staff reviewed LRA Table 3.3.2-19-4-IP3, which summarizes the results of AMR evaluations for the condenser air removal system component groups.

The LRA table referenced Note F for CASS valve bodies exposed to an internal environment of steam. The table also referenced Note G for stainless steel piping and valve bodies exposed to the same environment. The aging effect is listed as cracking –fatigue, and the AMP is listed as "TLAA-metal fatigue." The staff's review of the metal fatigue TLAAs is documented in SER Section 4.3.2. During an audit, the staff questioned the applicant about these AMR results, to gain a better understanding of the conditions and how cracking would be managed (Audit Item 233). In its response, dated December 18, 2007, the applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. Therefore, the staff finds the applicant's AMR results acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.19 Chlorination System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-5-IP3

The staff reviewed LRA Table 3.3.2-19-5-IP3, which summarizes the results of AMR evaluations for the chlorination system component groups.

The table referenced Note G and plant-specific Note 305 for gray cast iron piping and valve bodies exposed to an internal environment of treated water with loss of material as the aging effect which will be managed using the Periodic Surveillance and Preventive Maintenance Program. The staff's review of the Periodic Surveillance and Preventive Maintenance Program is documented in SER Section 3.0.3.3.7. Note 305 states "[t]his treated water environment includes water that has been treated but is not maintained by a chemistry control program, such as water from the city water system. There is no environment in the GALL Report that will support a useful comparison for this line." As described in the Periodic Surveillance and Preventive Maintenance Program, the applicant will use visual or other NDE techniques to inspect a representative sample of the gray cast iron piping and valve bodies exposed to treated water to manage the aging effect. The staff finds that visual or NDE techniques are adequate for detecting loss of material in piping systems and valves exposed to treated water.

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The staff finds the applicant's AMR results to be appropriate.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.20 Containment Spray System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-10-IP3

The staff reviewed LRA Table 3.3.2-19-10-IP3, which summarizes the results of AMR evaluations for the containment spray system component groups.

The LRA referenced Note G and plant-specific Note 318 for stainless steel piping and valve bodies internally exposed to treated water with an aging effect of loss of material which will be managed by the Water Chemistry Program – Primary and Secondary. The staff's evaluation of this program is documented in SER Section 3.0.3.2.17. The program includes periodic monitoring and control of known detrimental contaminants such as chlorides, fluorides, dissolved oxygen, and sulfate concentrations below the levels known to result in loss of material or cracking. Water chemistry control is in accordance with industry guidelines such as EPRI TR-105714 for primary water chemistry, and EPRI TR-102134 for secondary water chemistry. During an audit, the staff questioned the applicant about whether or not the One-Time Inspection Program is also credited to verify the effectiveness of the Water Chemistry Control - Primary and Secondary (Audit Item 72). In its response, dated December 18, 2007, the applicant confirmed that the One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Programs, including the Water Chemistry Program – Primary and Secondary. The One-Time Inspection Program for Water Chemistry utilizes inspections or NDEs of representative samples to verify that the Water Chemistry Control – Primary and Secondary Program has been effective at managing aging effects. Because chemistry will be monitored, and the One-Time Inspection Program will verify the effectiveness of the water chemistry control, the staff finds the applicant's AMR results for this material/environment combination acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.21 City Water Makeup System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-13-IP3

The staff reviewed LRA Table 3.3.2-19-13-IP3, which summarizes the results of AMR evaluations for the city water makeup system component groups.

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The LRA table referenced Note G and plant-specific Note 305 for carbon steel piping, pump casing, and strainer housing; copper alloy piping and valve body; copper alloy >15 percent zinc valve body; and gray cast iron valve body all exposed to an internal environment of treated water. The aging effect listed for these material/environment combinations is loss of material. The applicant credits the Periodic Surveillance and Preventive Maintenance Program to manage loss of material for the above material/environment combinations. The staff's evaluation of the AMR results for the city water makeup system nonsafety-related components is documented in SER Section 3.3A.2.3.19. As stated in that section, the staff determined that visual or NDE techniques are adequate for detecting loss of material in the city water system components exposed to treated water.

For stainless steel tubing and CASS valve body exposed to treated water, the applicant proposed the One-Time Inspection Program to manage the loss of material. The staff's evaluation of this program is documented in SER Section 3.0.3.1.9. This program also uses NDE techniques to monitor for loss of material. The staff verified that the One-Time Inspection Program includes monitoring of the internal surfaces of city water system stainless steel and CASS components containing treated water. Based on the above, the staff finds that the applicant's AMR results are acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.22 Emergency Diesel Generator System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-16-IP3

The staff reviewed LRA Table 3.3.2-19-16-IP3, which summarizes the results of AMR evaluations for the emergency diesel generator system component groups.

The LRA table referenced Note H for carbon steel piping exposed internally to condensation with an aging effect of cracking-fatigue which was identified by the applicant as a TLAA. The staff's review of the metal fatigue TLAAs is documented in SER Section 4.3.2. During an audit, the staff questioned the applicant about these AMR results, to gain a better understanding of the conditions and how cracking would be managed (Audit Item 233). In its response, dated December 18, 2007, the applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. Therefore, the staff finds the applicant's AMR results acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

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3.3B.2.3.23 Extraction Steam System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-18-IP3

The staff reviewed LRA Table 3.3.2-19-18-IP3, which summarizes the results of AMR evaluations for the extraction steam system component groups.

The LRA referenced Note H for stainless steel expansion joints, orifices, piping, thermowells, tubing, and valve bodies exposed to an internal environment of steam with an aging effect of cracking-fatigue which is a TLAA. The staff's review of the metal fatigue TLAAs is documented in SER Section 4.3.2. As stated in the above section, the staff questioned the applicant about these AMR results (Audit Item 233). In its response, dated December 18, 2007, the applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. On this basis, the staff finds the applicant's AMR results to be acceptable for these combinations.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

3.3B.2.3.24 Fire Water System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-20-IP3

The staff reviewed LRA Table 3.3.2-19-20-IP3, which summarizes the results of AMR evaluations for the fire water system component groups.

The LRA referenced Note G for carbon steel piping, tank, and valve bodies exposed to fire protection foam (internal) with an aging effect of loss of material managed by the Fire Water System Program. As stated in Table IX.C of the GALL Report, carbon steel is vulnerable to general, pitting, and crevice corrosion which cause a loss of material. The staff's evaluation of the Fire Water System Program is documented in SER Section 3.0.3.2.8. This program is being enhanced to inspect the internal surface of foam-based fire suppression tanks. In addition, the program performs wall thickness evaluations of fire protection piping are performed on system components using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material due to corrosion. Because the Fire Water System Program will monitor for the loss of material, the staff finds that the applicant's AMR results are acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.3B.2.3.25 Main Feedwater Pump and Services, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-23-IP3

The staff reviewed LRA Table 3.3.2-19-23-IP3, which summarizes the results of AMR evaluations for the main feedwater pump and services component groups.

The LRA table referenced Note H for stainless steel expansion joints, piping, and valve bodies internally exposed to steam with an aging effect of cracking-fatigue which was identified by the applicant as a TLAA. The staff's review of the metal fatigue TLAAs is documented in SER Section 4.3.2. As noted previously, the staff questioned the applicant about these AMR results (Audit Item 233). In its response, dated December 18, 2007, the applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. On this basis, the staff finds the applicant's AMR results to be acceptable for these combinations.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

3.3B.2.3.26 Gland Seal Steam System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-24-IP3

The staff reviewed LRA Table 3.3.2-19-24-IP3, which summarizes the results of AMR evaluations for the gland seal steam system component groups.

The LRA referenced Note G for nickel alloy rupture disks exposed to an internal environment of steam with three aging effects: (1) cracking which is managed by the Water Chemistry Control – Primary and Secondary; (2) cracking-fatigue which is a TLAA; and (3) loss of material which is managed by the Water Chemistry Control – Primary and Secondary. The staff's review of the AMP is documented in SER Section 3.0.3.2.17, and the staff's evaluation of the metal fatigue TLAA is documented in SER Section 4.3.2. As stated above and for the reason stated, the staff finds the applicant's AMR result for the aging effect of cracking-fatigue acceptable. The GALL Report has line items for steam generator tubes made of nickel alloy exposed to secondary feedwater/steam with the aging effect of cracking and loss of material and lists the Steam Generator Integrity Program and the Water Chemistry Program to manage these aging effects (GALL Report Table IV.D1, Line Items D1-23, D1-24, and D1-25) and one line item for nickel alloy piping, piping elements, and piping components with the Water Chemistry Program to manage loss of material (Chapter VIII.B1, Line Item B1-1). The Steam Generator Integrity Program is not applicable to rupture disks. The Water Chemistry Control – Primary and Secondary Program includes periodic monitoring and control of known detrimental contaminants such as chlorides, fluorides, dissolved oxygen, and sulfate concentrations below the levels known to result in loss of material or cracking. Water chemistry control is in accordance with industry guidelines such as EPRI TR-105714 for primary water chemistry, and EPRI TR-102134 for secondary water chemistry. Because the water chemistry will be

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periodically monitored, the staff finds that the AMR line items are acceptable for these combinations of material and environment.

The LRA referenced Note H for stainless steel piping, tubing, and valve bodies where the aging effect is cracking-fatigue which was identified by the applicant as a TLAA. The staff's review of the metal fatigue TLAAs is documented in SER Section 4.3.2. As stated in the above section for the reasons given, the staff finds the applicant's AMR results to be acceptable for these combinations.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.27 Hydrazine Addition System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-26-IP3

The staff reviewed LRA Table 3.3.2-19-26-IP3, which summarizes the results of AMR evaluations for the hydrazine addition system component groups.

The LRA referenced Note G and plant-specific Note 318 for stainless steel piping, pump casing, sight glass, tank, and valve body exposed to an internal environment of treated water. The applicant proposed the One-Time Inspection program to manage the aging effect of loss of material. The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.9. As stated above in SER Section 3.3B.2.3.15, the One-Time Inspection Program is credited to confirm the absence of loss of material. The above material/environment combination is similar to other combinations in the GALL Report (e.g., Table VIII.B, Line Item B1-4 and Table VIII.G Line Item G-32) which recommend water chemistry control augmented by a one-time inspection to verify the effectiveness of the water chemistry. Because the water chemistry is controlled by plant procedures and will be verified by the One-Time Inspection Program, the staff finds the applicant's AMR result acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.28 Heater Drain / Moisture Separator Drains / Vents System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review— LRA Table 3.3.2-19-27-IP3

The staff reviewed LRA Table 3.3.2-19-27-IP3, which summarizes the results of AMR evaluations for the heater drain / moisture separator drains / vents system component groups.

The LRA referenced Note G for sight glass internally exposed to steam with the aging effect and AMP listed as "none." Although the GALL Report does not contain an entry for glass

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exposed to steam, it does contain entries for other environments for glass. In all cases, the aging effect and AMP are listed as "none." Glass does not experience degradation absent a hydrofluoric acid environment. Because hydrofluoric acid is not used in the systems containing these components, the staff finds the applicant's AMR results for glass exposed to steam acceptable.

The LRA referenced Note H for stainless steel expansion joints, orifices, piping, tubing and valve bodies internally exposed to steam (internal) with an aging effect of cracking-fatigue which was identified by the applicant as a TLAA. The staff's review of the metal fatigue TLAAs is documented in SER Section 4.3.2. The staff questioned the applicant about these AMR results, to gain a better understanding of the conditions and how cracking would be managed (Audit Item 233). In its response, dated December 18, 2007, the applicant provided additional explanation of the conditions potentially leading to cracking and the consequences of a crack on performance of intended function. The staff reviewed this information and concluded that the applicant has been conservative in postulating potential cracking and in assessing the potential consequences. On this basis, the staff finds the applicant's AMR results to be acceptable for these combinations.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.29 High Pressure Steam Dump System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-28-IP3

The staff reviewed LRA Table 3.3.2-19-28-IP3, which summarizes the results of AMR evaluations for the high pressure steam dump system component groups.

The LRA referenced Note H for stainless steel tubing exposed to an internal environment of steam with an aging effect cracking-fatigue which was identified by the applicant as a TLAA. The staff's review of the metal fatigue TLAAs is documented in SER Section 4.3.2. The staff's evaluation of this AMR result for the material/environment combination is documented in SER Section 3.3B.2.3.28.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.30 Low Pressure Steam Dump System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-32-IP3

The staff reviewed LRA Table 3.3.2-19-32-IP3, which summarizes the results of AMR evaluations for the low pressure steam dump system component groups.

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The LRA referenced Note H for stainless steel tubing where the aging effect is cracking-fatigue which was identified by the applicant as a TLAA. The staff's review of the metal fatigue TLAAs is documented in SER Section 4.3.2. The staff's evaluation of this AMR result for the material/environment combination is documented in SER Section 3.3B.2.3.28.

