3.2.3 Conclusion

The staff concluded that the applicant provided sufficient information to demonstrate that the effects of aging for the ESF systems components that are within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicable UFSAR supplement program summaries and concludes that they adequately describe the AMPs credited for managing aging of the ESF systems, as required by 10 CFR 54.21(d).

3.3 Aging Management of Auxiliary Systems

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

- reactor water cleanup system
- reactor core isolation cooling system
- reactor building sampling system
- post accident sampling system
- circulating water system*
- screen wash water system
- service water system
- reactor building closed cooling water system
- turbine building closed cooling water system*
- diesel generator system
- heat tracing system
- instrument air system
- service air system*
- pneumatic nitrogen system
- fire protection system
- fuel oil system
- radioactive floor drains system
- radioactive equipment drains system
- makeup water treatment system
- chlorination system*
- potable water system
- process radiation monitoring system
- area radiation monitoring system*
- liquid waste processing system
- spent fuel system*
- fuel pool cooling and cleanup system
- HVAC diesel generator building
- HVAC reactor building
- HVAC service water intake structure*
- HVAC turbine building*
- HVAC radwaste building*
- torus drain system
- civil structure auxiliary systems
- non-contaminated water drainage system (NCWDS)

The systems denoted by (*) identifies systems that do not contain mechanical components/commodities requiring AMR. LRA Section 2.3.3 discussed the intended functions and in-scope components/commodities for these systems; the aging management reviews of these systems are discussed elsewhere by the staff in this SER. The AMRs for the remaining systems, those that have mechanical components/commodities requiring AMR, are discussed by the staff in this section.

3.3.1 Summary of Technical Information in the Application

In LRA Section 3.3, the applicant provided AMR results for components. In LRA Table 3.3.1, "Summary of Aging Management Evaluations in Chapter VII or NUREG-1801 for Auxiliary Systems," the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the auxiliary systems components and component groups.

The applicant's AMRs incorporated applicable operating experience in the determination of AERMs. These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of 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 operating experience issues identified since the issuance of the GALL Report.

3.3.2 Staff Evaluation

The staff reviewed LRA Section 3.3 to determine if the applicant provided sufficient information to demonstrate that the effects of aging for auxiliary systems components that are 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 performed an onsite audit of AMRs to confirm the applicant's claim that certain identified 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 had identified the appropriate GALL AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluations are documented in the Audit and Review Report and are summarized in SER Section 3.3.2.1.

During the audit, the staff reviewed the AMRs that were consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the acceptance criteria in SRP-LR Section 3.3.2.2. The staff's audit evaluations are documented in the Audit and Review Report and are summarized in SER Section 3.3.2.2.

During the audit, the staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The audit and technical review included evaluating (1) whether all plausible aging effects were identified, and (2) whether the aging effects listed were appropriate for the combination of materials and environments specified. The staff's audit evaluations are documented in the Audit and Review Report and are summarized in

SER Section 3.3.2.3. The staff's evaluation of its technical review is also documented in SER Section 3.3.2.3.

Finally, the staff reviewed the AMP summary descriptions in the UFSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the auxiliary systems components.

Table 3.3-1 below provides a summary of the staff's evaluation of components, aging effects/mechanisms, and AMPs listed in LRA Section 3.3, that are addressed in the GALL Report.

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

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Components in spent fuel pool cooling and cleanup (Item Number 3.3.1-01)	Loss of material due to general, pitting, and crevice corrosion	Water chemistry and one-time inspection	Water Chemistry Program (B.2.2), One-Time Inspection Program (B.2.15)	Consistent with GALL, which recommends further evaluation (See Section 3.3.2.2)
Linings in spent fuel pool cooling and cleanup system; seals and collars in ventilation systems (Item Number 3.3.1-02)	Hardening, cracking and loss of strength due to elastomer degradation; loss of material due to wear	Plant specific	Systems Monitoring Program (B.2.29), Preventive Maintenance Program (B.2.30)	Consistent with GALL, which recommends further evaluation (See Section 3.3.2.2)
Components in load handling, chemical and volume control system (PWR), and reactor water cleanup and shutdown cooling systems (older BWR) (Item Number 3.3.1-03)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Table 3.3.2-1	Section 3.3.2.1 and Section 3.3.2.3.1
Heat exchangers in reactor water cleanup system (BWR); high pressure pumps in chemical and volume control system (PWR) (Item Number 3.3.1-04)	Crack initiation and growth due to SCC or cracking	Plant specific		Not applicable (See Section 3.3.2.2)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Components in ventilation systems, diesel fuel oil system, and emergency diesel generator systems; external surfaces of carbon steel components (Item Number 3.3.1-05)	Loss of material due to general, pitting, and crevice corrosion, and MIC	Plant specific	One-Time Inspection Program (B.2.15), Systems Monitoring Program (B.2.29), Preventive Maintenance Program (B.2.30)	Consistent with GALL, which recommends further evaluation (See Section 3.3.2.2)
Components in reactor coolant pump oil collect system of fire protection (Item Number 3.3.1-06)	Loss of material due to galvanic, general, pitting, and crevice corrosion	One-time inspection		Not applicable (See Section 3.3.2.2)
Diesel fuel oil tanks in diesel fuel oil system and emergency diesel generator system (Item Number 3.3.1-07)	Loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling	Fuel oil chemistry and one-time inspection	Fuel Oil Chemistry Program (B.2.13), One-Time Inspection Program (B.2.15)	Consistent with GALL, which recommends further evaluation (See Section 3.3.2.2)
Piping, pump casing, and valve body and bonnets in shutdown cooling system (older BWR) (Item Number 3.3.1-08)	Water chemistry and one-time inspection	Water chemistry and one-time inspection		Not applicable (See Section 3.3.2.1)
Heat exchangers in chemical and volume control system (Item Number 3.3.1-09)	Crack initiation and growth due to SCC and cyclic loading	Water chemistry and a plant-specific verification program		Not applicable, PWR only
Neutron absorbing sheets in spent fuel storage racks (Item Number 3.3.1-10)	Reduction of neutron absorbing capacity and loss of material due to general corrosion (Boral, boron steel)	Plant specific		Not applicable (See Section 3.3.2.2)
New fuel rack assembly (Item Number 3.3.1-11)	Loss of material due to general, pitting, and crevice corrosion	Structures monitoring		Not applicable (See Section 3.3.2.2)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Spent fuel storage racks and valves in spent fuel pool cooling and cleanup (Item Number 3.3.1-12)	Crack initiation and growth due to stress corrosion cracking	Water chemistry		Not applicable (See Section 3.3.2.2)
Neutron absorbing sheets in spent fuel storage racks (Item Number 3.3.1-13)	Reduction of neutron absorbing capacity due to Boraflex degradation	Boraflex monitoring		Not applicable (See Section 3.3.2.2)
Closure bolting and external surfaces of carbon steel and low-alloy steel components (Item Number 3.3.1-14)	Loss of material due to boric acid corrosion	Boric acid corrosion		Not applicable, PWR Only
Components in or serviced by closed-cycle cooling water system (Item Number 3.3.1-15)	Loss of material due to general, pitting, and crevice corrosion, and MIC	Closed-cycle cooling water system	Closed-Cycle Cooling Water System Program (B.2.8)	Consistent with GALL, which recommends no further evaluation (See Section 3.3.2.2)
Cranes including bridge and trolleys and rail system in load handling system (Item Number 3.3.1-16)	Loss of material due to general corrosion and wear	Overhead heavy load and light load handling systems	Inspection of Overhead Heavy Load and Light Load Handling Systems Program (B.2.9)	Consistent with GALL, which recommends no further evaluation (See Section 3.3.2.2)
Components in or serviced by open-cycle cooling water systems (Item Number 3.3.1-17)	Loss of material due to general, pitting, crevice, and galvanic corrosion, MIC, and biofouling; buildup of deposit due to biofouling	Open-cycle cooling water system	Open-Cycle Cooling Water System Program (B.2.7), Closed-Cycle Cooling Water System Program (B.2.8), Selective Leaching of Materials Program (B.2.16)	Consistent with GALL, which recommends no further evaluation (See Section 3.3.2.2)
Buried piping and fittings (Item Number 3.3.1-18)	Loss of material due to general, pitting, and crevice corrosion, and MIC	Buried piping and tanks surveillance or Buried piping and tanks inspection	Buried Piping and Tanks Inspection Program (B.2.17)	Consistent with GALL, which recommends further evaluation (See Section 3.3.2.2)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Components in compressed air system (Item Number 3.3.1-19)	Loss of material due to general and pitting corrosion	Compressed air monitoring	One-Time Inspection Program (B.2.15)	Not consistent with GALL (See Section 3.3.2.2)
Components (doors and barrier penetration seals) and concrete structures in fire protection (Item Number 3.3.1-20)	Loss of material due to wear; hardening and shrinkage due to weathering	Fire protection	Fire Protection Program (B.2.10)	Consistent with GALL, which recommends no further evaluation (See Section 3.3.2.1)
Components in water-based fire protection (Item Number 3.3.1-21)	Loss of material due to general, pitting, crevice, and galvanic corrosion, MIC, and biofouling	Fire water system	Fire Water System Program (B.2.11)	Consistent with GALL, which recommends no further evaluation (See Section 3.3.2.2)
Components in diesel fire system (Item Number 3.3.1-22)	Loss of material due to galvanic, general, pitting, and crevice corrosion	Fire protection and fuel oil chemistry	Fire Protection Program (B.2.10), Fuel Oil Chemistry Program (B.2.13)	Consistent with GALL, which recommends no further evaluation (See Section 3.3.2.2)
Tanks in diesel fuel oil system (Item Number 3.3.1-23)	Loss of material due to general, pitting, and crevice corrosion	Aboveground carbon steel tanks	Aboveground Carbon Steel Tanks Program (B.2.12), Systems Monitoring Program (B.2.29)	Consistent with GALL, which recommends no further evaluation (See Section 3.3.2.2)
Closure bolting (Item Number 3.3.1-24)	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and SCC	Bolting integrity		Not applicable (See Section 3.3.2.2)
Components in contact with sodium pentaborate solution in standby liquid control system (BWR) (Item Number 3.3.1-25)	Crack initiation and growth due to SCC	Water chemistry		Not applicable (See Section 3.3.2.2)
Components in reactor water cleanup system (Item Number 3.3.1-26)	Crack initiation and growth due to SCC and IGSCC	Reactor water cleanup system inspection	ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD Program (B.2.1); Water Chemistry Program (B.2.2)	Not consistent with GALL (See Section 3.3.2.1 and Section 3.3.2.3.1)