The LRA referenced Note I and plant specific Note 310 for carbon steel bolting, piping, steam trap, strainer housing, and valve bodies externally exposed to air-indoor with no aging effect or aging management program. Note 310 states "[t]hese components remain at high temperature during normal operation which precludes moisture condensation and the resulting corrosion." The components referenced are carbon steel bolting, piping, steam trap, strainer housing, and valve bodies exposed to an external environment of indoor air with no aging effect or AMP. A similar material/environment/aging effect/AMP combination exists in GALL Report Table VII.J Line Item J-20. The environment in this GALL Report line item is controlled indoor air which means that the air is controlled for humidity. The applicant stated that the components remain at high temperatures which results in low humidity. Because these two environments are similar, the staff finds the applicant's AMR result acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.31 Liquid Waste Disposal System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-33-IP3

The staff reviewed LRA Table 3.3.2-19-33-IP3, which summarizes the results of AMR evaluations for the liquid waste disposal system component groups.

The LRA referenced Note G and plant-specific Note 305 for carbon and stainless steel piping and valve bodies exposed to an internal environment of treated water with an aging effect of loss of material. Note 305 states, "[t]his treated water environment includes water that has been treated but is not maintained by a chemistry control program, such as water from the city water system. There is no environment in the GALL Report that will support a useful comparison for this line." The applicant proposed to use the Periodic Surveillance and Preventive Maintenance AMP to manage loss of material for carbon steel components in this treated water environment, and One-Time Inspection to confirm no loss of material for the stainless steel components. The staff's review of the Periodic Surveillance and Preventive Maintenance Program is documented in SER Section 3.0.3.3.7. As described in the Periodic Surveillance and Preventive Maintenance Program, the applicant will use visual or other NDE techniques to inspect a representative sample of the carbon steel piping and valve bodies exposed to treated water to manage the aging effect. The staff finds that visual or NDE techniques are adequate for detecting loss of material in piping systems and valves exposed to treated water. The staff finds the applicant's AMR results to be acceptable.

For stainless steel piping and valve body exposed to treated water, the applicant proposed the One-Time Inspection Program to manage the loss of material. The staff's evaluation of this

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program is documented in SER Section 3.0.3.1.9. This program also uses NDE techniques to monitor for loss of material. The staff verified that the One-Time Inspection Program includes monitoring of the internal surfaces of the water treatment plant system stainless steel components containing treated water. Based on the above, the staff finds that the applicant's AMR results are acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.32 Main Feedwater System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-34-IP3

The staff reviewed LRA Table 3.3.2-19-34-IP3, which summarizes the results of AMR evaluations for the main feedwater system component groups.

The LRA referenced Note I and plant specific Note 310 for carbon steel bolting, flow element, filter housing, heat exchanger shell, piping, thermowell, and valve bodies externally exposed to air-indoor with no aging management effect or aging management program. Note 310 states "[t]hese components remain at high temperature during normal operation which precludes moisture condensation and the resulting corrosion." The components referenced are carbon steel bolting, piping, steam trap, strainer housing, and valve bodies exposed to an external environment of indoor air with no aging effect or AMP. A similar material/environment/aging effect/AMP combination exists in GALL Report Table VII.J Line Item J-20. The environment in this GALL Report line item is controlled indoor air which means that the air is controlled for humidity. The applicant stated that the components remain at high temperatures which results in low humidity. Because these two environments are similar, the staff finds the applicant's AMR result acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.33 Main Steam System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-35-IP3

The staff reviewed LRA Table 3.3.2-19-35-IP3, which summarizes the results of AMR evaluations for the main steam system component groups.

The LRA referenced Note H for stainless steel piping, tubing, and valve body exposed to an internal environment of steam where the aging effect is cracking-fatigue which was identified by the applicant as a TLAA. The staff's review of the metal fatigue TLAAs is documented in SER Section 4.3.2. The staff's evaluation of the AMR result for this material/environment combination is documented in SER Section 3.3B.2.3.28.

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The LRA referenced Note I and plant-specific Note 310 for carbon steel bolting, orifice, piping, silencer, steam trap, strainer housing, thermowell, and valve body externally exposed to air-indoor with no aging management effect or aging management program. The staff's evaluation of this material/environment is documented in SER Section 3.3B.2.3.32.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.34 Main Turbine Generator System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-36-IP3

The staff reviewed LRA Table 3.3.2-19-36-IP3, which summarizes the results of AMR evaluations for the main turbine generator system component groups.

The LRA referenced Note H for stainless steel rupture disc exposed to an internal environment of steam where the aging effect is cracking-fatigue which was identified by the applicant as a TLAA. The staff's review of the metal fatigue TLAAs is documented in SER Section 4.3.2. The staff's evaluation of the AMR result for this material/environment combination is documented in SER Section 3.3B.2.3.28.

The LRA referenced Note I and plant-specific Note 310 for carbon steel bolting, piping, turbine housing, and valve body externally exposed to air-indoor with no aging management effect or aging management program. The staff's evaluation of this material/environment is documented in SER Section 3.3B.2.3.32.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report.

3.3B.2.3.35 Primary Plant Sampling System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-41-IP3

The staff reviewed LRA Table 3.3.2-19-41-IP3, which summarizes the results of AMR evaluations for the primary plant sampling system component groups.

The LRA referenced Note G for stainless steel piping and valve body exposed to an internal steam environment where the aging effect is cracking-fatigue which was identified by the applicant as a TLAA. The staff's review of the metal fatigue TLAAs is documented in SER Section 4.3.2. The staff's evaluation of the AMR result for this material/environment combination is documented in SER Section 3.3B.2.3.28.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL

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Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.36 Pressurizer System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-43-IP3

The staff reviewed LRA Table 3.3.2-19-43-IP3, which summarizes the results of AMR evaluations for the pressurizer system component groups.

The LRA table referenced Note F and plant-specific Note 313 for carbon steel tank exposed to treated water with an aging effect of loss of material. Note 313 states "[t]he tank is steel with a corrosion-resistant coating on the wetted surfaces (AMERCOAT 55 System)." The applicant proposed the Periodic Surveillance and Preventive Maintenance Program to manage loss of material. The staff's review of the Periodic Surveillance and Preventive Maintenance Program is documented in SER Section 3.0.3.3.7. The use of the Periodic Surveillance and Preventive Maintenance Program for the material/environment combination is appropriate because the tank will be periodically inspected using visual inspection or other NDE methods to detect loss of material. Therefore, the staff finds the applicant's AMR result acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.37 Reheat Steam System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-45-IP3

The staff reviewed LRA Table 3.3.2-19-45-IP3, which summarizes the results of AMR evaluations for the reheat steam system component groups.

The LRA referenced Note H for stainless steel tubing exposed to an internal environment of steam where the aging effect is cracking-fatigue which was identified by the applicant as a TLAA. The staff's review of the metal fatigue TLAAs is documented in SER Section 4.3.2. The staff's evaluation of the AMR result for this material/environment combination is documented in SER Section 3.3B.2.3.28.

The LRA referenced Note I and plant-specific Note 310 for carbon steel bolting, flow element, heat exchanger shell, piping, steam trap, strainer housing, thermowell and valve body externally exposed to air-indoor with no aging management effect or aging management program. The staff's evaluation of this material/environment is documented in SER Section 3.3B.2.3.32.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.3B.2.3.38 Steam Generator Sampling System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-52-IP3

The staff reviewed LRA Table 3.3.2-19-52-IP3, which summarizes the results of AMR evaluations for the SG sampling system component groups.

The LRA referenced Note G and plant-specific Note 305 for carbon steel heat exchanger shell exposed to treated water (external) with an aging effect of loss of material. Note 305 states "[t]his treated water environment includes water that has been treated but is not maintained by a chemistry control program, such as water from the city water system. There is no environment in the Gall Report that will support a useful comparison for this line." The applicant proposed to use the Periodic Surveillance and Preventive Maintenance AMP to manage loss of material for carbon steel components in this treated water environment. The staff's review of the Periodic Surveillance and Preventive Maintenance Program is documented in SER Section 3.0.3.3.7. As described in the Periodic Surveillance and Preventive Maintenance Program, the applicant will use visual or other NDE techniques to inspect a representative sample of the carbon steel components exposed to treated water to manage the aging effect. The staff finds that visual or NDE techniques are adequate for detecting loss of material in carbon steel components exposed to treated water. The staff finds the applicant's AMR results to be acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.39 Secondary Plant Sampling System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-55-IP3

The staff reviewed LRA Table 3.3.2-19-55-IP3, which summarizes the results of AMR evaluations for the secondary plant sampling system component groups.

The LRA table referenced Note G and plant-specific Note 305 for carbon steel heat exchanger shell exposed to an external environment of treated water with an aging effect of loss of material to be managed by the Periodic Surveillance and Preventive Maintenance Program. As stated in the previous section of this SER, the staff finds that visual or NDE techniques are adequate for detecting loss of material in carbon steel components exposed to treated water. Therefore, the staff finds the applicant's AMR results to be acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.3B.2.3.40 Vapor Containment Hydrogen Analyzer System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-59-IP3

The staff reviewed LRA Table 3.3.2-19-59-IP3, which summarizes the results of AMR evaluations for the vapor containment hydrogen analyzer system component groups.

The LRA table referenced Note G for stainless steel gas analyzer, piping, tank, and valve body internally exposed to air-indoor with no aging effect requiring management and no AMP required. This material/environment combination is similar to other material/environment combinations in the GALL Report (e.g., Table VII.J, Line Items J-15 and J-18) which list the aging effect and AMP as "none." Therefore, the staff finds the applicant's AMR results acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3B.2.3.41 Building Vent Sampling System, Nonsafety-Related Components Potentially Affecting Safety Functions—Summary of Aging Management Review—LRA Table 3.3.2-19-63-IP3

In response to RAI 2.3A.2.2-1, by letter dated March 12, 2008, the applicant revised the LRA to add the building vent sampling system to the scope of license renewal. In addition, the applicant added LRA Table 3.3.2-19-63-IP3, which summarizes the results of AMR evaluations for the building vent sampling system component groups. The staff reviewed LRA Table 3.3.2-19-63-IP3.

The LRA referenced Note G for stainless steel filter housing, tubing, and valve bodies exposed to air-indoor (internal) with no aging effects or AMPs. This material/environment combination is similar to other material/environment combinations in the GALL Report (e.g., Table VII.J, Line Items J-15 and J-18) which list the aging effect and AMP as "none." Therefore, the staff finds the applicant's AMR results acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the auxiliary systems components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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3.4 Aging Management of Steam and Power Conversion Systems

This section of the SER documents the staff's review of the applicant's AMR results for the following steam and power conversion system components and component groups:

- main steam
- main feedwater
- auxiliary feedwater (AFW)
- steam generator (SG) blowdown
- IP2 AFW pump room fire event
- condensate

3.4.1 Summary of Technical Information in the Application

LRA Section 3.4 provides AMR results for the steam and power conversion system components and component groups. LRA Table 3.4.1, "Summary of Aging Management Programs for the Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the steam and power conversion system components and component groups.

The applicant's AMRs evaluated and incorporated applicable plant-specific and industry operating experience in the determination of AERMs. The plant-specific evaluation included condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and issues identified through operating experience since the issuance of this report.

IP2 AFW Pump Room Fire Event

As stated in the LRA, the IP2 UFSAR Section 9.6.2 describes the fire protection system requirements and regulations. A combination of secondary systems and components provide a method of feeding the steam generators should a fire in the AFW pump room make it temporarily unavailable for operator actions. These plant systems and components provide feedwater flow through the main feedwater isolation valves to the steam generators from the IP1 condensate storage tanks (CST). The flowpath is from the Unit 1 CSTs through the hotwell dump and condensate transfer pump, through the condensate pumps and boiler feed pumps to the main feedwater isolation valves to the steam generators.

The applicant stated that aging management of the systems required to supply feedwater to the SGs during a fire in the AFW pump room is not based on an analysis of materials, environments, and aging effects. The components in the systems required to supply feedwater to the SGs during the short duration of the fire event are in service at the time the event occurs or their availability is checked daily. Therefore, normal plant operation continuously confirms the integrity of the systems and components required to perform their intended functions for at least 1 hour after a fire. During the event, these systems and components must continue to perform their intended functions to supply feedwater to the SGs for a minimum of 1 hour. Significant degradation that could threaten the performance of the intended functions will be apparent in the period immediately preceding the event, and sustaining continued operation will require

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corrective action. For the minimal 1-hour period that these systems would be required to provide makeup to the SGs, further aging degradation that would not have been apparent before the event is negligible. Therefore, the applicant has identified no aging effects and has provided no Summary of Aging Management Review table.

Furthermore, the applicant indicated IP1 CSTs are only subject to intermittent service. Therefore, a daily check of tank levels and intermittent usage of piping and valves from the IP1 CSTs to the IP2 condenser confirm availability. Significant degradation that could threaten the performance of the intended functions will be apparent in the period immediately preceding the event and sustaining continued operation will require corrective action. The applicant stated that the use of this approach to confirm the integrity of systems required to supply water to the SGs is analogous to the approach used to confirm condenser integrity in the main steam isolation valve (MSIV) leakage pathway of BWRs. In this MSIV leakage pathway scenario, normal plant operation continuously confirms the intended function of the condenser (holdup and plateout of MSIV leakage). The applicant stated that the staff accepted the use of this approach (Section 3.4.2.4.4 of NUREG-1796, "Safety Evaluation Report Related to the License Renewal of the Dresden Nuclear Power Station, Units 2 and 3, and Quad Cities Nuclear Power Station, Units 1 and 2," issued October 2004, and Section 3.4.2.3 of NUREG-1769, "Safety Evaluation Report Related to the License Renewal of Peach Bottom Atomic Power Station, Units 2 and 3," issued March 2003), concluding that main condenser integrity is continually verified during normal plant operation and that no AMP is required to ensure the intended function after an accident.

Condensate

In the LRA, the applicant stated that because condensate system components subject to an AMR are evaluated with other systems, including miscellaneous systems within the scope of 10 CFR 54.21(a)(2), it did not provide AMR tables specifically associated with the condensate system. This is further explained by the applicant in LRA Section 2.3.4.6.

3.4.2 Staff Evaluation

The staff reviewed LRA Section 3.4 to determine whether the applicant provided sufficient information to demonstrate that the effects of aging for the steam and power conversion system components, within the scope of license renewal and subject to an AMR, will be adequately managed, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to verify the applicant's claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate AMRs in the GALL Report. SER Section 3.0.3 documents the staff's evaluations of the AMPs. SER Section 3.4.2.1 documents the details of the staff's audit evaluation.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which it recommended further evaluation. The staff confirmed that the applicant's further evaluations were consistent with the acceptance criteria in SRP-LR Section 3.4.2.2. SER Section 3.4.2.2 documents the staff's audit evaluations.

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The staff also conducted a technical review of the results of the remaining AMRs not consistent with, or not addressed in, the GALL Report. The technical review evaluated whether all plausible aging effects had been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. SER Sections 3.4A.2.3 and 3.4B.2.3 document the staff's evaluations.

For components that the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant's operating experience to verify the applicant's claims.

Table 3.4-1 summarizes the staff's evaluation of components, aging effects, or mechanisms, as well as the AMPs listed in LRA Section 3.4 and addressed in the GALL Report.

Table 3.4-1 Staff Evaluation for Steam and Power Conversion System Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel piping, piping components, and piping elements exposed to steam or treated water (3.4.1-1)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Consistent with GALL Report (see SER Section 3.4.2.2.1)
Steel piping, piping components, and piping elements exposed to steam (3.4.1-2)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Control— Primary and Secondary and One-Time Inspection	Consistent with GALL Report (see SER Section 3.4.2.2.2(1))
Steel heat exchanger components exposed to treated water (3.4.1-3)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Control— Primary and Secondary and One-Time Inspection	Consistent with GALL Report (see SER Section 3.4.2.2.2.(1))
Steel piping, piping components, and piping elements exposed to treated water (3.4.1-4)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Control— Primary and Secondary and One-Time Inspection	Consistent with GALL Report (see SER Section 3.4.2.2.2(1))

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel heat exchanger components exposed to treated water (3.4.1-5)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (see SER Section 3.4.2.2.9)
Steel and stainless steel tanks exposed to treated water (3.4.1-6)	Loss of material due to general (steel only), pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Control—Primary and Secondary and One-Time Inspection	Consistent with GALL Report (see SER Section 3.4.2.2.2(1))
Steel piping, piping components, and piping elements exposed to lubricating oil (3.4.1-7)	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis and One-Time Inspection	Consistent with GALL Report (see SER Section 3.4.2.2.2(2))
Steel piping, piping components, and piping elements exposed to raw water (3.4.1-8)	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion and fouling	Plant specific	Yes	Periodic Surveillance and Preventive Maintenance	Consistent with GALL Report (see SER Section 3.4.2.2.3)
Stainless steel and copper alloy heat exchanger tubes exposed to treated water (3.4.1-9)	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Control—Primary and Secondary and One-Time Inspection	Consistent with GALL Report (see SER Section 3.4.2.2.4(1))
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil (3.4.1-10)	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis and One-Time Inspection	Consistent with GALL Report (see SER Section 3.4.2.2.4(2))
Buried steel piping, piping components, piping elements, and tanks (with or without coating or wrapping) exposed to soil (3.4.1-11)	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Buried Piping and Tank Surveillance or Buried Piping and Tank Inspection	No Yes	Buried Piping and Tank Inspection	Consistent with GALL Report (see SER Section 3.4.2.2.5(1))

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel heat exchanger components exposed to lubricating oil (3.4.1-12)	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis and One-Time Inspection	Consistent with GALL Report (see SER Section 3.4.2.2.5(2))
Stainless steel piping, piping components, and piping elements exposed to steam (3.4.1-13)	SCC	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (see SER Section 3.4.2.2.6)
Stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water > 60 °C (> 140 °F) (3.4.1-14)	SCC	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Control—Primary and Secondary, and One-Time Inspection	Consistent with GALL Report (see SER Section 3.4.2.2.6)
Aluminum and copper alloy piping, piping components, and piping elements exposed to treated water (3.4.1-15)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Control—Primary and Secondary, and One-Time Inspection	Consistent with GALL Report (see SER Section 3.4.2.2.7(1))
Stainless steel piping, piping components, and piping elements; tanks; and heat exchanger components exposed to treated water (3.4.1-16)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Control—Primary and Secondary, and One-Time Inspection	Consistent with GALL Report (see SER Section 3.4.2.2.7(1))
Stainless steel piping, piping components, and piping elements exposed to soil (3.4.1-17)	Loss of material due to pitting and crevice corrosion	Plant specific	Yes	Not applicable	Not applicable to IP (see SER Section 3.4.2.2.7(2))

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Copper alloy piping, piping components, and piping elements exposed to lubricating oil (3.4.1-18)	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis and One-Time Inspection	Consistent with GALL Report (see SER Section 3.4.2.2.7(3))
Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil (3.4.1-19)	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis and One-Time Inspection	Consistent with GALL Report (see SER Section 3.4.2.2.8)
Steel tanks exposed to air—outdoor (external) (3.4.1-20)	Loss of material due to general, pitting, and crevice corrosion	Aboveground Steel Tanks	No	Aboveground Steel Tanks	Consistent with GALL Report
High-strength steel closure bolting exposed to air with steam or water leakage (3.4.1-21)	SCC, cracking due to cyclic loading,	Bolting Integrity	No	Not applicable	Not applicable to IP (see SER Section 3.4.2.1.1)
Steel bolting and closure bolting exposed to air with steam or water leakage, air—outdoor (external), or air—indoor uncontrolled (external); (3.4.1-22)	Loss of material due to general, pitting, and crevice corrosion; loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Bolting Integrity	Consistent with GALL Report (see SER Section 3.4.2.1.2)
Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water > 60 °C (> 140 °F) (3.4.1-23)	SCC	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to IP (see SER Section 3.4.2.1.1)
Steel heat exchanger components exposed to closed-cycle cooling water (3.4.1-24)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Water Chemistry Control—Closed-Cycle Cooling Water	Consistent with GALL Report (see SER Section 3.4.2.1.3)

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed-cycle cooling water (3.4.1-25)	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	No	Water Chemistry Control—Closed-Cycle Cooling Water	Consistent with GALL Report for IP2. Not applicable to IP3 steam and power conversion systems (see SER Section 3.4.2.1.4)
Copper alloy piping, piping components, and piping elements exposed to closed-cycle cooling water (3.4.1-26)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Water Chemistry Control—Closed-Cycle Cooling Water	Consistent with GALL Report for IP2. Not applicable to IP3 steam and power conversion systems (see SER Section 3.4.2.1.5)
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed-cycle cooling water (3.4.1-27)	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to IP (see SER Section 3.4.2.1.1)
Steel external surfaces exposed to air—indoor uncontrolled (external), condensation (external), or air—outdoor (external) (3.4.1-28)	Loss of material due to general corrosion	External Surfaces Monitoring	No	External Surfaces Monitoring	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to steam or treated water (3.4.1-29)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Flow-Accelerated Corrosion	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to condensation (internal) or air—outdoor (internal) (3.4.1-30)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Water Chemistry Control—Primary and Secondary, One-Time Inspection, Periodic Surveillance and Preventive Maintenance	See SER Section 3.4.2.1.6

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel heat exchanger components exposed to raw water (3.4.1-31)	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion and fouling	Open-Cycle Cooling Water System	No	Service Water Integrity	Not applicable to IP (see SER Section 3.4.2.1.7)
Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water (3.4.1-32)	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Open-Cycle Cooling Water System	No	Periodic Surveillance and Preventive Maintenance, and One-Time Inspection	See SER Section 3.4.2.1.8 for IP2. Not applicable to IP3 steam and power conversion systems (see SER Section 3.4.2.1.1)
Stainless steel heat exchanger components exposed to raw water (3.4.1-33)	Loss of material due to pitting, crevice, and microbiologically influenced corrosion and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to IP (see SER Section 3.4.2.1.1)
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to raw water (3.4.1-34)	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to IP (see SER Section 3.4.2.1.1)
Copper alloy > 15% Zn piping, piping components, and piping elements exposed to closed-cycle cooling water, raw water, or treated water (3.4.1-35)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Selective Leaching	Consistent with GALL Report for IP2. Not applicable to IP3 steam and power conversion systems (see SER Section 3.4.2.1.1)
Gray cast-iron piping, piping components, and piping elements exposed to soil, treated water, or raw water (3.4.1-36)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable	Not applicable to IP (see SER Section 3.4.2.1.1)

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel, stainless steel, and nickel-based alloy piping, piping components, and piping elements exposed to steam (3.4.1-37)	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Water Chemistry Control—Primary and Secondary, and One-Time Inspection	Consistent with GALL Report
Steel bolting and external surfaces exposed to air with borated water leakage (3.4.1-38)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Not applicable	Not applicable to IP (see SER Section 3.4.2.1.1)
Stainless steel piping, piping components, and piping elements exposed to steam (3.4.1-39)	SCC	Water Chemistry	No	Water Chemistry Control—Primary and Secondary, and One-Time Inspection	Consistent with GALL Report
Glass piping elements exposed to air, lubricating oil, raw water, and treated water (3.4.1-40)	None	None	NA	None	Consistent with GALL Report
Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air—indoor uncontrolled (external) (3.4.1-41)	None	None	NA	None	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to air—indoor controlled (external) (3.4.1-42)	None	None	NA	Not applicable	Not applicable to IP (see SER Section 3.4.2.1.1)
Steel and stainless steel piping, piping components, and piping elements in concrete (3.4.1-43)	None	None	NA	Not applicable	Not applicable to IP (see SER Section 3.4.2.1.1)

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Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas (3.4.1-44)	None	None	NA	None	Consistent with GALL Report

The staff's review of the steam and power conversion system component groups followed one of several approaches. In one approach, documented in SER Section 3.4.2.1, the staff reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. In the second approach, documented in SER Section 3.4.2.2, the staff reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. In the third approach, documented in SER Sections 3.4A.2.3 (for IP2) and 3.4B.2.3 (for IP3), the staff reviewed AMR results for components that the applicant indicated are not consistent with, or not addressed in, the GALL Report. The staff documents its review of AMPs credited with managing or monitoring the aging effects for the steam and power conversion system components in SER Section 3.0.3.

3.4.2.1 AMR Results Consistent with the GALL Report

LRA Section 3.4.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the steam and power conversion system components:

- Aboveground Steel Tanks Program
- Bolting Integrity Program
- Buried Piping and Tanks Inspection Program
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion Program
- Oil Analysis Program
- One-Time Inspection Program
- Periodic Surveillance and Preventive Maintenance Program
- Water Chemistry Control—Primary and Secondary Program

LRA Tables 3.4.2-1-IP2 through 3.4.2-4-IP2 and 3.4.2-1-IP3 through 3.4.2-4-IP3 summarize the results of AMRs for the steam and power conversion system components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report, where the report does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these component groups were bounded by the GALL Report evaluation.

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For each AMR line item, the applicant stated how the information in the tables aligns with the information in the GALL Report. Notes A through E indicate how the AMR is consistent with the GALL Report. The staff audited these AMRs.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and the validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report and determined that the identified exceptions to the GALL Report AMPs had been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item is consistent with, although different from, the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL Report AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified a different component in the GALL Report with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the AMR line item of the different component was applicable to the component under review and whether the AMR was valid for the site-specific conditions.

Note D indicates that the component for the AMR line item is consistent with, although different from, the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL Report AMP. The staff audited these line items to verify consistency with the GALL Report. The staff verified whether the AMR line item of the different component was applicable to the component under review and whether the identified exceptions to the GALL Report AMPs had been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluation follows.

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3.4.2.1.1 AMR Results Identified as Not Applicable

In LRA Table 3.4.1, the applicant identified Items 21, 23, 25 (IP3), 26 (IP3), 27, 31, 32 (IP3), 33, 34, 35 (IP3), 36, 38, 42, and 43 as not applicable, since the combination of component, material, and environment does not apply to the in-scope components. For each of these items, the staff reviewed the LRA and the applicant's supporting documents and confirmed the applicant's claim that the combination of component, material, and environment does not exist. On the basis that IP2 and IP3 do not have the combination of component, material, and environment, the staff finds that these AMRs are not applicable to IP.