Component Group	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Components in shutdown cooling system (older BWR) (Item Number 3.3.1-27)	Crack initiation and growth due to SCC	BWR stress corrosion cracking and water chemistry		Not applicable
Components in shutdown cooling system (older BWR) (Item Number 3.3.1-28)	Loss of material due to pitting and crevice corrosion, and MIC	Closed-cycle cooling water system		Not applicable (See Section 3.3.2.2)
Components (aluminum bronze, brass, cast iron, cast steel) in open-cycle and closed-cycle cooling water systems, and ultimate heat sink (Item Number 3.3.1-29)	Loss of material due to selective leaching	Selective leaching of materials	Selective Leaching of Materials Program (B.2.16)	Consistent with GALL, which recommends no further evaluation (See Section 3.3.2.1)
Fire barriers, walls, ceilings, and floors in fire protection (Item Number 3.3.1-30)	Concrete cracking and spalling due to freeze-thaw, aggressive chemical attack, and reaction with aggregates; loss of material due to corrosion of embedded steel	Fire protection and structures monitoring	Fire Protection Program (B.2.10), Structures Monitoring Program (B.2.23)	Consistent with GALL, which recommends no further evaluation (See Section 3.3.2.1)

The staff's review of the BSEP component groups followed one of three approaches depending on the group's consistency with the GALL Report. SER Section 3.3.2.1 discusses the staff's review and documentation of the AMR results for components in the auxiliary systems that the applicant indicated are consistent with the GALL Report and do not require further evaluation; SER Section 3.3.2.2 discusses the staff's review and documentation of the AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended; and SER Section 3.3.2.3 discusses the staff's review and documentation of the AMR results for components that the applicant indicated are not consistent with, or not addressed in, the GALL Report. The staff's review of BSEP AMPs that are 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 That Are Consistent with the GALL Report

Summary of Technical Information in the Application. In LRA Section 3.3.2.1, the applicant identified the materials, environments, and aging effects requiring management. The applicant identified the following programs that manage the aging effects related to the auxiliary systems components:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program
- BWR Stress Corrosion Cracking Program
- Flow-accelerated Corrosion Program
- One-Time Inspection Program
- Systems Monitoring Program
- Water Chemistry Program
- Protective Coating Monitoring and Maintenance Program
- Selective Leaching of Materials Program
- Closed-Cycle Cooling Water System Program
- Buried Piping and Tanks Inspection Program
- Open-Cycle Cooling Water System Program
- Preventive Maintenance Program
- Fuel Oil Chemistry Program
- Aboveground Carbon Steel Tanks Program
- Fire Protection Program
- Fire Water System Program

Staff Evaluation. In LRA Tables 3.3.2-1 through 3.3.2-26, the applicant provided a summary of AMRs for the auxiliary systems components, and identified which AMRs it considered to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report does not recommend further evaluation, the staff performed an audit to determine whether the plant-specific components contained in these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant provided a note for each AMR line item. The notes described how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with Notes A through E, which indicate that the AMR is consistent with the GALL Report.

Note A indicated 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 AMP identified in the GALL Report. 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 BSEP AMP takes some exceptions to the AMP identified in the GALL Report. The staff audited these line items to verify consistency with the GALL Report. The staff verified that the identified exceptions to the GALL AMPs had been reviewed and accepted by the staff. The staff also determined whether the BSEP AMP identified by the applicant was consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item is different from, but consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the AMP identified by the GALL Report. 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 that had the same material, environment, aging effect,

and AMP as the component that was 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 different from, but consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP takes some exceptions to the AMP identified in the GALL Report. 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. The staff verified whether the identified exceptions to the GALL AMPs had been reviewed and accepted by the staff. The staff also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report 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 a different aging management program is credited. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the identified AMP would manage the aging effect consistent with the AMP identified by the GALL Report and whether the AMR was valid for the site-specific conditions.

The staff conducted an audit of the information provided in the LRA, as documented in the Audit and Review 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 had identified the appropriate GALL Report AMRs. The staff's evaluation is discussed below.

In LRA Section 3.3, the applicant provided the results of its AMRs for the auxiliary systems.

LRA Tables 3.3.2-1 through 3.3.2-25 provide a summary of the applicant's AMR results for components/commodities in the (1) reactor water cleanup (RWCU) system; (2) RCIC system; (3) reactor building sampling system; (4) high post-accident sampling system; (5) screen wash water system; (6) service water system; (7) RBCCW system; (8) DG system; (9) heat tracing system; (10) instrument air system; (11) PMS; (12) fire protection system; (13) fuel oil system; (14) radioactive floor drains system; (15) radioactive equipment drains system; (16) makeup water treatment system; (17) potable water system; (18) PRM system; (19) liquid waste processing system; (20) fuel pool cooling and cleanup system; (21) HVAC diesel generator building; (22) HVAC reactor building; (23) torus drain system; (24) civil structure auxiliary systems; and (25) NCWDS.

Also, for each component type in LRA Table 3.3.1, the applicant identified those components that are consistent with the GALL Report for which no further evaluation is required, those that are consistent with the GALL Report for which further evaluation is recommended, and those that are not addressed in the GALL Report together with the basis for their exclusion.

For AMRs that the applicant stated are consistent with the GALL Report, the staff conducted its audit to determine if the applicant's references to the GALL Report in the LRA are acceptable.

The staff reviewed its assigned LRA line-items to determine that the applicant (1) provided a brief description of the system, components, materials, and environment; (2) stated that the applicable

aging effects have been reviewed and are evaluated in the GALL Report; and (3) identified those aging effects for the reactor water cleanup system, reactor core isolation cooling system, reactor building sampling system, post-accident sampling system, screen wash water system, service water system, reactor building closed cooling water system, diesel generator system, heat tracing system, instrument air system, pneumatic nitrogen system, fire protection system, fuel oil system, radioactive floor drains system, radioactive equipment drains system, makeup water treatment system, potable water system, process radiation monitoring system, liquid waste processing system, fuel pool cooling and cleanup system, HVAC diesel generator building, HVAC reactor building, torus drain system, civil structure auxiliary systems, and non-contaminated water drainage system components that are subject to an AMR.

3.3.2.1.1 Loss of Material for Circulating Water Pump Strainers in the Service Water System

In the discussion section of LRA Table 3.3.2-6, the applicant included an AMR line item for strainers in the service water system that are constructed of copper alloy and exposed to raw water on their internal surface. The Open-Cycle Cooling Water System Program is credited for managing loss of material due to crevice corrosion, pitting corrosion, and MIC. GALL Report item VII.C1.6-a is referenced, which evaluates strainers constructed of carbon steel and stainless steel. This GALL Report line item does not identify copper alloy as one of the materials evaluated. However, generic Note C is noted in the applicant's AMR, indicating consistency with the GALL Report, except for the component. In the audit, the staff asked the applicant why generic Note C was referenced for this AMR.

As documented in the Audit and Review Report, the applicant provided the following explanation for this discrepancy:

> The strainers in question are circulating water pump cooling water strainers in scope for spatial interaction. The assignment of note C was a result of comparing these housings to GALL line item VII.C1.1-a (piping and fittings), which does include copper alloys in a raw water environment. As such, the appropriate GALL reference should be to VII.C1.1-a; not VII.C1.6-a. The service water basket strainers addressed elsewhere in Table 3.3.2-6, are referenced to GALL VII.C1.6-a, and correctly assigned Note A.

On the basis of its review, the staff found that the applicant appropriately addressed the aging mechanism, as recommended by the GALL Report.