For IP3, the staff noted that there are no items in Tables 3.4.2 and 3.3.2-19 in the IP3 steam and power conversion system that reference Items 3.4.1-25, 3.4.1-26, 3.4.1-32, and 3.4.1-35 of Table 3.4.1. On the basis that IP3 does not have any components from this group, the staff finds that the aging effect covered by these items is not applicable to the IP3 steam and power conversion system.

3.4.2.1.2 Steel Bolting and Closure Bolting Exposed to Air—with Steam or Water Leakage, Air—Outdoor (external), or Air—Indoor Uncontrolled

In the discussion column of LRA Table 3.4.1, Item 3.4.1-22, the applicant stated that the loss of preload is a design-driven effect and not an aging effect requiring management. This statement appeared to be contrary to the GALL Report recommendation which states that loss of preload is an aging effect. During the audit, the staff asked the applicant to justify why other aging effects were not applicable and why the Bolting Integrity Program (B.1.2) did not take exception to the GALL Report since, at IP, the loss of preload is not considered an aging effect (Audit Item 241).

In its response, dated December 18, 2007, the applicant stated that:

> The reason why loss of preload is not identified as an aging effect is that Entergy has consistently followed industry guidance (EPRI Report 1010639) in performing aging management reviews. Based on these reviews, loss of preload has not been listed as an aging effect requiring management in the system level aging management review results. While not included in system-level aging management review results, loss of preload is addressed in the Bolting Integrity Program for all bolting within the scope of license renewal except for the reactor vessel closure studs, which are addressed in a separate program. The Bolting Integrity Program is an existing program that addresses loss of preload in accordance with the guidelines of NUREG-1801 Section XI.M18, Bolting Integrity.
>
> The program description of LRA Section B.1.2 states that the program applies to all bolting except the reactor head closure studs and includes preventive measures to preclude or minimize loss of preload and cracking. Likewise, loss of material is not an aging effect requiring management for this bolting, but it is also managed by the Bolting Integrity Program. As stated in LRA Section B.1.2, the IP Bolting Integrity Program will be consistent with NUREG-1801 Section XI.M18, which includes measures to manage loss of material and loss of

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preload. The Bolting Integrity Program will apply to all pressure boundary bolting, including the main steam bolting.

LRA Table 3.4.1, Item 3.4.1-22 discussion column will be clarified by inserting the following sentence after "Improper bolting application (design) and maintenance issues are current plant operational concerns and not related to aging effects or mechanisms that require management during the period of extended operation.

Nevertheless, the Bolting Integrity Program manages loss of preload for all bolting in steam and power conversion systems.

The staff finds the applicant's response acceptable, because the Bolting Integrity Program includes preventive measures that preclude or minimize the loss of preload. This is consistent with the GALL Report. The applicant provided a clarification for this issue in a letter dated December 18, 2007, and amended the LRA by inserting a sentence stating that the Bolting Integrity Program manages loss of preload. In addition, Commitment 2 has been clarified to specifically state that the Bolting Integrity Program manages the loss of preload and loss of material for all external bolting.

The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed, so that their intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.1.3 Steel Heat Exchanger Components Exposed to Closed-Cycle Cooling Water

In the discussion column of LRA Table 3.4.1, Item 3.4.1-24, the applicant claimed consistency with the GALL Report in managing the loss of material by the Water Chemistry Control—Closed Cooling Water Program for steel heat exchanger components exposed to closed-cycle cooling water. However, in LRA Table 3.3.2-19-15-IP2, Item 3.4.1-24 of Table 3.4.1 has been used to manage the loss-of-material aging effect for carbon steel piping, piping components (filter housing, pump casing, valve body, sight glass, and thermowell), tanks, and heat exchanger shells exposed to treated water by using the Water Chemistry Control—Auxiliary Systems Program (B.1.39). The only AMR line item using Item 3.4.1-24 of Table 3.4.1 in the IP3 steam and power conversion systems is for the carbon steel heat exchanger shell exposed to treated water, and it is included in LRA Table 3.3.2-19-23-IP3. This AMR line proposes the use of Water Chemistry Control—Closed Cooling Water Program (B.1.40) to manage the loss-of-material aging effect. These AMR result lines refer to Note E for all these components.

The staff reviewed the above-stated AMR result lines referring to Note E and determined that the component material, environment, and aging effect are consistent with or identical to those of the corresponding line item in the GALL Report. The staff documents its review and evaluation of the applicant's Water Chemistry Control—Auxiliary Systems Program, proposed in the LRA, in SER Section 3.0.3.3.8. SER Section 3.0.3.2.16 documents the staff's review and

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evaluation of the applicant's Water Chemistry Control—Closed Cooling Water Program, proposed in the LRA. The staff finds that this program includes activities that control water chemistry and are consistent with the recommendations in the GALL Report. The staff finds that these programs include activities that control water chemistry, are consistent with the recommendations in the GALL Report, and are adequate to manage the loss of material in the above-stated carbon steel components exposed to treated water.

The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed, so that their intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.1.4 Stainless Steel Piping, Piping Components, Piping Elements, and Heat Exchanger Components Exposed to Closed-Cycle Cooling Water

In the discussion column of LRA Table 3.4.1, Item 3.4.1-25, the applicant claimed consistency with the GALL Report in managing the loss of material by using the Water Chemistry Control—Closed Cooling Water Program for stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed-cycle cooling water. However, in LRA Table 3.3.2-19-15-IP2, Item 3.4.1-25 of Table 3.4.1 has been used to manage the loss-of-material aging effect for stainless steel piping and stainless steel piping components, such as strainer housing and valve bodies, exposed to treated water by using the Water Chemistry Control—Auxiliary Systems Program (B.1.39). These AMR result lines refer to Note E for all these components.

The staff reviewed the above-stated IP2 AMR result lines referring to Note E and determined that the component material, environment, and aging effect are consistent with or identical to those of the corresponding line item in the GALL Report. The staff documents its review and evaluation of the applicant's Water Chemistry Control—Auxiliary Systems Program, proposed in the LRA, in SER Section 3.0.3.3.8. The staff finds that this program includes activities that control water chemistry, are consistent with the recommendations in the GALL Report, and are adequate to manage the loss of material in the above-stated carbon steel components exposed to treated water.

The staff evaluated the applicant's claim of consistency with the GALL Report for IP2. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed, so that their intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

For IP3, none of the AMR line items in LRA Tables 3.4.2-1-IP3 through 3.4.2-4-IP3, or any of the Table 3.3.2-19-XX-IP3 in the steam and power conversion systems used Table 3.4-1

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Item 3.4.1-25. Therefore, the above combination of material, environment, and AERM does not apply to IP3.

3.4.2.1.5 Copper Alloy Piping, Piping Components, and Piping Elements Exposed to Closed-Cycle Cooling Water

In the discussion column of LRA Table 3.4.1, Item 3.4.1-26, the applicant claimed consistency with the GALL Report in managing the loss of material by using the Water Chemistry Control—Closed Cooling Water Program for copper alloy piping, piping components, and piping elements exposed to closed-cycle cooling water. However, in LRA Table 3.3.2-19-15-IP2, Item 3.4.1-26 of Table 3.4.1 has been used to manage the loss-of-material aging effect for a copper alloy valve body exposed to treated water by using the Water Chemistry Control—Auxiliary Systems Program (B.1.39). This AMR result line refers to Note E for this component.

The staff reviewed the above-stated IP2 AMR result line referring to Note E and determined that the component material, environment, and aging effect are consistent with or identical to those of the corresponding line item in the GALL Report. The staff documents its review and evaluation of the applicant's Water Chemistry Control—Auxiliary Systems Program, proposed in the LRA, in SER Section 3.0.3.3.8. The staff finds that this program includes activities that control water chemistry, are consistent with the recommendations in the GALL Report, and are adequate to manage the loss of material in the above-stated carbon steel component exposed to treated water.

The staff evaluated the applicant's claim of consistency with the GALL Report for IP2. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed, so that their intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

For IP3, none of the AMR line items in LRA Tables 3.4.2-1-IP3 through 3.4.2-4-IP3, or any of the Table 3.3.2-19-XX-IP3 in the steam and power conversion systems used Item 3.4.1-26 of Table 3.4.1. Therefore, the above combination of material, environment, and AERM does not apply to IP3.

3.4.2.1.6 Steel Piping, Piping Components, and Piping Elements Exposed to Outdoor Air (Internal) or Condensation (Internal)

In the discussion column of LRA Table 3.4.1, Item 3.4.1-30, the applicant stated that "steel components with intended functions in steam and power conversion systems with the internal surface exposed to outdoor air or condensation are the condensate storage tanks (CSTs), steel main steam safety valve tailpipes, and atmospheric dump valve silencers. The condensate storage tank vapor space is nitrogen blanketed but the environment is conservatively assumed to be condensation." Even though Item 3.4.1-30 of Table 3.4.1 does not cover steel tanks, this item has been used in LRA Tables 3.4.2-3-IP2 and 3.4.2-3-IP3 for managing the loss of material due to general, pitting, and crevice corrosion by using the Water Chemistry Control—Primary and Secondary Program (B.1.41) and the One-Time Inspection Program (B.1.27) for

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the steel condensate storage tank exposed to condensation. This AMR result line refers to Note E for this component.

The staff reviewed the above-stated AMR result line referring to Note E and determined that the component material, environment, and aging effect are consistent with or identical to those of the corresponding line item in the GALL Report. The staff documents its reviews and evaluations of the applicant's Water Chemistry Control—Primary and Secondary Program and its One-Time Inspection Program, proposed in the LRA, in SER Sections 3.0.3.2.17 and 3.0.3.1.9, respectively. The staff finds that the use of the Water Chemistry Control—Primary and Secondary Program to control water chemistry and the use of the One-Time Inspection Program to verify the effectiveness of chemistry controls are consistent with the recommendations in the GALL Report and are adequate to manage the loss of material in the steel condensate storage tank exposed to condensation.

The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed, so that their intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.1.7 Steel Heat Exchanger Components Exposed to Raw Water

In the discussion column of LRA Table 3.4.1, Item 3.4.1-31, the applicant stated that this item is not applicable to IP. The discussion column also notes that there are no steel heat exchanger components with intended functions exposed to raw water in the steam and water conversion system. However, LRA Tables 3.3.2-19-23-IP2 and 3.3.2-19-23-IP3 do use Item 3.4.1-31 of Table 3.4.1 to manage the loss of material for a steel heat exchanger shell exposed to raw water (internal). The LRA uses the Service Water Integrity Program (B.1.34) to manage the aging effect for this component. The AMR result line refers to Note C for this component, indicating that the component is consistent with the GALL Report for material, environment, and aging effect and that the AMP used for aging management is also consistent with the GALL Report.

The staff reviewed the above-stated AMR result line and determined that the use of the Service Water Integrity Program (B.1.34) for managing the loss-of-material aging effect for a steel heat exchanger shell exposed to raw water (internal) is consistent with the GALL Report, Table 4, Line Item 31. The staff documents its review and evaluation of the applicant's Service Water Integrity Program in SER Section 3.0.3.1.14.

3.4.2.1.8 Stainless Steel and Copper Alloy Piping, Piping Components, and Piping Elements Exposed to Raw Water

In LRA Table 3.3.2-19-6-IP2, the applicant used Item 3.4.1-32 of Table 3.4.1 to manage the loss-of-material aging effect for (1) stainless steel tubing exposed to raw water (internal) by using the One-Time Inspection Program (B.1.27), (2) copper alloy valve body exposed to raw water (internal) by using the Periodic Surveillance and Preventive Maintenance

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Program (B.1.29), and (3) stainless steel valve body exposed to raw water (internal) by using the One-Time Inspection Program (B.1.27). The GALL Report recommends Open-Cycle Cooling Water System Program AMP XI.M20 for this AERM. The AMR result lines for these three components in LRA Table 3.3.2-19-6-IP2 refer to Note E, indicating that different AMPs are credited for these components.

By letter dated June 12, 2009, the applicant amended its LRA to state that stainless steel pump casings exposed internally and externally to raw water with an aging effect of loss of material will be managed by the Periodic Surveillance and Preventive Maintenance Program, and referenced Item 3.4.1-32 of LRA Table 3.4-1.

The use of the Periodic Surveillance and Preventive Maintenance Program for managing the loss-of-material aging effect for stainless steel pump casings exposed to raw water (internal and external) and copper alloy valve bodies exposed to raw water (internal) is adequate because this program includes activities that are consistent with the recommendations in the GALL Report. The component material, environment, and aging effect are also consistent with or identical to those of the corresponding line items in the GALL Report. The staff's review and evaluation of the applicant's Periodic Surveillance and Preventive Maintenance Program is documented in SER Section 3.0.3.3.7.

The use of the One-Time Inspection Program for managing the loss-of-material aging effect for stainless steel tubing and valve body exposed to raw water (internal) is adequate because the One-Time Inspection Program manages this aging effect by visual and other NDE techniques to verify that the loss of material has not occurred or is so insignificant that no AMP is warranted for this component. The staff's review of the One-Time Inspection Program is documented in SER Section 3.0.3.1.9.

The staff evaluated the applicant's claim of consistency with the GALL Report for IP2. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with the GALL Report AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed, so that their intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

For IP3, none of the AMR line items in LRA Tables 3.4.2-1-IP3 through 3.4.2-4-IP3, or any of the Table 3.3.2-19-XX-IP3 in the steam and power conversion systems used Item 3.4.1-32 of Table 3.4.1. Therefore, the above combination of material, environment, and AERM does not apply to IP3.

3.4.2.1.9 IP2 Auxiliary Feedwater Pump Room Fire Event

In LRA Section 3.4.2, the applicant summarizes its AMR results for the IP2 auxiliary feedwater pump room fire event. In the LRA, the applicant states that

> The components in the systems required to supply feedwater to the steam generators during the short duration of the fire event are in service at the time the event occurs or their availability is checked daily. Therefore, integrity of the

> systems and components required to perform post-fire intended functions for at least one hour is continuously confirmed by normal plant operation. During the event these systems and components must continue to perform their intended functions to supply feedwater to the steam generators for a minimum of one hour. Significant degradation that could threaten the performance of the intended functions will be apparent in the period immediately preceding the event and corrective action will be required to sustain continued operation. For the minimal one hour period that these systems would be required to provide make up to the steam generators, further aging degradation that would not have been apparent prior to the event is negligible. Therefore, no aging effects are identified, and no Summary of Aging Management Review table is provided.

Section 54.21(a)(1) of 10 CFR requires that for those systems, structures, and components within the scope of license renewal, as delineated in § 54.4, applicants must identify and list those structures and components subject to an aging management review. Additionally, Section 54.21(a)(3), requires that for each structure and component identified in paragraph 54.21(a)(1), applicants must 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. Based on the information contained in the LRA, Entergy does not appear to have demonstrated that the effects of aging for passive, long-lived components within the systems credited for providing flow to the steam generators during the fire event will be adequately managed.

By letter dated December 30, 2008, the staff issued an RAI to request that the applicant provide a list of passive, long-lived component types, material, environment, and aging effect combinations, and the programs that will be used to manage the aging effects for these SCs. Pending receipt and review of the applicant's response, this was identified as Open Item 3.4-1.

By letter dated January 27. 2009, Entergy responded to the staff's request. Entergy reiterated that as indicated in LRA Section 2.3.4.5, normal plant operation demonstrates the ability of secondary systems to supply feedwater to the steam generators. Additionally, it stated that the function of supporting safe shutdown in the event of a fire in the auxiliary feed pump room is confirmed on an ongoing basis since the required SSCs are performing their intended functions under design basis conditions during normal operation. Furthermore, performance of intended functions during normal plant operation demonstrates that the systems and components can perform those functions for one hour in the event of a fire in the auxiliary feedwater pump room.

Additionally, Entergy provided tables containing clarifying details regarding the passive, long-lived component types, materials, environments, aging effects and programs for SSCs that support the AFW pump room fire event that were not already included in scope and subject to an AMR for 10 CFR 54.4(a)(1) or (a)(2). For each entry in the provided tables, Entergy listed the aging effect as "none," and the AMP as "none," and provided plant-specific note 408 which states:

> Materials and environments have been identified, however there are no aging effects requiring management. The function of supporting safe shutdown in the event of a fire in the auxiliary feed pump room is confirmed since these SSCs, which are required to support this function, perform their intended functions during normal operation. Conditions under which these SSCs must perform their

intended functions are the same conditions under which they operate during the course of normal plant operations. Performance of intended functions during normal plant operation demonstrates that the systems and components can perform those functions for one hour in the event of a fire in the auxiliary feedwater pump room.

The staff reviewed the applicant's response and determined that the systems contain passive, long-lived components made of materials that when exposed to the stated environments may experience aging effects as described in the GALL Report, which must be managed during the period of extended operation in accordance with 10 CFR 54.21(a)(3).

By letter dated May 1, 2009, Entergy submitted a clarification response to RAI 3.4.2-1 as well as a new commitment (Commitment 39) to install a fixed automatic fire suppression system for IP2 in the AFW pump room prior to entering the period of extended operation. Entergy stated that this commitment will delete the requirement for IP2 to place reliance on certain portions of the secondary plant systems for alternate secondary heat sink measures to cope with potential AFW Pump Room fire scenarios. In addition, it stated that all of the tables that were provided in the January 27, 2009 letter are superseded by this commitment.

The staff determined that because the planned installation is not yet part of the CLB, it cannot make a finding consistent with the requirement in 10 CFR 54.29(a). Therefore, by letter dated May 20, 2009, the staff requested that the applicant provide information to demonstrate that the effects of aging will be adequately managed so that the intended function(s) will maintained consistent with the current licensing basis for the period of extended operation as required by 10 CFR 54.21(a)(3). Specifically, the staff requested that the applicant list all aging effects and the aging management programs needed to manage the aging effects for the component types provided in the January 27, 2009 letter.

By letter dated June 12, 2009, the applicant responded to the staff's May 20, 2009 request and provided revised tables which include aging effects and aging management programs to manage the aging effects for the component types that support the AFW pump room fire event that were not already included in scope and subject to aging management review for 10 CFR 54.4(a)(1) or (a)(2).

The applicant revised LRA Tables 3.4.2-5-1-IP2 through 3.4.2-5-13-IP2 to include aging effects and AMPs for all of the components previously identified in response to RAI 3.4.2-1 by letter dated January 27, 2009. The staff reviewed the applicant's revised AMR results and found that the AMR results are consistent with the GALL Report for these combinations of materials and environments with Notes A through D. On the basis of its review, the staff finds that all applicable aging effects were identified, and the aging effects listed are appropriate for the combination of materials and environments identified.

The staff's evaluation of AMR results with Note E is documented in SER Sections 3.3.2.1.3, 3.3.2.1.5, 3.3.2.1.9, 3.3.2.1.10, 3.3.2.2.10, 3.4.2.1.8, and 3.4.2.2.3. The staff's evaluation of AMR results not consistent with or not addressed in the GALL Report is documented in SER Section 3.4A.2.3.5.

Based upon the applicant's provision of the revised AMR results identifying appropriate aging effects and AMPs, and the staff's review thereof, Open Item 3.4-1 is closed.

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3.4.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation Is Recommended

In LRA Section 3.4.2.2, the applicant further evaluated aging management for the steam and power conversion system components, as recommended by the GALL Report, and provided information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to general, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and microbiologically influenced corrosion and fouling
- reduction of heat transfer due to fouling
- loss of material due to general, pitting, crevice, and microbiologically influenced corrosion
- SCC
- loss of material due to pitting and crevice corrosion
- loss of material due to pitting, crevice, and microbiologically influenced corrosion
- loss of material due to general, pitting, crevice, and galvanic corrosion
- QA for aging management of nonsafety-related components

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the report and for which the report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.4.2.2. The staff's review of the applicant's further evaluations follows.

3.4.2.2.1 Cumulative Fatigue Damage

LRA Section 3.4.2.2.1 states that fatigue is a TLAA, as defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1).

The applicant stated that Section 4.3 of the LRA addresses those steam and power conversion system components that require metal fatigue analysis. The staff verified that LRA Table 3.4.1 includes an applicable line item on metal fatigue of steam and power conversion system components, as stated in LRA AMR Item 3.4.1-1, and that LRA Section 4.3.2 contains the section on TLAA and metal fatigue analysis for steam and power conversion system components. The staff also reviewed the applicant's further evaluation assessment in LRA Section 3.4.2.2.1 to verify that it conforms to the recommendations provided in SRP-LR

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Section 3.4.2.2.1 and that the LRA includes AMR Item 3.4.1-1, which corresponds to this further evaluation item. The staff also verified that AMR Item 3.4.1-1 is consistent with and conforms to the recommended AMR evaluation in AMR Item 1 in Table 4 of the GALL Report. Based on this review, the staff concludes that the applicant's further evaluation discussion in LRA Section 3.4.2.2.1 is consistent with and conforms to the evaluation recommendations in SRP-LR Section 3.4.2.2.1 and is acceptable. The staff also concludes that the LRA includes AMR Item 3.4.1-1 on metal fatigue for applicable steam and power conversion system components and that this AMR is consistent with the recommendations in Table 4 of the GALL Report.

The staff reviewed the applicant's TLAA on metal fatigue, and SER Section 4.3 and its subsections contain its evaluation.

By letter dated March 24, 2008, the applicant amended its LRA Tables 3.3.2-19-12-IP2, 3.3.2-19-2-IP3, 3.3.2-19-14-IP3 and 3.3.2-19-27-IP3 to state the Periodic Surveillance and Preventive Maintenance Program will provide aging management of carbon steel sight glasses in either a treated water (internal) or steam (internal) environment for the aging effect of cracking due to fatigue.

By letter dated June 11, 2008, the applicant amended its LRA Table 3.3.2-19-27-IP3 to state the Periodic Surveillance and Preventive Maintenance Program will provide aging management of carbon steel sight glasses in a treated water (internal) environment for the aging effect of cracking due to fatigue.

The staff's review of the Periodic Surveillance and Preventive Maintenance Program is documented in SER Section 3.0.3.3.7. The Periodic Surveillance and Preventive Maintenance Program enhancements add new activities to the plant's preventive maintenance and surveillance programs, which implement preventive maintenance and surveillance testing activities through repetitive tasks or routine monitoring of plant operations. The staff also determined that this program will use visual or other NDE techniques to inspect a representative sample of components to manage cracking due to fatigue. On the basis of its review, the staff finds that because these components will be inspected periodically for loss of material and fouling, the aging effect for these component/environment combinations will be effectively managed by this aging management program.

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

The staff reviewed LRA Section 3.4.2.2.2 against the criteria in SRP-LR Section 3.4.3.2.2.

(1) LRA Section 3.4.2.2.2 addresses the loss of material due to general, pitting, and crevice corrosion for carbon steel piping and piping components, heat exchanger components, and tanks exposed to treated water and for carbon steel piping and components exposed to steam in the steam and power conversion and other systems, stating that the Water Chemistry Control—Primary and Secondary Program manages this aging effect. The One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control—Primary and Secondary Program by an inspection of a representative sample of components that credit it, including those in areas of stagnant flow and other susceptible locations.

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SRP-LR Section 3.4.2.2.2 states that the loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water and in steel piping, piping components, and piping elements exposed to steam. The existing AMP monitors and controls water chemistry to manage the effects of the loss of material due to general, pitting, and crevice corrosion. However, control of water chemistry does not preclude the loss of material due to general, pitting, and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of selected components and susceptible locations is an acceptable method to ensure that corrosion does not occur and that the intended functions of components will be maintained during the period of extended operation.

SRP-LR Item 3.4.2.2.2, Item 1, cites Items 2, 3, 4, and 6 in Table 4 of the GALL Report. Collectively, AMR Items 2, 3, 4, and 6 in Table 4 of the GALL Report reference generic AMR items that may be applicable to the steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to a treated water environment, and to the steel piping, piping components, and piping elements exposed to a steam environment in PWR steam and power conversion systems. For these combinations of components, material, and environment, the GALL Report (like the SRP-LR) recommends that the Water Chemistry Control—Primary and Secondary Program be credited with preventing or mitigating the loss of material in the components and that a plant-specific program be credited with verifying the effectiveness of the Water Chemistry Control—Primary and Secondary Program in achieving its preventive or mitigative function. Like the SRP-LR, the GALL AMRs identify the One-Time Inspection Program as an acceptable program to verify the effectiveness of the applicant's Water Chemistry Control—Primary and Secondary Program.

The staff noted that the applicant had not included the steam turbine system and the extraction steam system in the list of systems covered under the steam and power conversion systems described in LRA Section 3.4.1. In response to Audit Item 234, by letter dated December 18, 2007, the applicant explained that, for IP2, the steam turbine system was listed as the turbine generator system and the extraction steam system was included in the main steam system.

Items 3.4.1-2 and 3.4.1-4 in LRA Table 3.4.1 address the loss of material due to general, pitting, and crevice corrosion for steel piping, piping components, and piping elements exposed to steam or treated water. During the audit, the staff confirmed that the applicant uses the Water Chemistry Control—Primary and Secondary Program to manage aging effects and verifies the effectiveness of its water chemistry controls through the One-Time Inspection Program. This program includes inspections of selected components at susceptible locations, as recommended by the GALL Report. The One-Time Inspection Program is a new program that, when implemented, will be consistent with GALL AMP XI.M32. The staff reviewed and evaluated the applicant's Water Chemistry Control—Primary and Secondary Program and the One-Time Inspection Program and documents its evaluations in Sections 3.0.3.2.17 and 3.0.3.1.9,

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respectively. Based on the programs identified above, the staff concludes that the applicant has met the criteria in SRP-LR Section 3.4.2.2.2(1) for further evaluation.