3.3.2.1.2 Loss of Material for Piping in the Instrument Air System

In the discussion section of LRA Table 3.3.2-10, the applicant included an AMR line item for piping in the instrument air system that is constructed of carbon steel and exposed to indoor air on its internal surface. The One-Time Inspection Program is credited for managing loss of material due to general corrosion for this component; however, GALL Report line item VII.D.1-a recommends the Compressed Air Monitoring Program to manage this aging effect. The applicant's AMR indicates generic Note E, indicating consistency with the GALL Report except for the AMP.

In comparing the AMP recommended in the GALL Report to the applicant's One-Time Inspection Program, the staff noted that the AMP recommended in the GALL Report includes activities in

addition to visual inspection for managing this aging effect, such as frequent leak testing of valves, piping, and other system components, and a preventive maintenance program to check air quality at several locations in the system. The applicant's program does not include these activities.

During the audit, the staff asked the applicant to provide justification for concluding that the One-Time Inspection Program is sufficient to manage aging for the piping identified in this AMR line item. In its response, the applicant provided the following explanation:

> In the BSEP LRA Table 3.3.2-10 for the instrument air system, the table line item for piping with indoor air (internal) and the one-time inspection AMP represents components that are in the instrument air system but are not in an instrument air or compressed air environment. The internal environment is indoor air. The components representing the line item are non safety-related piping downstream of relief valves connected to the safety-related nitrogen header and are shown on drawing D-73068-LR Sh 1. The GALL XI.M32 one-time inspection AMP is appropriate for the subject instrument air system piping components.
>
> As stated in the draft 2005 GALL Report, a one-time inspection may be used to provide additional assurance that aging that has not yet manifested itself is not occurring, that the evidence of aging shows that the aging is so insignificant that an aging management program is not warranted. A one-time inspection may also trigger development of a program necessary to assure component intended functions through the period of extended operation. XI.M32 also states that there may be locations that are isolated from the flow stream for extended periods and are susceptible to the gradual accumulation or concentration of agents that promote certain aging effects. This program provides inspections that either verify that unacceptable degradation is not occurring or trigger additional actions that will assure the intended function of affected components will be maintained during the period of extended operation.
>
> In summary, the subject in-scope instrument air system components are not in an instrument air or a compressed air environment. Thus, a compressed air monitoring program would not be a good fit. Instead, the One-Time Inspection Program was chosen. The use of the one-time inspection AMP is appropriate for the subject instrument air piping components.

The applicant also provided a copy of a BSEP calculation, as documented in the Audit and Review Report, which was reviewed by the staff to confirm the application of the piping in question and the environment identified in the LRA for this component.

The staff determined that, since the subject components are not in a compressed air environment, the compressed air program would not be appropriate for aging management. The One-Time Inspection Program will provide inspections that either verify that unacceptable degradation is not occurring or trigger additional actions that will assure that the intended function of affected components will be maintained during the period of extended operation. Therefore, the One-Time Inspection Program is an acceptable AMP to manage aging for these components.

On the basis of its review, the staff found that the applicant appropriately addressed the aging mechanism, as recommended by the GALL Report.

3.3.2.1.3 Loss of Material for Piping and Valves in the Heat Tracing System

In the discussion section of LRA Table 3.3.2-9, the applicant included AMR line items for piping and valves in the heat tracing system that are constructed of carbon steel and exposed to treated water on their internal surface. The One-Time Inspection Program is specified for managing loss of material due to corrosion for these components. Since the environment is treated water, the staff expected that the Water Chemistry Program would also be credited. During the audit, the staff asked the applicant to provide justification for not crediting the Water Chemistry Program, in addition to the One-Time Inspection Program, for aging management. In its response the applicant stated:

> The steam supplied to the heat tracing system from the auxiliary boiler can be classified as treated water. However, it is not appropriate to credit the water chemistry program to prevent aging of the heat tracing system piping. Auxiliary boiler water quality is not controlled to the same water chemistry requirements applicable to reactor feed water. The heat tracing system is used on a very infrequent basis. The One-Time Inspection Program is considered to be the appropriate program to confirm the extent, if any, of age-related degradation.

The staff reviewed and determined the applicant's response to be acceptable, on the basis that credit cannot be taken for the Water Chemistry Program and a one-time inspection of this infrequently used system will determine the extent of degradation, if any, and any follow-up actions required, prior to entering the extended period of operation. On the basis of its review, the staff found that the applicant appropriately addressed the aging mechanism, as recommended by the GALL Report.

Conclusion. 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 associated aging effects. On the basis of its review, the staff concluded that the AMR results, which the applicant claimed to be consistent with the GALL Report, are consistent with the AMRs in the GALL Report. Therefore, the staff concluded that the applicant 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 for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2 AMR Results For Which Further Evaluation is Recommended By the GALL Report

Summary of Technical Information in the Application. In LRA Section 3.3.2.2, the applicant provided further evaluation of aging management as recommended by the GALL Report for the auxiliary systems. The applicant provided information concerning how it will manage the following aging effects:

- loss of material due to general, pitting, and crevice corrosion
- hardening and cracking or loss of strength due to elastomer degradation or loss of material due to wear

- cumulative fatigue damage
- crack initiation and growth due to cracking or stress corrosion cracking
- loss of material due to general, microbiologically influenced, pitting, and crevice corrosion
- loss of material due to general, galvanic, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and biofouling
- quality assurance for aging management of NSR components
- crack initiation and growth due to stress corrosion cracking and cyclic loading
- reduction of neutron absorbing capacity and loss of material due to general corrosion
- loss of material due to general, pitting, crevice, and microbiologically influenced corrosion

Staff Evaluation. For component groups evaluated in the GALL Report for which the applicant has claimed consistency with the GALL Report, and for which the GALL Report recommends further evaluation, the staff audited the applicant's evaluation to determine whether it adequately addressed the issues that were further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.3.2.2. Details of the staff's audit are documented in the staff's Audit and Review Report. The staff's evaluation of the aging effects is discussed in the following sections.

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

Spent Fuel Pool Cooling Heat Exchangers. The staff reviewed LRA Section 3.3.2.2.1.1 against the criteria found in SRP-LR Section 3.3.2.2.1:

> Loss of material due to general, pitting, and crevice corrosion could occur in the channel head and access cover, tubes, and tubesheets of the heat exchanger in the spent fuel pool cooling and cleanup [system]. The water chemistry program relies on monitoring and control of reactor water chemistry based on EPRI guidelines of BWRVIP-29 (TR-103515) for water chemistry in BWRs to manage the effects of loss of material from general, pitting or crevice corrosion. However, high concentrations of impurities at crevices and locations of stagnant flow conditions could cause general, pitting, or crevice corrosion. Therefore, verification of the effectiveness of the chemistry control program should be performed to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage loss of material from general, pitting, and crevice corrosion to verify the effectiveness of the water chemistry program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

In LRA Section 3.3.2.2.1.1, the applicant stated that the Water Chemistry Program is used to manage aging effects/mechanisms that could occur on various heat exchanger components in the fuel pool cooling system that are exposed to treated water used as coolant for the fuel pools. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry

Program for the management of corrosion for the surfaces of components normally exposed to the fuel pool treated water.

The staff found that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.1 for further evaluation. The staff found that the applicant demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Spent Fuel Pool Cooling Piping, Valves, Filters, and Ion Exchangers. The staff reviewed LRA Section 3.3.2.2.1.2 against the criteria found in SRP-LR Section 3.3.2.2.1:

> Loss of material due to pitting and crevice corrosion could occur in the piping, filter housing, valve bodies, and shell and nozzles of the ion exchanger in the spent fuel pool cooling and cleanup system. The water chemistry program relies on monitoring and control of reactor water chemistry based on EPRI guidelines of BWRVIP-29 (TR-103515) for water chemistry in BWRs to manage the effects of loss of material from pitting or crevice corrosion. However, high concentrations of impurities at crevices and locations of stagnant flow conditions could cause pitting or crevice corrosion. Therefore, verification of the effectiveness of the chemistry control program should be performed to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage loss of material from pitting and crevice corrosion to verify the effectiveness of the water chemistry program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

In LRA Section 3.3.2.2.1.2, the applicant stated that the Water Chemistry Program is used to manage aging effects/mechanisms that could occur on various components in the fuel pool cooling system that are exposed to treated water used as coolant for the fuel pools. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program for the management of corrosion for the surfaces of components normally exposed to the fuel pool treated water.

The staff found that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.1 for further evaluation. The staff found that the applicant demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.2 Hardening and Cracking or Loss of Strength Due to Elastomer Degradation or Loss of Material Due to Wear

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

> Hardening and cracking due to elastomer degradation could occur in elastomer linings of the filter, valve, and ion exchangers in spent fuel pool cooling and cleanup systems. Hardening and loss of strength due to elastomer degradation could occur in the collars and seals of the duct and in the elastomer seals of the filters in the control room area, auxiliary and radwaste area, and primary

containment heating ventilation systems and in the collars and seals of the duct in the diesel generator building ventilation system. Loss of material due to wear could occur in the collars and seals of the duct in the ventilation systems. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

In LRA Section 3.3.2.2.2, the applicant stated that the plant-specific Systems Monitoring Program is used to manage aging effects/mechanisms for the external surfaces of elastomer components. The Preventive Maintenance Program is used to manage aging effects/mechanisms for the internal surfaces of elastomer components for the emergency diesel generator building, reactor building, and control building ventilation systems. No valve elastomers requiring aging management have been identified in the fuel pool cooling system.