LRA Table 3.4.1, Item 3.4.1-3, addresses the loss of material due to general, pitting, and crevice corrosion for steel heat exchanger components exposed to treated water. During the audit, the staff confirmed that the applicant uses the Water Chemistry Control—Primary and Secondary Program to manage aging effects and verifies the effectiveness of its water chemistry controls through the One-Time Inspection Program. This program includes inspections of selected components at susceptible locations, as recommended by the GALL Report. The One-Time Inspection Program is a new program that, when implemented, will be consistent with GALL AMP XI.M32. The staff reviewed and evaluated the applicant's Water Chemistry Control—Primary and Secondary Program and the One-Time Inspection Program and documents its evaluations in Sections 3.0.3.2.17 and 3.0.3.1.9, respectively. Based on the programs identified above, the staff concludes that the applicant has met the criteria in SRP-LR Section 3.4.2.2.2(1) for further evaluation.

LRA Table 3.4.1, Item 3.4.1-6, addresses the loss of material due to general, pitting, and crevice corrosion for steel and stainless steel tanks exposed to treated water. During the audit, the staff confirmed that the applicant uses the Water Chemistry Control—Primary and Secondary Program to manage aging effects and verifies the effectiveness of water chemistry controls through the One-Time Inspection Program. This program includes inspections of selected components at susceptible locations, as recommended by the GALL Report. The One-Time Inspection Program is a new program that, when implemented, will be consistent with GALL AMP XI.M32. The staff reviewed and evaluated the applicant's Water Chemistry Control—Primary and Secondary Program and the One-Time Inspection Program and documents its evaluations in Sections 3.0.3.2.17 and 3.0.3.1.9, respectively. Based on the programs identified above, the staff concludes that the applicant has met the criteria in SRP-LR Section 3.4.2.2.2(1) for further evaluation.

(2) LRA Section 3.4.2.2.2 addresses the loss of material due to general, pitting, and crevice corrosion in steel piping and components exposed to lubricating oil, stating that the Oil Analysis Program manages this aging effect by periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits and preserve an environment not conducive to corrosion. The One-Time Inspection Program will use visual inspections or NDEs of representative samples to confirm the effectiveness of the Oil Analysis Program in managing aging effects for components that credit it.

SRP-LR Section 3.4.2.2.2 states that the loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, and piping elements exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lubricating oil contaminants may not always be fully effective in precluding corrosion; therefore, the applicant should verify the effectiveness of its lubricating oil contaminant controls to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of lubricating oil chemistry control programs. A one-time inspection of selected components at susceptible locations is an

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acceptable method to ensure that corrosion does not occur and that the intended functions of components will be maintained during the period of extended operation.

LRA Table 3.4.1, Item 3.4.1-7, addresses the loss of material due to general, pitting, and crevice corrosion for steel piping, piping components, and piping elements exposed to lubricating oil. During the audit, the staff confirmed that the applicant uses the Oil Analysis Program to manage the loss-of-material aging effect and verifies the effectiveness of the lubricating oil chemistry control using the One-Time Inspection Program. This program inspects selected components at susceptible locations, as recommended by the GALL Report. The staff reviewed and evaluated the applicant's Oil Analysis Program, which maintains lubricating oil contaminants within acceptable limits. Monitoring and trending the results of lubricating oil analyses can identify the aging of components before their intended functions are lost. The staff also reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with GALL AMP XI.M32. The staff documents its review and evaluation of the Oil Analysis Program and the One-Time Inspection Program in Sections 3.0.3.2.12 and 3.0.3.1.9, respectively. Based on the programs identified above, the staff concludes that the applicant has met the criteria in SRP-LR Section 3.4.2.2.2(2) for further evaluation.

In the "Notes" column of LRA Tables 3.3.2-19-15-IP2 and 3.3.2-19-15-IP3, the applicant has included Footnote D for several lines addressing steel piping, piping components, and steel tank items. The applicant used Item 3.4.1-7 of LRA Table 3.4.1 to manage the loss-of-material aging effect for the items in Footnote D. All these steel components are exposed to a lubricating oil environment. The applicant has proposed managing loss-of-material AERMs for these components by using the Oil Analysis Program, together with the One-Time Inspection Program, which will verify the effectiveness of the Oil Analysis Program. Based on the review of the combination of material, environment, AERMs, and AMPs, the staff finds the proposed programs acceptable for these components. The same combination of material, environment, AERMs, and AMPs is recommended in the GALL Report for steel components, such as piping, piping components, and piping elements, exposed to lubricating oil.

Based on the programs identified above, the staff concludes that the applicant's programs meet the criteria in SRP-LR Section 3.4.2.2.2. For those line items that apply to LRA Section 3.4.2.2.2, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed, so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.3 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion and Fouling

The staff reviewed LRA Section 3.4.2.2.3 against the criteria in SRP-LR Section 3.4.3.2.3.

LRA Section 3.4.2.2.3 addresses the loss of material due to general, pitting, crevice, and microbiologically influenced corrosion and fouling in steel piping and components in the steam and power conversion systems exposed to raw water, stating that the Periodic Surveillance and Preventive Maintenance Program manages this aging effect by visual inspections and other NDE techniques so the intended functions of components will not be affected.

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SRP-LR Section 3.4.2.2.3 states that the loss of material due to general, pitting, crevice, and microbiologically influenced corrosion and fouling may occur in steel piping, piping components, and piping elements exposed to raw water. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

By letter dated June 12, 2009, the applicant amended LRA Table 3.4.2-5-3-IP2 to state that carbon steel bolting, piping, pump casing (internal and external surface) and gray cast iron pump casings (internal and external surface) exposed either internally or externally to raw water will be managed by the Periodic Surveillance and Preventive Maintenance Program.

The applicant has used Item 3.4.1-8 of LRA Table 3.4.1 to manage the loss of material due to general, pitting, crevice, and microbiologically influenced corrosion and fouling in the circulating water system's carbon steel piping and piping components exposed to a raw water environment. To manage this aging effect, the applicant has proposed using the Periodic Surveillance and Preventive Maintenance Program (B.1.29), which is an existing plant-specific program. During the site audit, the staff reviewed details of this program, along with the pertinent plant records documenting the use of this program. The staff also reviewed the applicable procedures for analyzing the results obtained from periodic surveillance and inspections during preventive maintenance activities, as well as those for handling and controlling corrective actions. The program uses visual inspections and NDE techniques to manage the loss of material. The staff documents its review and evaluation of this program in Section 3.0.3.3.7. In the "Notes" column of LRA Tables 3.3.2-19-6-IP2 and 3.3.2-19-12-IP3, the applicant has referenced Note E for the components for which Item 3.4.1-8 of Table 3.4.1 has been used. Based on the review of the applicant's program and the supporting plant documentation depicting the use of the program, the staff finds the proposed program acceptable for these components.

Based on the program identified above, the staff concludes that the applicant's program meets the criteria in SRP-LR Section 3.4.2.2.3. For those line items that apply to LRA Section 3.4.2.2.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed, so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.4 Reduction of Heat Transfer Due to Fouling

The staff reviewed LRA Section 3.4.2.2.4 against the criteria in SRP-LR Section 3.4.3.2.4.

(1) LRA Section 3.4.2.2.4 addresses the reduction of heat transfer due to fouling for stainless steel and copper alloy heat exchanger tubes exposed to treated water, stating that the Water Chemistry Control—Primary and Secondary Program manages this aging effect. The One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control—Primary and Secondary Program by an inspection of a representative sample of components that credit it, including those in areas of stagnant flow and other susceptible locations. The steam and power conversion systems have no stainless steel heat exchanger tubes with intended functions exposed to treated water.

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SRP-LR Section 3.4.2.2.4 states that the reduction of heat transfer due to fouling may occur in stainless steel and copper alloy heat exchanger tubes exposed to treated water. The existing AMP controls water chemistry to manage the reduction of heat transfer due to fouling. However, the control of water chemistry may not always be fully effective in precluding fouling. Therefore, the GALL Report recommends that the effectiveness of water chemistry control programs be verified to ensure that the reduction of heat transfer due to fouling does not occur. A one-time inspection is an acceptable method to ensure that the reduction of heat transfer does not occur and that the intended functions of components will be maintained during the period of extended operation.

LRA Table 3.4.1, Item 3.4.1-9, addresses the reduction of heat transfer due to fouling in stainless steel and copper alloy heat exchanger tubes exposed to treated water. The only AMR item that uses Item 3.4.1-9 of LRA Table 3.4.1 covers copper heat exchanger tubes exposed to treated water and is included in LRA Tables 3.4.2-3-IP2 and 3.4.2-3-IP3. These heat exchanger tubes are part of the AFW system. IP does not have any in-scope stainless steel heat exchanger tubes in the steam and power conversion systems.

During the site audit, the staff confirmed that the applicant uses the Water Chemistry Control—Primary and Secondary Program to manage aging effects and verifies the effectiveness of water chemistry control by the One-Time Inspection Program. The One-Time Inspection Program includes an inspection of selected components at susceptible locations, as recommended by the GALL Report. The One-Time Inspection Program is a new program that, when implemented, will be consistent with GALL AMP XI.M32. The staff documents its review and evaluation of the applicant's Water Chemistry Control—Primary and Secondary Program and its One-Time Inspection Program in SER Sections 3.0.3.2.17 and 3.0.3.1.9, respectively. Based on the programs identified above, the staff concludes that the applicant has met the criteria in SRP-LR Section 3.4.2.2.2(1) for further evaluation.

(2) LRA Section 3.4.2.2.4 addresses the reduction of heat transfer due to fouling for copper alloy heat exchanger tubes exposed to lubricating oil in steam and power conversion systems, stating that the Oil Analysis Program manages this aging effect. There are no stainless steel or steel heat exchanger tubes exposed to lubricating oil in the steam and power conversion systems that have the intended function of transferring heat. This program periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits and preserve an environment not conducive to fouling. The One-Time Inspection Program will use visual inspections or NDEs of representative samples to confirm the effectiveness of the Oil Analysis Program in managing aging effects for components that credit it.

SRP-LR Section 3.4.2.2.4 states that the reduction of heat transfer due to fouling may occur in steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. The existing AMP monitors and controls lubricating oil chemistry to mitigate the reduction of heat transfer due to fouling. However, controlling lubricating oil chemistry may not always be fully effective in precluding corrosion; therefore, the applicant should verify the effectiveness of its lubricating oil contaminant controls to ensure that fouling does not occur. The GALL Report recommends further evaluation of the effectiveness of programs to control lubricating oil chemistry. A one-time inspection

of selected components at susceptible locations is an acceptable method to determine whether an aging effect is occurring or is slowly progressing, to ensure that the components' intended functions will be maintained during the period of extended operation.

LRA Table 3.4.1, Item 3.4.1-10, addresses the reduction of heat transfer due to fouling in steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. The only AMR item that uses Item 3.4.1-10 of LRA Table 3.4.1 covers copper heat exchanger tubes exposed to lubricating oil and is included in LRA Table 3.4.2-3-IP2. These heat exchanger tubes are part of the AFW system. IP2 does not have any in-scope stainless steel heat exchanger tubes in the steam and power conversion systems.

During the site audit, the staff confirmed that the applicant uses the Oil Analysis Program to manage the aging effect and verifies the effectiveness of this program through the One-Time Inspection Program, which includes an inspection of selected components at susceptible locations, as recommended by the GALL Report. The One-Time Inspection Program is a new program that, when implemented, will be consistent with GALL AMP XI.M32. The staff documents its review and evaluation of the applicant's Oil Analysis Program and One-Time Inspection Program in SER Sections 3.0.3.2.12 and 3.0.3.1.9, respectively. Based on the programs identified above, the staff concludes that the applicant has met the criteria in SRP-LR Section 3.4.2.2.2(1) for further evaluation.

Based on the programs identified above, the staff concludes that the applicant's programs meet the criteria in SRP-LR Section 3.4.2.2.4. For those line items that apply to LRA Section 3.4.2.2.4, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed, so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.5 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion

The staff reviewed LRA Section 3.4.2.2.5 against the criteria in SRP-LR Section 3.4.3.2.5.

(1) LRA Section 3.4.2.2.5 addresses the loss of material due to general, pitting, crevice, and microbiologically influenced corrosion for carbon steel piping and components (with or without coating or wrapping) in the steam and power conversion systems buried in soil, stating that the Buried Piping and Tanks Inspection Program manages this aging effect by (1) preventive measures to mitigate corrosion and (2) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel components. Buried components will be inspected when excavated during maintenance, and there will be inspections within 10 years before the period of extended operation and within the first 10 years of the period of extended operation unless opportunistic inspections occur within these 10-year periods. This program will manage the aging effect of the loss of material so the intended functions of components will not be affected.

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SRP-LR Section 3.4.2.2.5 states that the loss of material due to general, pitting, crevice, and microbiologically influenced corrosion may occur in steel piping, piping components, piping elements, and tanks (with or without coating or wrapping) exposed to soil. The Buried Piping and Tanks Inspection Program relies on industry practice, the frequency of pipe excavation, and operating experience to manage the effects of the loss of material from general, pitting, crevice, and microbiologically influenced corrosion. The applicant should verify the effectiveness of its Buried Piping and Tanks Inspection Program by evaluating its inspection frequency and operating experience with buried components to ensure that the loss of material does not occur.