The staff found that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.2 for further evaluation. The staff found that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.3 Cumulative Fatigue Damage

Cumulative fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed in LRA Section 4.6.

3.3.2.2.4 Crack Initiation and Growth Due to Cracking or Stress Corrosion Cracking

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

> Crack initiation and growth due to SCC could occur in the regenerative and non-regenerative heat exchanger components in the reactor water cleanup system of BWR plants. The GALL Report recommends further evaluation to ensure that these aging effects are managed adequately.

In LRA Section 3.3.2.2.4, the applicant stated that, for the regenerative and non-regenerative heat exchangers in the reactor water cleanup system, this component group is not applicable because only the carbon steel shells of the reactor water cleanup system heat exchangers have an intended function, and carbon steel is typically not subject to SCC.

The staff confirmed that only the carbon steel shells of the regenerative heat exchangers have an intended function and are within the scope of license renewal because they are the anchor in the pipe stress analyses associated with the SR/NSR boundary at valves 1-G31-F042 and 2-G31-F042. The carbon steel shells of the non-regenerative heat exchangers have no intended function, and are not within the scope of license renewal.

The staff agreed with the applicant's assessment that SCC does not apply to the carbon steel shell. Therefore, the staff concluded that the applicant's evaluation is acceptable, on the basis that SRP-LR Section 3.3.2.2.4 is not applicable to BSEP.

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

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

> Loss of material due to general, pitting, and crevice corrosion could occur in the piping and filter housing and supports in the control room area, the auxiliary and radwaste area, the primary containment heating and ventilation systems; in the piping of the diesel generator building ventilation system, in the above ground piping, and fittings, valves, and pumps in the diesel fuel oil system and in the diesel engine starting air, combustion air intake, and combustion air exhaust subsystems in the EDG system. Loss of material due to general, pitting, crevice and microbiologically influenced corrosion could occur in the duct fittings, access doors, and closure bolts, equipment frames and housing of the duct, due to pitting and crevice corrosion could occur in the heating/cooling coils of the air handler heating/cooling, and due to general corrosion could occur on the external surfaces of all carbon steel SCs, including bolting exposed to operating temperatures less than 212°F in the ventilation systems. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

In LRA Section 3.3.2.2.5, the applicant stated that loss of material on the exterior surfaces of carbon steel components exposed to moist air will be managed using the Systems Monitoring Program for those components with operating temperatures less than 212°F. The One-Time Inspection Program will confirm that aging is managed on the interior surfaces of those components that are exposed to moist air, but not subject to periodic inspection under the Preventive Maintenance Program.

The applicant stated that the components described in LRA Section 3.3.2.2.5 as requiring aging management for loss of material are all constructed of carbon steel, with the exception of a drain valve in the control building HVAC system. The potential for loss of material due to crevice corrosion and pitting corrosion exists for the internal surface of this stainless steel valve located in the condensate drain piping of the control building HVAC system. The internal surface of this valve is normally in a moist air environment and is subject to periodic wetting. The condition of the valve will be confirmed by the One-Time Inspection Program.

LRA Section 3.3.2.2.5 also states that the external surfaces of the plate coils within the penetration cooling system are normally concealed from view, such that routine visual inspection is not practical. These components will be managed with the Preventive Maintenance Program.

LRA Section 3.3.2.2.5 further states that aging of both the exterior and interior surfaces of miscellaneous mechanical components associated with the control building, diesel generator building, service water intake structure, and reactor buildings will be managed for loss of material using the Preventive Maintenance Program. These include sump pump components and back flow valves. The staff noted that the description of the Preventive Maintenance Program in LRA Section B.2.30 includes a table that identifies the components included in the program, and the reactor building is not listed in the line item associated with aging of sump pump components. During the audit, the staff asked the applicant to explain this apparent discrepancy.

As documented in the Audit and Review Report, the applicant provided the following explanation for this discrepancy:

> The table in the description of BSEP AMP B.2.30 is correct. The reactor building sump pumps are associated with the radioactive floor drains system and are subject to a one-time inspection. The further evaluation in Section 3.3.2.2.5 of the BSEP LRA should state '...aging of both the exterior and interior surfaces of miscellaneous mechanical components associated with the control building, diesel generator building, and service water intake structure will be managed for loss of material using the preventive maintenance program (BSEP AMP B.2.30)'.

The staff determined the applicant's response acceptable on the basis that it clarifies the applicant's AMR for aging management of the reactor building sump pump components. The reactor building sump pumps are included in the radioactive floor drains system and the One-Time Inspection Program will be used to manage aging, which is acceptable.

LRA Section 3.3.2.2.5 further states that aging of exterior surfaces of aboveground carbon steel tanks associated with the fire protection system will be managed by the Aboveground Carbon Steel Tanks Program.

The staff found that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.5 for further evaluation. The staff found that the applicant demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.6 Loss of Material Due to General, Galvanic, Pitting, and Crevice Corrosion

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

> Loss of material due to general, galvanic, pitting, and crevice corrosion could occur in tanks, piping, valve bodies, and tubing in the reactor coolant pump oil collection system in fire protection. The fire protection program relies on a combination of visual and volumetric examinations in accordance with the guidelines of 10 CFR Part 50 Appendix R and Branch Technical Position 9.5-1 to manage loss of material from corrosion. However, corrosion may occur at locations where water from wash downs may accumulate. Therefore, verification of the effectiveness of the program should be performed to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage loss of material due to general, galvanic, pitting, and crevice corrosion to verify the effectiveness of the program. A one-time inspection of the bottom half of the interior surface of the tank of the reactor coolant pump oil collection system is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

In LRA Section 3.3.2.2.6, the applicant stated, and the staff agreed, that components in the reactor coolant pump oil collection fire protection system are not applicable since BSEP is not designed with a reactor coolant pump oil collection system. The reactor coolant pumps are contained within the primary containment, which is inerted with nitrogen during normal operation.

The staff found that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.6 for further evaluation. The staff found that the applicant demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained 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, Crevice, and Microbiologically Influenced Corrosion, and Biofouling

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

> Loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling could occur on the internal surface of tanks in the diesel fuel oil system and due to general, pitting, and crevice corrosion and MIC in the tanks of the diesel fuel oil system in the EDG system. The existing AMP relies on the fuel oil chemistry program for monitoring and control of fuel oil contamination in accordance with the guidelines of ASTM Standards D4057, D1796, D2709 and D2276 to manage loss of material due to corrosion or biofouling. Corrosion or biofouling may occur at locations where contaminants accumulate. Verification of the effectiveness of the chemistry control program should be performed to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage corrosion/biofouling to verify the effectiveness of the program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

In LRA Section 3.3.2.2.7, the applicant stated that the Fuel Oil Chemistry Program manages loss of material and fouling for all components wetted by fuel oil. This also includes the tank and other components supplying fuel to the diesel fire pump. The effectiveness of the Fuel Oil Chemistry Program is confirmed by inspection of fuel oil tanks using the One-Time Inspection Program.

The staff found that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.7 for further evaluation. The staff found that the applicant demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.8 Quality Assurance for Aging Management of Non-Safety Related Components

The staff addressed this subject in SER Section 3.0.4.

3.3.2.2.9 Crack Initiation and Growth Due to Stress Corrosion Cracking and Cyclic Loading (LRA Section 3.3.2.2.8)

Applicable to PWR systems only.

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

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

> Reduction of neutron-absorbing capacity and loss of material due to general corrosion could occur in the neutron-absorbing sheets of the spent fuel storage rack in the spent fuel storage. The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

In LRA Section 3.3.2.2.10, the applicant stated that the boral plates are sandwiched between the inner and outer wall of the rack tubes and are not subject to dislocation, deterioration, or removal. Plant-specific operating experience and testing results of boral sample stations have validated the absence of aging effects. Therefore, no AMP is required for this commodity.

The staff reviewed the applicant's further evaluation and requested documentation of the test results that support the applicant's conclusion that no AMP is required. The applicant provided information, as documented in the Audit and Review Report, which included a summary of test results performed in 1989 and 1995. The boral plates were installed in 1984 as part of a spent fuel pool expansion, and boral coupons were tested in 1989 and 1995 to monitor degradation of the boral. The results of the tests showed little change (i.e., no significant aging) of the coupons from their original condition in 1984. Based on these results, the applicant noted that further testing was not warranted. The staff's review of the test results supports this conclusion.

The staff found that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.10 for further evaluation. The staff found that the applicant demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained 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 General, Pitting, Crevice, and Microbiologically Influenced Corrosion

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

> Loss of material due to general, pitting, and crevice corrosion and MIC could occur in the underground piping and fittings in the open-cycle cooling water system (SW system) and in the diesel fuel oil system. The buried piping and tanks inspection program relies 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 is not occurring.

In LRA Section 3.3.2.2.11, the applicant stated that the Buried Piping and Tanks Inspection Program will be used for managing loss of material for buried components of the service water and diesel fuel oil systems. The program relies on industry practice and operating experience to manage the effects of loss of material from exterior corrosion.

The staff found that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.3.2.2.11 for further evaluation. The staff found that the applicant demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Conclusion. On the basis of its review, for component groups evaluated in the GALL Report for which the GALL Report recommends further evaluation, the staff determined that the applicant adequately addressed the issues that were further evaluated. The staff found that the applicant demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3 Results That Are Not Consistent with or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In LRA Tables 3.3.2-1 through 3.3.2-25, the staff reviewed additional details of the results of the AMRs for material, environment, aging effect requiring management, and AMP combinations that are not consistent with the GALL Report, or that are not addressed in the GALL Report.

In LRA Tables 3.3.2-1 through 3.3.2-25, the applicant indicated, via Notes F through J, that neither the identified component nor the material and environment combination is evaluated in the GALL Report and provided information concerning how the aging effect will be managed. Specifically, Note F indicated that the material for the AMR line-item component is not evaluated in the GALL Report. Note G indicated that the environment for the AMR line-item component and material is not evaluated in the GALL Report. Note H indicated that the aging effect for the AMR line-item component, material, and environment combination is not evaluated in the GALL Report. Note I indicated that the aging effect identified in the GALL Report for the line-item component, material, and environment combination is not applicable. Note J indicated that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

Staff Evaluation. For component type, material, and environment combinations that are not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant had demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation. The staff's evaluation is discussed in the following sections.

The RAIs are organized in two groups: general RAIs and system-specific RAIs.

General RAIs on AMR Issues:

By letter dated April 25, 2005, the staff requested the applicant to provide additional information on issues described in the following general RAIs (RAIs 3.3-1 through 3.3-4) which are applicable to more than one system. By letter dated May 11, 2005, the applicant responded to these RAIs. In addition, the applicant addressed the use of the One-Time Inspection Program in supplemental response to the staff's RAI 3.3.2-5-1, by letter dated August 11, 2005. The following describes these RAIs, the applicant's responses, and the staff's evaluation of these responses.

Erosion of Plastic/Polymer, Materials In RAI 3.3-1, the staff stated that in LRA Table 3.3.2-5 for the screen wash water system and in Table 3.3.2-6 for the service water system, cracking is identified as an aging effect for plastics/polymer piping exposed to a raw water (internal) environment. Table 3.3.2-5 credits the One-Time Inspection Program and Table 3.3.2-6 credits the Open-Cycle Cooling Water System Program to manage cracking caused by exposure to raw water. LRA Table 3.0-1 describes raw water as water that enters the plant from a river, lake, pond, ocean, or bay that has not been demineralized and has been rough filtered to remove large

particles. Small particles in raw water may cause erosion in materials susceptible to erosion. For example, LRA Table 3.3.2-6 identifies copper-alloy materials exposed to raw water as being susceptible to loss of material due to erosion and the open-cycle cooling water system program is credited with managing this aging effect. Therefore, the staff requested that the applicant clarify why loss of material from erosion is not identified for plastics/polymer piping in a raw water environment and to evaluate if a periodic inspection rather than a one-time inspection would be more appropriate to manage aging effects in plastics/polymer piping for the screen wash water system. The applicant was also requested to consider industry and plant operating experience in determining appropriate aging effects and programs to manage this material.

In its response, dated May 11, 2005, the applicant provided the following information:

> The components represented by this line item are elastomeric (i.e., butyl rubber) expansion joints. This material is extremely resistant to erosion and is commonly used in fluid applications where abrasive components are present. Operating experience, to date, has not identified degradation of these components due to erosion or abrasion. BSEP has conservatively predicted cracking may occur as a result of aging. This aging effect, driven by age related hardening of the rubber expansion joint element, would be a slowly occurring phenomenon for which a one time inspection would be appropriate.

The staff reviewed the applicant's response and found the response to be reasonable and acceptable because the applicant identified the specific elastomeric material as butyl rubber and clarified that this material is resistant to erosion. The applicant also indicated that operating experience has not identified degradation of these components as a result of erosion or abrasion, and the One-Time Inspection Program is appropriate for a slowly occurring aging effect. Based on the erosion-resistant properties of butyl rubber and operating experience, the staff agreed that erosion is not an applicable aging effect and the One-Time Inspection Program is appropriate to manage other aging effects in plastic/polymer materials. Therefore, the staff's concern described in RAI 3.3-1 is resolved.

Bolting Integrity In RAI 3.3-2, the staff stated that the auxiliary systems 3.3.2 AMR tables in the LRA do not include bolting, and the Bolting Integrity Program is not credited in the 3.3.2 AMR tables. In LRA Table 3.3.1, Item 3.3.1-24 indicates that the Bolting Integrity Program is not applicable to Non-Class 1 closure bolting, and bolting materials are not itemized as a separate component. This table further states that the Systems Monitoring Program, credited for visual identification of external general corrosion, will also address bolting materials. Therefore, the staff requested that the applicant explain (1) why crack initiation and growth due to cyclic loading and loss of preload are not identified as aging effects for auxiliary systems bolting; (2) the conditions under which certain sizes of cracks can be identified visually in the closure bolting for auxiliary system components; and (3) why the bolting integrity AMP, currently designated for Class 1 closure bolting only, is not credited for managing cracking, loss of preload, and other aging effects for closure bolting in auxiliary system components.

In its response, dated May 11, 2005, the applicant provided the following information:

(1) BSEP has revised its position on bolting in response to NRC concerns raised during the Aging Management Program (AMP) portion of the GALL Consistency Audit. The revised Bolting Integrity Program addresses bolting integrity for each of the NUREG-1800, "Standard Review Plan for the Review of License Renewal

Applications for Nuclear Power Plants," system groupings (i.e., Reactor Vessel and Internals and Reactor Coolant System/Class 1, Engineered Safety Features, Auxiliary, and Steam and Power Conversion Systems). Aging management reviews for each these groupings treat bolting as potentially susceptible to loss of material, cracking and loss of preload consistent with NUREG-1800. BSEP uses the Bolting Integrity Program, ASME Section XI Inservice Inspection, Subsection IWB, IWC and IWD Program, and Systems Monitoring for aging management

(2) Physical inspections (i.e., surface and volumetric exams) of Auxiliary System bolting for cracking are performed, to the extent applicable, under the ASME Section XI Inservice Inspection, Subsection IWB, IWC and IWD Program, as noted in the NUREG-1801, "Generic Aging Lessons Learned (GALL) Report," description of the Bolting Integrity Program, XI.M18. Inspection methods and acceptance criteria for these inspections are specified by the ASME Code. BSEP Auxiliary Systems do not utilize high strength pressure boundary bolting, and direct visual examinations for cracking is not considered necessary. The Bolting Integrity Program does contain elements of materials control, consumables control, and installation/torquing that are preventive in nature and are generally applied to pressure boundary bolting, as well as physical inspections for leakage under the ASME Section XI Inservice Inspection, Subsection IWB, IWC and IWD Program and the Systems Monitoring Program, as applicable.

(3) See the response to item (1), above.

The staff reviewed the applicant's response and found that the response is reasonable and acceptable because the applicant provided sufficient information on how bolting is managed in auxiliary systems. The staff found that revising the Bolting Integrity Program to be consistent with the GALL Report should provide reasonable assurance that bolting in auxiliary systems will be adequately managed to ensure that bolting performs its intended function. Therefore, the staff's concern described in RAI 3.3-2 is resolved.

Aging Effects for Lubricating Oil Environment In RAI 3.3-3, the staff stated that in LRA Tables 3.3.2-6 and 3.3.2-8, no aging effects are identified for certain carbon steel and copper-alloy components in a lubricating oil (LO) environment and no AMPs are credited. Carbon steel and copper-alloy materials may experience loss of material in an oil environment if exposed to contaminants and/or moisture. For example, LRA Table 3.3.2-8 identified certain carbon steel materials in a fuel oil environment that are susceptible to loss of material. GALL Report item VII G.7.2 identifies loss of material for carbon steel and copper-alloy materials in a LO environment with contaminants and/or moisture, and identifies a verification program. In LRA Table 3.0-1, the description of a lubricating oil environment includes the statement that water contamination of lubricating oil is not assumed unless indicated by operating experience or design review. Therefore, the staff requested that the applicant clarify if leakage of raw water or the absence of a chemistry control AMP for the lubricating oil may result in contamination of the LO environment such that aging effects could occur. If such aging effects could occur, the staff also requested that the applicant identify an appropriate AMP to manage the aging effects. Furthermore, the staff also requested that the applicant address industry and plant-specific operating experience for this aging effect.