LRA Table 3.4.1, Item 3.4.1-11, addresses the loss of material due to general, pitting, crevice, and microbiologically influenced corrosion for buried steel piping, piping components, piping elements, and tanks (with or without coating and wrapping) exposed to soil. The only AMR item that uses Item 3.4.1-11 of LRA Table 3.4.1 covers the carbon steel buried piping exposed to soil and is included in LRA Tables 3.4.2-3-IP2 and 3.4.2-3-IP3. This piping is part of the AFW system.

During the site audit, the staff reviewed the applicant's new Buried Piping and Tanks Inspection Program and the pertinent documentation on the operating experience with buried piping. The new Buried Piping and Tanks Inspection Program will be implemented within the 10-year period before the period of extended operation, during which time an opportunistic or planned inspection will be performed. Upon entering the period of extended operation, the program will require a planned inspection within 10 years unless an opportunistic inspection has occurred. The staff documents its evaluation of the Buried Piping and Tanks Inspection Program in SER Section 3.0.3.1.2. Based on the programs identified above, the staff concludes that the applicant has met the criteria in SRP-LR Section 3.4.2.2.5(1) for further evaluation.

(2) LRA Section 3.4.2.2.5 addresses the loss of material due to general, pitting, crevice, and microbiologically influenced corrosion for carbon steel heat exchanger components exposed to lubricating oil, stating that the Oil Analysis Program manages this aging effect in the steam and power conversion systems by periodically sampling and analyzing lubricating oil to maintain contaminants within acceptable limits and preserve an environment not conducive to corrosion. The One-Time Inspection Program will use visual inspections or NDEs of representative samples to confirm the effectiveness of the Oil Analysis Program in managing aging effects for components that credit it.

SRP-LR Section 3.4.2.2.5 states that the loss of material due to general, pitting, crevice, and microbiologically influenced corrosion may occur in steel heat exchanger components exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lubricating oil contaminants may not always be fully effective in precluding corrosion; therefore, the applicant should verify the effectiveness of its control of lubricating oil contaminants to ensure that corrosion does not occur. The GALL Report recommends such further evaluation of the program to control lubricating oil chemistry. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that the intended functions of components will be maintained during the period of extended operation.

LRA Table 3.4.1, Item 3.4.1-12, addresses the loss of material due to general, pitting, crevice, and microbiologically influenced corrosion for steel heat exchanger components exposed to lubricating oil. The AMR items that use Item 3.4.1-12 of LRA Table 3.4.1 cover the carbon steel heat exchanger shell exposed to lubricating oil and are included in LRA Tables 3.4.2-3-IP2, 3.4.2-3-IP3, and 3.3.2-19-23-IP3. These heat exchangers are part of the AFW system and the main feedwater pump and services system, respectively.

During the site audits and review of the LRA, the staff confirmed that the applicant uses the Oil Analysis Program to manage the loss-of-material aging effect and verifies the effectiveness of its control of lubricating oil chemistry through the One-Time Inspection Program, which inspects selected components at susceptible locations, as recommended by the GALL Report. The staff reviewed the Oil Analysis Program, which maintains lubricating oil contaminants within acceptable limits. Monitoring and trending the results of oil analyses can identify the aging of components before their intended functions are lost. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with GALL AMP XI.M32. The staff documents its review and evaluation of the Oil Analysis Program and the One-Time Inspection Programs in SER Sections 3.0.3.2.12 and 3.0.3.1.9, respectively. Based on the programs identified above, the staff concludes that the applicant has met the criteria in SRP-LR Section 3.4.2.2.5(2) for further evaluation.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.5 criteria. For those line items that apply to LRA Section 3.4.2.2.5, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed, so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.6 Stress-Corrosion Cracking

The staff reviewed LRA Section 3.4.2.2.6 against the criteria in SRP-LR Section 3.4.3.2.6.

LRA Section 3.4.2.2.6 addresses SCC in stainless steel components exposed to steam or treated water, stating that the Water Chemistry Control—Primary and Secondary Program manages this aging effect. The One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control—Primary and Secondary Program by an inspection of a representative sample of components that credit it, including those in stagnant areas and other susceptible locations.

SRP-LR Section 3.4.2.2.6 states that SCC may occur in stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water greater than 60 °C (140 °F) and in stainless steel piping, piping components, and piping elements exposed to steam. The existing AMP monitors and controls water chemistry to manage the effects of SCC. However, high concentrations of impurities in crevices and stagnant flow conditions may cause SCC; therefore, the GALL Report recommends verifying the effectiveness of water chemistry control programs to ensure that SCC does not occur. A one-time inspection of selected components at susceptible locations is an acceptable method to

ensure that SCC does not occur and that the intended functions of components will be maintained during the period of extended operation.

For PWRs, SRP-LR Section 3.4.2.2.6 cites GALL Report, Volume 1, AMR Items 4-13 and 4-14 and a number of component-specific AMRs in Chapter VIII of the GALL Report, Volume 2, on SCC in stainless steel piping, piping components, piping elements, tanks, and heat exchanger components in steam and power conversion systems that are exposed to treated water greater than 60 °C (140 °F). Like SRP-LR Section 3.4.2.2.6, the aging management guidance in these GALL-based AMRs recommends that a program corresponding to GALL AMP XI.M2, "Water Chemistry," be credited with the management of SCC in the stainless component surfaces that are exposed to treated water greater than 60 °C (140 °F). The guidance also recommends that a program be credited with verifying the effectiveness of the applicant's water chemistry control program in managing cracking in the component surfaces that are exposed to treated water greater than 60 °C (140 °F). These GALL AMRs state that a One-Time Inspection Program is an acceptable basis for verifying the effectiveness of the water chemistry program in managing cracking in these components.

The staff noted that in LRA Table 3.4.1, Item 3.4.1-13, the applicant stated that this line item applies to BWR plants only. This is in accordance with both SRP-LR Table 3.4-1 and Table 4 of the GALL Report. Since IP2 and IP3 are PWRs, the staff agrees with the applicant's determination that the AMR evaluation result pertaining to this line item in the SRP-LR and in the GALL Report is not applicable to IP.

The staff also noted that in LRA Table 3.4.1, Item 3.4.1-14, the applicant addressed SCC in stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water greater than 60 °C (140 °F). During the site audits and review of the LRA, the staff confirmed that the applicant uses the Water Chemistry Control—Primary and Secondary Program to manage the aging effect and verifies the effectiveness of its water chemistry control using the One-Time Inspection Program, which inspects selected components at susceptible locations, as recommended by the GALL Report. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with GALL AMP XI.M32. The staff evaluates the Water Chemistry Control—Primary and Secondary Program and the One-Time Inspection Program in SER Sections 3.0.3.2.17 and 3.0.3.1.9, respectively. Based on the programs identified above, the staff concludes that the applicant has met the criteria in SRP-LR Section 3.4.2.2.6 for further evaluation.

In LRA Tables 3.1.2-4-IP2 and 3.1.2-4-IP3, the staff determined that the applicant aligned some AMRs for secondary-side SG components to LRA AMR Item 3.4.1-14. Specifically, the staff determined that, in LRA Tables 3.1.2-4-IP2 and 3.1.2-4-IP3, the applicant included AMRs on SCC in stainless steel SG instrumentation system piping, valve, and tubing components that are exposed internally to treated water greater than 60 °C (140 °F) and that, in these AMRs, the applicant aligned the AMRs to GALL Report, Volume 1, AMR 4-14 but credited only the Water Chemistry Control—Primary and Secondary Program to manage SCC in the internal component surfaces that are exposed to treated water greater than 60 °C (140 °F). The staff determined that this was inconsistent with the staff's recommended aging management position in GALL Report, Volume 1, AMR 4-14 because, in contrast to the GALL Report guidance, the applicant did not take credit for its One-Time Inspection Program in its AMRs on cracking in the stainless steel secondary-side SG instrumentation system components. In Audit Item 212, the staff asked the applicant to provide its basis for omitting the One-Time Inspection Program in

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the AMRs on cracking in stainless steel SG instrumentation system piping, valve, and tubing components under internal exposure to treated water greater than 60 °C (140 °F).

In its response, dated December 18, 2007, the applicant stated that it would amend the applicable AMRs on cracking in the stainless steel SG instrumentation system piping, valve, and tubing components to make reference to LRA Table 3.1.1, Note 104, which specifically states that the "One-Time Inspection Program will verify effectiveness of the Water Chemistry Control—Primary and Secondary Program." The staff verified that the applicant, in its letter dated December 18, 2007, made the applicable amendment to the AMRs in LRA Table 3.1.2-4-IP2 for these SG instrumentation components. Based on this review of the relevant information in the LRA, the applicant's response to Audit Item 212, and the staff's verification of the amendment to the applicable AMR items for these SG instrumentation components, the staff finds that the applicant has provided an acceptable basis for managing cracking in the stainless steel SG instrumentation system piping, tubing, and valves. This finding is based on the determination that the AMRs for these components have been amended to be consistent with the staff's recommended aging management position in SRP-LR 3.4.2.2.6 and in the GALL Report AMRs that are invoked by this SRP-LR Section.

Based on the programs identified above, the staff concludes that the applicant's programs meet the criteria in SRP-LR Section 3.4.2.2.6 or have provided an acceptable basis for demonstrating that these criteria do not apply to the relevant IP system or systems addressed by the specific SRP-LR item. For those line items that apply to LRA Section 3.4.2.2.6, including the AMRs on cracking in the stainless steel SG instrumentation system piping, tubing, and valves, the staff determines that the LRA is consistent with the SRP-LR and the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed, so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.7 Loss of Material Due to Pitting and Crevice Corrosion

The staff reviewed LRA Section 3.4.2.2.7 against the criteria in SRP-LR Section 3.4.3.2.7.

(1) LRA Section 3.4.2.2.7 addresses the loss of material due to pitting and crevice corrosion for stainless steel and copper alloy components exposed to treated water, stating that the Water Chemistry Control—Primary and Secondary Program manages this aging effect. The steam and power conversion systems have no aluminum components with intended functions that expose them to treated water. The One-Time Inspection Program will confirm the effectiveness of the Water Chemistry Control—Primary and Secondary Program by an inspection of a representative sample of components that credit it, including those in areas of stagnant flow and other susceptible locations.

SRP-LR Section 3.4.2.2.7 states that the loss of material due to pitting and crevice corrosion may occur in stainless steel, aluminum, and copper alloy piping, piping components, and piping elements and in stainless steel tanks and heat exchanger components exposed to treated water. The existing AMP monitors and controls water chemistry to manage the effects of the loss of material due to pitting and crevice corrosion. However, the control of water chemistry may not preclude corrosion at locations with stagnant flow conditions; therefore, the GALL Report recommends verifying the effectiveness of water chemistry programs to ensure that corrosion does

not occur. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that the intended functions of components will be maintained during the period of extended operation.

For PWRs, SRP-LR Section 3.4.2.2.7(1) cites GALL Report, Volume 1, AMRs Items 4-15 and 4-16, and a number of component-specific AMRs in Chapter VIII of the GALL Report, Volume 2, as applicable to the management of the loss of material due to pitting and crevice corrosion in aluminum and copper alloy steam and power conversion system piping, piping components, and piping elements that are exposed to treated water, and in the stainless steel steam and power conversion system piping, piping components, piping elements, tanks, and heat exchanger components that are exposed to a treated water environment. Like SRP-LR Section 3.4.2.2.7(1), the aging management guidance in these GALL-based AMRs recommends that a program corresponding to GALL AMP XI.M2 be credited for managing the loss of material due to pitting and crevice corrosion in the component surfaces that are exposed to a treated water environment, and that a program be credited with verifying the effectiveness of the applicant's water chemistry control program in managing cracking in the component surfaces that are exposed to a treated water environment. These GALL AMRs state that a One-Time Inspection Program is an acceptable basis for verifying the effectiveness of the water chemistry program in managing the loss of material due to pitting and crevice corrosion in these components.

LRA Table 3.4.1, Item 3.4.1-15 (LRA AMR Item 3.4.1-15), is the applicant's AMR that addresses the loss of material due to pitting and crevice corrosion for aluminum and copper alloy piping, piping components, and piping elements exposed to treated water, as discussed in LRA Section 3.4.2.2.7(1). In its discussion in LRA AMR Item 3.4.1-15, the applicant states that there are no in-scope aluminum components exposed to treated water in the IP steam and power conversion systems. LRA Tables 3.4.2-3-IP2, 3.4.2-3-IP3, and 3.3.2-19-4-IP2 list AMR line items on managing the loss of material due to pitting and crevice corrosion of steam and power conversion copper alloy piping components that are based on LRA AMR Item 3.4.1-15 and the staff's AMR guidance in GALL Report, Volume 1 AMR item 4-15. During the site audits and review of the LRA, the staff confirmed that the applicant uses the Water Chemistry Control—Primary and Secondary Program to manage this aging effect for the copper alloy piping and piping components. The staff also determined that, under Note 404 of LRA Table 3.4.1, the applicant credits its One-Time Inspection Program with verifying the effectiveness of the Water Chemistry Control—Primary and Secondary Program in managing the loss of material in these components, as recommended by the GALL Report. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with GALL AMP XI.M32. The staff evaluates the Water Chemistry Control—Primary and Secondary Program and the One-Time Inspection Program in Sections 3.0.3.2.17 and 3.0.3.1.9, respectively. Based on the programs identified above, the staff concludes that the applicant has met the criteria in SRP-LR Section 3.4.2.2.7(1) for further evaluation.

LRA Table 3.4.1, Item 3.4.1-16 (LRA AMR Item 3.4.1-16), contains the applicant's AMR that addresses the loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, and piping elements and for stainless steel tanks and heat exchanger components exposed to treated water, as discussed in LRA

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Section 3.4.2.2.7(1). During the site audits and review of the LRA, the staff confirmed that, for those stainless steel steam and power conversion components that are exposed to treated water, the applicant credits its Water Chemistry Control—Primary and Secondary Program with managing the aging effect. The staff also determined that, under note 404 of LRA Table 3.4.1, the applicant credits its One-Time Inspection Program with verifying the effectiveness of the Water Chemistry Control—Primary and Secondary Program in managing the loss of material in these components, as recommended in the GALL Report. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with GALL AMP XI.M32. The staff evaluates the Water Chemistry Control—Primary and Secondary Program and the One-Time Inspection Programs in Sections 3.0.3.2.17 and 3.0.3.1.9, respectively. Based on the programs identified above, the staff concludes that the applicant has met the criteria in SRP-LR Section 3.4.2.2.7(1) for further evaluation.

The staff noted that, in LRA Tables 3.1.2-4-IP2 and 3.1.2-4-IP3, the applicant aligned some AMRs for secondary-side SG components to LRA AMR Item 3.4.1-16. Specifically, the staff noted that in LRA Tables 3.1.2-4-IP2 and 3.1.2-4-IP3, the applicant included AMRs on the loss of material due to pitting and crevice corrosion of stainless steel SG instrumentation system piping, valve, and tubing components that are exposed internally to a treated water environment, and that the applicant aligned these AMRs with GALL Report, Volume 1, AMR Item 4-16, but credited only the Water Chemistry Control—Primary and Secondary Program with managing the loss of material due to pitting and crevice corrosion in the internal component surfaces that are exposed to a treated water environment. The staff noted that this was inconsistent with the staff's recommended aging management position in GALL Report, Volume 1, AMR Item 4-16 because, in contrast to the GALL guidance, the applicant did not take credit for its One-Time Inspection Program in its AMRs regarding the loss of material in these stainless steel secondary-side SG instrumentation system components. In Audit Item 212, the staff asked the applicant to provide its basis for omitting the One-Time Inspection Program in the AMRs on the loss of material due to pitting and crevice corrosion in the stainless steel SG instrumentation system piping, valve, and tubing components that are exposed internally to a treated water environment.

In its response, dated December 18, 2007, the applicant stated that it would amend the applicable AMRs on the loss of material in the stainless steel SG instrumentation system piping, valve, and tubing components to make reference to LRA Table 3.1.1, Note 104, which specifically states that the "One-Time Inspection Program will verify effectiveness of the Water Chemistry Control—Primary and Secondary Program." The staff verified that the applicant, in its letter dated December 18, 2007, made the applicable amendment to the AMRs in LRA Tables 3.1.2-4-IP2 and 3.1.2-4-IP3 for these SG instrumentation components as noted. Based on this review of the relevant information in the LRA, the applicant's response to Audit Item 212, and the staff's verification of the amendment to the applicable AMR items for these SG instrumentation components, the staff finds that the applicant has provided an acceptable basis for managing the loss of material in the stainless steel SG instrumentation system piping, tubing, and valves. This finding is based on the determination that the AMRs for these components have been amended to be consistent with the staff's recommended aging management position in SRP-LR Section 3.4.2.2.7 and in the GALL Report AMRs that are invoked by this SRP-LR Section.

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(2) LRA Section 3.4.2.2.7 addresses the loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, and piping elements exposed to soil, stating that this aging effect is not applicable because there are no stainless steel components exposed to soil in the steam and power conversion systems.

SRP-LR Section 3.4.2.2.7 states that the loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements exposed to soil. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

LRA Table 3.4.1, Items 3.4.1-17, addresses the loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, and piping elements exposed to soil. The discussion column of LRA Table 3.4.1 states that there are no in-scope stainless steel components exposed to soil in the IP2 and IP3 steam and power conversion systems. Therefore, Item 3.4.1-17 of LRA Table 3.4.1 has not been used in the AMR tables.

(3) LRA Section 3.4.2.2.7 addresses the loss of material due to pitting and crevice corrosion for copper alloy piping and components exposed to lubricating oil, stating that the Oil Analysis Program manages this aging effect by periodically sampling and analyzing lubricating oil to maintain contaminants within acceptable limits and preserve an environment not conducive to corrosion. The One-Time Inspection Program will use visual inspections or NDEs of representative samples to confirm the effectiveness of the Oil Analysis Program in managing the aging effects for components that credit it.

SRP-LR Section 3.4.2.2.7 states that the loss of material due to pitting and crevice corrosion may occur in copper alloy piping, piping components, and piping elements exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, the control of lubricating oil contaminants may not always be fully effective in precluding corrosion; therefore, the applicant should verify the effectiveness of lubricating oil contaminant controls to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the program to control lubricating oil chemistry. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that the intended functions of components will be maintained during the period of extended operation.

LRA Table 3.4.1, Item 3.4.1-18, addresses the loss of material due to pitting and crevice corrosion for the copper alloy piping, piping components, and piping elements exposed to a lubricating oil environment. The only AMR items that use Item 3.4.1-18 in LRA Table 3.4.1 are the copper alloy heat exchanger tubes in LRA Tables 3.4.2-3-IP2 and 3.4.2-3-IP3, and the copper alloy valve body in LRA Table 3.3.2-19-15-IP2.

During the site audits and review of the LRA, the staff confirmed that the applicant uses the Oil Analysis Program to manage the loss-of-material aging effect and verifies the effectiveness of the lubricating oil chemistry control by the One-Time Inspection

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Program, which inspects selected components at susceptible locations, as recommended by the GALL Report. The staff reviewed the Oil Analysis Program, which maintains lubricating oil contaminants within acceptable limits. Monitoring and trending the results of oil analyses can identify the aging of components before their intended functions are lost. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with GALL AMP XI.M32. The staff documents its review and evaluation of the Oil Analysis Program and the One-Time Inspection Program in SER Sections 3.0.3.2.12 and 3.0.3.1.9, respectively. Based on the programs identified above, the staff concludes that the applicant has met the criteria in SRP-LR Section 3.4.2.2.7(3) for further evaluation.

Based on the programs identified above, the staff concludes that the applicant's programs meet the criteria in SRP-LR Section 3.4.2.2.7. For those line items that apply to LRA Section 3.4.2.2.7, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed, so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.8 Loss of Material Due to Pitting, Crevice, and Microbiologically Influenced Corrosion

The staff reviewed LRA Section 3.4.2.2.8 against the criteria in SRP-LR Section 3.4.3.2.8.

LRA Section 3.4.2.2.8 addresses the loss of material due to pitting, crevice, and microbiologically influenced corrosion in stainless steel piping and components exposed to lubricating oil, stating that the Oil Analysis Program manages this aging effect by periodically sampling and analyzing lubricating oil to maintain contaminants within acceptable limits and preserve an environment not conducive to corrosion. The One-Time Inspection Program will use visual inspections or NDEs of representative samples to confirm the effectiveness of the Oil Analysis Program in managing the aging effects for components that credit it.

SRP-LR Section 3.4.2.2.8 states that the loss of material due to pitting, crevice, and microbiologically influenced corrosion may occur in stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, the control of lubricating oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil contaminant controls should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the program to control lubricating oil chemistry. A one-time inspection of selected components at susceptible locations program is an acceptable method to ensure that corrosion does not occur and that the intended functions of components will be maintained during the period of extended operation.

LRA Table 3.4.1, Item 3.4.1-19, addresses the aging effect of the loss of material due to pitting, crevice, and microbiologically influenced corrosion for stainless steel piping, piping components, piping elements, and heat exchanger components exposed to a lubricating oil environment. The AMR items included in the LRA that use Item 3.4.1-19 of LRA Table 3.4.1 cover the stainless steel piping in LRA Table 3.3.2-19-15-IP2, the stainless steel valve bodies in

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LRA Tables 3.3.2-19-15-IP2, 3.3.2-19-41-IP2, 3.3.2-19-23-IP3 and 3.3.2-19-57-IP3, and the stainless steel tubing in LRA Table 3.3.2-19-57-IP3.

During the site audits and review of the LRA, the staff confirmed that the applicant uses the Oil Analysis Program to manage the loss-of-material aging effect and verifies the effectiveness of the lubricating oil chemistry control by the One-Time Inspection Program, which inspects selected components at susceptible locations, as recommended by the GALL Report. The staff reviewed the Oil Analysis Program, which maintains lubricating oil contaminants within acceptable limits. Monitoring and trending the results of oil analyses can identify the aging of components before their intended functions are lost. The staff also reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with GALL AMP XI.M32. The staff documents its review and evaluation of the Oil Analysis Program and the One-Time Inspection Programs in SER Sections 3.0.3.2.12 and 3.0.3.1.9, respectively. Based on the programs identified above, the staff concludes that the applicant has met the criteria in SRP-LR Section 3.4.2.2.8 for further evaluation.

Based on the programs identified above, the staff concludes that the applicant's programs meet the criteria in SRP-LR Section 3.4.2.2.8. For those line items that apply to LRA Section 3.4.2.2.8, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed, so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.9 Loss of Material Due to General, Pitting, Crevice, and Galvanic Corrosion

The staff reviewed LRA Section 3.4.2.2.9 against the criteria in SRP-LR Section 3.4.2.2.9.

LRA Section 3.4.2.2.9 addresses the loss of material due to general, pitting, crevice, and galvanic corrosion for steel heat exchanger components exposed to treated water, stating that this aging effect corresponds to a GALL Report line for BWRs only.

SRP-LR Section 3.4.2.2.9 states that the loss of material due to general, pitting, crevice, and galvanic corrosion may occur in steel heat exchanger components exposed to treated water.

In Item 3.4.1.-5 of LRA Table 3.4.1, the applicant stated that this line item applies to BWRs only. Since IP2 and IP3 are PWRs, the staff agrees with the applicant's determination that the AMR evaluation result in the SRP-LR and in the GALL Report is not applicable.

Based on the above, the staff concludes that the criteria in SRP-LR Section 3.4.2.2.9 do not apply.

3.4.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program.

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3.4A.2.3 IP2 AMR Results Not Consistent with, or Not Addressed in, the GALL Report

In LRA Tables 3.4.2-1-IP2 through 3.4.2-4-IP2, the staff reviewed additional details of the AMR results for combinations of material, environment, AERM, and AMP not consistent with, or not addressed in, the GALL Report.

In LRA Tables 3.4.2-1-IP2 through 3.4.2-4-IP2, the applicant indicated, through Notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, Note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item combination of component, material, and environment is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item combination of component, material, and environment is not applicable. Note J indicates that neither the component nor the combination of material and environment for the line item is evaluated in the GALL Report.

For combinations of component type, material, and environment not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether it has demonstrated that the effects of aging will be adequately managed, so that the intended functions will be maintained consistent with the CLB for the period of extended operation. The staff documents its evaluation in the following sections.

3.4A.2.3.1 Main Steam System—Summary of Aging Management Review—LRA Table 3.4.2-1-IP2

The staff reviewed LRA Table 3.4.2-1-IP2, which summarizes the results of AMR evaluations for the main steam system component groups.

In LRA Table 3.4.2-1-IP2, the applicant used Note I and identified no aging effect for the carbon steel bolting, piping, and piping components, such as steam traps, flow elements, strainer housing, and valve bodies, externally exposed to the plant indoor air environment. Note I for these AMR lines is further supplemented by the plant-specific Note 401, which states that these components are not subject to moisture condensation because they remain at high temperatures during normal plant operation. These components have a similar material and environment as Item SP-1 in the GALL Report, which is applicable to the steel piping, piping components, and piping elements in an external environment of indoor air and does not require an AERM or AMP. On the basis that the LRA components are similar to other GALL Report items for the material and environment (e.g., GALL Report, Volume 2, Table V.F, Line Item V.F-16, whereby the AERM is listed as "none," the AMP is listed as "none," and no further evaluation is required), the staff finds that the effect of plant indoor air on steel components at elevated temperatures will not result in aging that will be of concern during the period of extended operation.

In LRA Table 3.4.2-1-IP2, the applicant applied Note H and identified "cracking–fatigue" as the aging effect for stainless steel piping, piping components, piping elements, and tubing exposed to steam (internal). The applicant has credited the Fatigue Monitoring Program with managing this aging effect. The staff documents its review and evaluation of the proposed Fatigue

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