By letter dated May 11, 2005, the applicant provided the following information:

The components in question are the "Heat Exchanger (Service Water Pump Motor Cooler Coils)," Lube Oil side, in Table 3.3.2-6, and components of the DG Engines and Lube Oil Systems, in Table 3.3.2-8.

GALL item VII.G7.2 identifies loss of material for copper alloy materials in a lubricating oil (LO) environment for Reactor Coolant Pump Oil Collection System components. Contamination is expected and water intrusion is possible in this system. The environment described in GALL item VII.G7 is not applicable to the SW and DG components in question.

Metals are not corroded by the hydrocarbon components of lubricants. LO is not a good electrolyte, and the oil film on the lubricated surfaces of components tends to minimize the potential for corrosion. Moisture contamination and the use of additives can, however, cause corrosion. Copper and copper alloys, for example, may be attacked by oxidized oil and active sulfur compounds, especially in the presence of water. One of the functions of almost all lubricants is the prevention of corrosion in the lubricating system by water. The purity of the LO for major BSEP components is maintained and sampled regularly.

Fuel oil can present a much more corrosive environment if there should be an intrusion of water during transportation and storage. Microbiologically-induced corrosion (MIC) is also a potential concern in fuel oil systems. Water and other contaminants, such as chlorides and sulfides, occur naturally in crude oil. While fuel oil in its purest refined form contains little if any moisture, water contamination can occur during storage and transportation. This water contamination, naturally occurring contaminants, and any fuel additives, can produce an environment which is corrosive. Several forms of fungus and other microorganisms can survive and multiply in hydrocarbon fuels. These organisms can occur in all areas of the fuel handling system and need only trace amounts of minerals and water to sustain their growth.

As noted in LRA Table 3.0-1, the BSEP LO environment is defined as oil used in diesel engines, pumps, air compressors, the main turbine, and various LO storage tanks. Water contamination of LO is not assumed unless indicated by operating experience or design review. Loss of material for carbon steel and copper alloys in a LO environment is not observed without contaminants and/or moisture.

Industry Lube Oil Operating Experience

A majority of the significant generic operating experience (OE) correspondence was concerned with either water intrusion or lack of adequate oil and fuel oil purity control. Water intrusion into oil or fuel oil systems can result in a corrosive environment. NRC Information Notice (IN) 79-23, "Emergency Diesel Generator Lube Oil Coolers," and NRC Circular 80-11, "Emergency Diesel Generator Lube Oil Cooler Failures," dealt with specific failures of LO coolers.

NRC Circular #80-11: Emergency Diesel Generator Lube Oil Cooler Failures

Diesel generator LO cooler failures were reported. The DGs were manufactured by Electro-Motive Division (EMD) of General Motors. The failures were caused by severe corrosion of the solder, which sealed the tubes to the tube sheets. These failures occurred in the water side of the coolers. The corrosion inhibitor in use was Calgon CS, a borated-nitrite type inhibitor. The manufacturer of this type of inhibitor has recommended the use of hard solder in CS treated systems. EMD does not recommend the use of Calgon CS since the puddle solder used in EMD radiators and oil coolers is a soft solder of lead-tin composition.

IN 79-23: Emergency Diesel Generator Lube Oil Coolers

Water intrusion in the LO system resulted in trips of both diesel generator units during their surveillance tests. The water intrusion was caused by tube sheet failure in the LO coolers. The failures were cracks around the outer periphery of the tube sheets. Coolers were replaced; however, the failure mechanism was not determined.

Both of these failures were a result of degradation on the treated water side of the LO coolers and provide no evidence of an aging effect requiring management for metals in contact with LO.

BSEP Lube Oil Operating Experience

The LO in major BSEP components is subject to periodic sampling and corrective action. DG engine LO is sampled monthly for water and quarterly for a spectrum of contaminants. Service water pump LO is sampled during routine lubrication. This sampling provides no evidence of water contamination in these components under normal operation.

A review of non-conformance reports over the past 10 years found only one case of water contamination of LO in major components:

A non-conformance report documented the identification of water in the oil of the Unit 2 Reactor Core Isolation Cooling System. The most probable cause was determined to be addition of oil mixed with water when the oil was added during maintenance. Significant water leakage was not considered likely because subsequent oil checks did not show an increase in level. Testing of the LO cooler confirmed that there was no leakage from the tube (i.e., water) side to the shell (i.e., oil) side.

This is considered to be an isolated event that was identified, corrected and is not representative of normal operation for the components in question.

In summary, LO systems generally do not suffer appreciable degradation by cracking or loss of material since the environment is not conducive to corrosion mechanisms. There are some conditions, however, in which moisture intrusion into the systems can result in an aggressive environment. Aging effects requiring management for carbon steel and copper alloy materials in LO are not anticipated unless water contamination is present. A review of maintenance practices and operating experience indicts that the normal LO environment for the BSEP "Heat Exchanger (Service Water Pump Motor Cooler Coils)"

and the DG Engine and LO Systems is free of water and harmful contaminants. LO sampling is performed by maintenance on a periodic basis such that leakage of water would be identified and corrected prior to component age related degradation.

The staff reviewed the applicant's response and found that, although it cites LO sampling, the response did not include a formal lubricating oil analysis AMP or a verification method to demonstrate that the LO analysis program is effective. The staff requested that the applicant submit its oil analysis program or equivalent and a verification program, such as a one-time inspection, to provide objective evidence that verifies that aging effects caused by moisture intrusion are not occurring in systems containing lubricating oil.

By letter dated August 11, 2005, the applicant provided additional information to address this unresolved item. To evaluate potential corrosion in carbon steel and copper-alloy components from water contamination in the lubricating oil, the applicant identified that the Preventive Maintenance Program will incorporate routine sampling and analysis of the lubricating oil in the service water pump reservoir and emergency diesel generator system (see Commitment Item #24). The applicant also identified that the One-Time Inspection Program will be used to verify the effectiveness of the LO sampling by visually inspecting a sample of the cooling coils in the service water pump and diesel generator lubricating oil sumps for evidence of corrosion products or moisture.

The applicant's response is reasonable and acceptable because the applicant will apply the Preventive Maintenance Program to sample/analyze lubricating oil for evidence of corrosion products or moisture and apply the One-Time Inspection Program to verify that the Preventive Maintenance Program is effective in detecting potential aging effects in the lubricating oil system. The application of these two AMPs provides reasonable assurance that aging effects will be detected and corrected before loss of component function. Therefore, all concerns related to RAI 3.3-3 are resolved.

Aging Effects for Various Materials Exposed to Dry Air/Gas (Internal) Environment In RAI 3.3-4, the staff stated that the applicant did not identify aging effects for various materials exposed to a dry air/gas (internal) environment for various component commodities listed in the following LRA tables:

Table 3.3.2-10, Instrument Air System
Table 3.3.2-11, Pneumatic Nitrogen System
Table 3.3.2-12, Fire Protection System
Table 3.3.2-14, Radioactive Floor Drains System
Table 3.3.2-15, Radioactive Equipment Drains System
Table 3.3.2-19, Liquid Waste Processing System
Table 3.3.2-21, HVAC Diesel Generator Building
Table 3.3.2-22, HVAC Reactor Building

In the dry air/gas system, components that are located upstream of air dryers are generally exposed to a wet air/gas environment; therefore, they may be subject to loss of material due to general and pitting corrosion. Although it is reasonable to assume that components downstream of the dryers are exposed to a dry air/gas environment, NRC IN 87-28, "Air Systems Problems at U.S. Light Water Reactors," identified that the air/gas system downstream of the dryer may also not be dry. Therefore, the staff requested that the applicant provide the technical basis for not

identifying loss of material as an aging effect for these components, including a discussion of the plant-specific operating experience related to components that are exposed to an air environment to support its conclusion.

In its response, by letter May 11, 2005, the applicant provided the following information:

> Dry air/gas (internal) environments identified in the above-referenced LRA tables can be dry gases and/or dry instrument air. The discussions below are for these dry gas and dry instrument air environments.
>
> > Dry Gases - Examples of a dry gas environment include nitrogen, carbon dioxide and Halon-containing components in the Pneumatic Nitrogen System and the Fire Protection System. Experience has shown that commercial grade gases are provided as a high quality product with little if any external contaminants. Based upon nitrogen, carbon dioxide, and Halon environments not being subject to wetting, the BSEP methodology predicted no aging effects for these dry gases.
> >
> > Dry Instrument Air - The following discussion of the BSEP Instrument Air (IA) System and the Service Air (SA) System provides background for the assignment of no aging effects to in-scope component internal surfaces exposed to dry instrument air. BSEP dry instrument air is neither saturated nor moist. It is noted that all in-scope components served by dry instrument air are located downstream of the IA System and SA System air dryers. There are no in-scope components located upstream of the air dryers. The IA System air compressors, air dryer and SA System air dryers are not in the scope of License Renewal.
>
> Instrument Air System Design
>
> By design, the IA System provides a medium which is dry, oil-free, and free of foreign materials to pneumatically operated instruments and controls throughout the plant. The SA System air dryers dry both SA and IA, while the IA dryer dries only IA. The IA dryer is normally bypassed when the SA dryers are in service. The IA dryer is placed in service if the SA dryers are removed from service or have degraded.
>
> IA and SA are filtered and dried by means of electrically heat reactivated desiccant type dryers, efficient at removing moisture. The inlet of a SA dryer has a coalescing filter capable of removing 90% of the entrained liquid moisture. The SA and IA dryers are described as follows:
>
> Unit 1 SA Dryer: The Unit 1 SA dryer is a heat reactivated vertical dual tower desiccant type designed to supply air dried to a dewpoint of -40°F. This dryer has a bank of electric heaters (i.e., in individual heater tubes) embedded within the desiccant.
>
> Unit 2 SA Dryer: The Unit 2 SA dryer is a heat regenerative vertical dual tower desiccant type designed to supply air dried to a dewpoint of -40°F. The electrically heated dryer is external to the desiccant.
>
> IA dryer: The IA dryer is a dual tower desiccant type dryer with a fully automatic regeneration cycle. This dryer is capable of supplying air dried to a dew point of -40°F.

BSEP is currently in the process of upgrading the air dryers for the Unit 1 and 2 SA Systems.

BSEP Response to Generic Letter 88-14

NRC Generic Letter (GL) 88-14, "Instrument Air Supply System Problems," was issued after several years of study of problems, including those in NRC IN 87-28, and failures of IA systems. GL 88-14 recommended extensive design and operations review and verification of IA systems. Progress Energy has met the intent of GL 88-14. The NRC review of the BSEP response to GL 88-14 stated:

> "The staff has reviewed your response and finds that you have addressed all points stated in the GL."

NUREG-1801 states:

> "...as a result of Generic Letter 88-14, performance of air systems has improved significantly."

Operating Experience (OE) Review

The aging management review methodology applied at BSEP included use of OE to confirm the set of aging effects that had been identified through material/environment evaluations. Plant-specific and industry OE was identified and reviewed.

BSEP site-specific OE reviews included a review of PassPort EDB and Maintenance Rule databases and Nuclear Assessment Section records. The BSEP Periodic System Review for the IA System examined system aspects such as equipment performance, material indicators, trending results, outstanding modifications, plant workarounds, performance problems and corrosion concerns. The review noted that air sampling for dewpoint had been satisfactory.

The BSEP Air Operated Valves (AOV) Program Health Report was reviewed for health status of green, yellow or red. The results show the program to be in green condition. There were no transients or power reductions caused by AOVs that should have been prevented by the program. There were no systems/components placed in a(1) Maintenance Rule status due to an AOV failure. No corrective actions were recommended. The plant-specific OE review identified no additional unpredicted or unique aging effects requiring management.

Industry OE reviews included those in NUREG-1801. An evaluation of industry OE published since the effective date of NUREG-1801 was also performed to identify any additional aging effects requiring management using the Progress Energy internal OE review process. OE sources subject to review under this process include Institute of Nuclear Power Operations and World Association of Nuclear Operators items, NRC documents (i.e., INs, GLs, Notices of Violation, and staff reports), 10 CFR 21 reports, and vendor bulletins, as well as corporate internal OE information from Progress Energy

nuclear sites. The industry OE review identified no additional unpredicted aging effects requiring management.

The IA and SA System Engineer was interviewed. During every refueling outage, the IA System Engineer performs a walkdown of the drywell to inspect for component material condition. No additional information related to aging effects/mechanisms which might affect the components of the IA System within the scope of License Renewal were identified by the System Engineer. A review of operating experience did not identify a pattern of degradation due to moisture for in-scope IA components.

Dry IA Summary

By design, IA is filtered and dried by means of electrically heat reactivated desiccant type dryers, efficient at removing moisture. There are no in-scope components located upstream of the air dryers. To verify dry IA, BSEP currently uses procedures to periodically test air quality, review trend data and initiate corrective actions as appropriate for the IA System and has met the intent of GL 88-14.

A review of operating experience at BSEP did not identify a pattern of degradation due to moisture for in-scope components exposed to the IA environment. Based on the delivery of dry air by the IA System, no aging effects/mechanisms due to IA moisture were identified for IA System in-scope components. Dry air is provided by system design, and is maintained by system operation and testing requirements. The above discussion provides the technical basis for not identifying loss of material as an aging effect for components exposed to an IA environment.

The staff reviewed the applicant's response to RAI 3.3-4 and found that the response is reasonable and acceptable because the applicant clarified that (1) all in-scope components served by dry instrument air are located downstream of the IA system and SA system air dryers; (2) experience has shown that commercial grade gases are provided as a high quality product with little, if any, external contaminants; and (3) an operating experience review has demonstrated that IA system components within scope of license renewal are not subject to degradation due to moisture. The applicant has also addressed all GL 88-14 concerns; moreover, it is currently upgrading the air dryers for the Units 1 and 2 SA systems. Therefore, the staff's concern described in RAI 3.3-4 is resolved.

The Use of One-Time Inspection Program. In a supplemental request for additional information on an issue similar to the one described in RAI 3.3.2-5-1, the applicant was requested to explain why a one-time inspection, rather than periodic inspections, are proposed to manage various components exposed to raw water environment in the radioactive floor drains system (LRA Table 3.3.2-14), the makeup water treatment system (LRA Table 3.3.2-16), and the non-contaminated water drain system (LRA Table 3.3.2-25). In its supplemental response to RAI 3.3.2-5-1, dated August 11, 2005, the applicant stated:

The BSEP LRA identified the potential for aging effects in the Radioactive Floor Drains System (LRA Table 3.3.2-14) and Non-Contaminated Water Drainage System (LRA Table 3.3.2-25), and specified the One-Time Inspection Program for aging management. BSEP has revised the aging management strategy for these components based on the potential for locally aggressive environments, particularly associated with floor drains

periodically exposed to Service Water, and roof drains exposed to coastal atmospheric conditions. The revised strategy will utilize the Preventive Maintenance Program to perform inspections of susceptible components on a recurring basis [see Commitment Item #24]. This revision is intended to provide a greater level of scrutiny to ensure detection of aging effects prior to loss of intended function.

BSEP has also reviewed the aging management strategy for Makeup Water Treatment System (LRA Table 3.3.2-16) and Potable Water (LRA Table 3.3.2-17) components to affirm the adequacy of the One-Time Inspection Program for aging management as specified by the LRA. This review determined that components in these systems are exposed to a relatively benign environment, and that aging effects are expected to progress slowly and predictably. Based on this factor, and supported by the lack of adverse plant operating experience, the One-Time Inspection Program is considered to be appropriate for aging management of these components.

The staff reviewed the applicant's response and found it acceptable because the applicant revised the aging management strategy for components in the radioactive floor drains system and NCWDS to ensure detection of aging effects prior to loss of intended function.

System-Specific Evaluations:

3.3.2.3.1 Reactor Water Cleanup System

The staff reviewed the AMR of the RWCU system component-material-environment-AERM combinations that are assigned to the staff for review. Only those system components beyond the second containment isolation valve are evaluated here. Portions of the system that are part of the RCPB are addressed in LRA Section 3.3.2.1.1 as part of the reactor coolant system. These combinations use Notes F through J in LRA Table 3.3.2-1 identifying them as either not consistent with or not addressed in the GALL Report. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs and TLAAs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-1 lists individual system components within the scope of license renewal and subject to aging management review. The component types with materials not identified in the GALL Report (Note F) include carbon steel piping/fittings and regenerative heat exchanger shell. The component types with an environment not identified in the GALL Report (Note G) include stainless steel piping and fittings in an indoor air environment. The component types with aging effects not identified in the GALL Report (Note H) include stainless steel piping and fittings in a treated water/steam environment. The component types with material and environment combination not evaluated in the GALL Report (Note J) include piping, fittings, valves, tanks, pumps, and piping specialties.

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Stainless steel exposed to indoor air experiences no aging effects.

- Stainless steel in a treated water/steam environment experiences loss of material due to crevice corrosion and pitting corrosion as well as cracking due to SCC and thermal fatigue.
- Carbon steel exposed to treated water/steam experiences loss of material due to crevice corrosion, general corrosion and pitting corrosion as well as cracking due to thermal fatigue. Glass in an indoor air or treated water environment experiences no aging effects.

The staff reviewed the information in LRA Section 2.3.3.1, Table 2.3.3-1, Section 3.3.2.1.1, and Table 3.3.2-1. During its review, the staff determined that additional information was needed to complete its review.

General RAI 3.3-2 is applicable to this system. This RAI, the applicant's responses, and the staff's evaluation are described at the beginning of SER Section 3.3.2.3.

In RAI 3.3.2-1-1, dated April 25, 2005, the staff stated that in LRA Table 3.3.2-1, RWCU piping and fitting (small bore piping less than NPS 4) are identified but the location or class of the piping is not identified. Therefore, the staff requested that the applicant clarify whether this small bore piping includes the small bore piping beyond the second isolation valve that is addressed in GALL Report Section VII E3 or is this piping limited to Class 1 piping within the RCPB that is addressed in GALL Report Section IV under the RCS. In its response, by letter dated May 11, 2005, the applicant clarified that components in this line item are inside ASME Class 1 boundaries, as denoted by the reference to GALL IV.C1.1 in column seven. The staff reviewed the applicant's response and found the response to be reasonable and acceptable, because the applicant clarified that this is Class 1 piping within the RCPB that is reviewed separately as part of the RCS system. Therefore, the staff's concern described in RAI 3.3.2-1-1 is resolved.

In RAI 3.3.2-1-3, dated April 25,2005, the staff stated that In LRA Table 3.3.2-1, a treated water environment with steam is identified for various carbon steel components in the RWCU system beyond the second isolation valve. Therefore, the staff requested that the applicant explain why loss of material due to FAC managed by the FAC Program is not identified as an aging effect for carbon steel components beyond the second isolation valve. In its response, by letter dated May 11, 2005, the applicant clarified that its AMR methodology used the environment "treated water (includes steam)" to represent components that may be in a treated water or a steam environment and not a two-phase condition. The staff reviewed the applicant's response and finds the response to be reasonable and acceptable because the applicant clarified that the treated water (includes steam) environment does not represent a two-phase condition; therefore, the FAC Program is not required.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's responses to the above RAIs, the staff found that the aging effects of the above reactor water cleanup system component types are not addressed by the GALL Report, but are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the RWCU system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs and TLAAs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR

supplement contains an adequate description of the program, in accordance with 10 CFR 54.21(d).

To manage the aging effects described above for the reactor water cleanup system components, LRA Table 3.3.2-1 identifies TLAA(s) evaluated in accordance with 10 CFR 54.21(c) and the following AMPs:

- Water Chemistry Program
- One-Time Inspection Program

The staff's detailed review of these AMPs is found in SER Sections 3.0.3.2.1 and 3.0.3.2.11. The staff's evaluation of the TLAAs is addressed in SER Section 4.3.

Based on the above, the staff identified an area in which additional information was necessary to complete the review. The applicant responded to the staff's RAI as discussed below.

In RAI 3.3.2-1-2, dated April 25, 2005, the staff requested that the applicant explain why the BWR RWCU system AMP identified in the GALL Report is not applied and to clarify if the stainless steel piping beyond the second containment isolation valve has been replaced with material not susceptible to IGSCC. In its response, by letter dated May 11, 2005, the applicant clarified that extensive mitigative activities as well as ongoing requirements related to water chemistry and inspections were implemented in response to GL 88-01. For purposes of license renewal, these ongoing requirements are implemented under the Water Chemistry Program and ASME Section XI Subsection IWB, IWC and IWD Program. This response further stated that BSEP considers that the mitigative measures already implemented in response to GL 88-01, in conjunction with these AMPs, are the equivalent of the BWR RWCU AMP. The applicant also clarified that the one-time inspections are generally specified for water chemistry effectiveness verification where volumetric examinations are not otherwise performed. In regard to IGSCC, the applicant stated that BSEP replaced those portions of RWCU piping that were deemed to be susceptible to IGSCC on the basis of NUREG-0313 with non-susceptible materials.

The staff reviewed the applicant's response to RAI 3.3.2-1-2 and found the response to be reasonable and acceptable because the applicant clarified that the mitigative measures already implemented in response to GL 88-01, in conjunction with these aging management programs, are the equivalent of the BWR Reactor Water Cleanup System Aging AMP. In regard to IGSCC, the applicant did not specifically identify whether piping beyond the second isolation valve was replaced; however, the staff determined that, in BSEP letter dated August 20, 1998, the licensee identified that the RWCU system piping outboard of the second containment isolation valve has been replaced with low carbon wrought austenitic stainless steel material in accordance with the recommendations outlined in NUREG-0313, Revision 2. The low carbon stainless steel is resistant to IGSCC. Therefore, the staff also found that the use of a One-Time Inspection Program is appropriate as a chemistry verification program for managing aging effects in stainless steel materials not susceptible to IGSCC that are exposed to treated water. Therefore, the staff's concern described in RAI 3.3.2-1-2 is resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff found that the applicant identified appropriate AMPs and TLAAs for managing aging effects for the reactor water cleanup system

component types that are not addressed by the GALL Report. In addition, the staff found the program descriptions in the UFSAR supplement acceptable.

3.3.2.3.2 Reactor Core Isolation Cooling (RCIC) System – Table 3.3.2-2

Portions of the piping system contained in the RCIC system (up to the second isolation valve) are Class 1 piping and are within the RCS pressure boundary. The staff's review of this Class 1 piping is provided in SER Section 3.1.2.3.5. The staff's review for the portion of the RCIC piping system and components beyond the second isolation valve is provided in this section.

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

In LRA Section 3.3.2.1.2, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the AERMs for the RCIC system components:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program
- Water Chemistry Program
- BWR Stress Corrosion Cracking Program
- Flow-Accelerated Control Program
- One-Time Inspection Program
- Selective Leaching of Materials Program
- Protective Coating Monitoring and Maintenance Program
- Systems Monitoring Program

The technical staff reviewed the applicant's AMR of the RCIC system component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations are identified by Notes F through J in LRA Table 3.3.2-2. The staff also reviewed those combinations in Table 3.3.2-2, with Notes A through E, for which issues were identified. The staff determined that the applicant has identified all applicable AERMs and credited appropriate AMPs for managing them. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions are adequate.

Aging Effects. LRA Table 2.3.3-2 lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for AMR include: piping and fittings, pumps, valves, tanks, steam turbines, strainer elements, heat exchangers, and pressure regulators.

For these component types, the applicant identified the materials, environments, and AERMs, as specified below:

- Carbon steel components in treated water (includes steam)(internal), or treated water (internal) environments are subject to loss of material due to general, crevice, and pitting corrosion.
- Carbon steel components in treated water (internal) environments are subject to general, crevice, pitting, and galvanic corrosion.

- Carbon steel components in treated water (internal) environments are subject to flow blockage due to fouling.
- Carbon steel components in treated water (includes steam)(internal) environments are subject to loss of material due to FAC.
- Carbon steel components in indoor air (external) environments are subject to loss of material due to general corrosion.
- Stainless steel components in treated water (includes steam)(internal) environments are subject to cracking due to SCC, and loss of material due to crevice and pitting corrosion.
- Stainless steel components in treated water (includes steam)(internal), or treated water (internal) environments are subject to loss of material due to crevice and pitting corrosion.
- Stainless steel components in treated water (internal) are subject to flow blockage due to fouling.
- Stainless steel components in treated water (includes steam)(internal) environments are subject to loss of material due to flow-accelerated corrosion.
- Copper alloys in treated water (internal) environments are subject to loss of material due to crevice and pitting corrosion, selective leaching, as well as loss of heat transfer effectiveness due to fouling of heat transfer surfaces.
- Grey cast iron components in treated water (internal) environments are subject to loss of material due to selective leaching, as well as loss of material due to crevice, galvanic, general, and pitting corrosion.
- Carbon steel and stainless steel components in indoor air (external) or lube oil (internal) environments are not identified with any AERMs.
- Insulation material in indoor air (external) environments are not identified with any AERMs.
- Copper alloy components in lube oil (external), dry air/gas (internal), or indoor air (external) environments are not identified with any AERMs.
- Glass components in indoor air (external), lube oil (internal), or treated water (internal) environments are not identified with any AERMs.

On the basis of its review of the information provided in the LRA, the staff found that the aging effects of the portion of non-Class 1 RCIC system component types not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the components in the RCIC system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine whether they are appropriate for managing the identified aging effects. The staff also determined that the UFSAR supplement contains an adequate description of the program, in accordance with 10 CFR 54.21(d).

LRA Table 3.3.2-2 identifies the following AMPs for managing the aging effects described above for the RCIC system:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program
- Water Chemistry Program
- BWR Stress Corrosion Cracking Program
- Flow-Accelerated Control Program
- One-Time Inspection Program
- Selective Leaching of Materials Program
- Protective Coating Monitoring and Maintenance Program
- Systems Monitoring Program

The staff's detailed review of these AMPs is found in SER Sections 3.0.3.1.1, 3.0.3.2.1, 3.0.3.1.3, 3.0.3.2.2, 3.0.3.2.11, 3.0.3.2.12, 3.0.3.2.18, and 3.0.3.3.2, respectively.

On the basis of its review of the information provided in the LRA, the staff found that the applicant has described appropriate AMPs for managing the aging effect of the RCIC system component types not addressed by the GALL Report. In addition, the staff found the program descriptions in the UFSAR supplement acceptable.

3.3.2.3.3 Reactor Building Sampling System

The staff reviewed the AMR of the reactor building sampling system component-material-environment-AERM combinations that are assigned to the staff for review. Only those system components beyond the second containment isolation valve are evaluated here. Portions of the system that are part of the RCPB are addressed in LRA section 3.1 as part of the reactor coolant system. These combinations use Note J in LRA Table 3.3.2-3 that are identified as not addressed in the GALL Report. The staff verified that the applicant had identified all applicable AERMs and credited the appropriate AMPs and TLAAs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-3 lists individual system components within the scope of license renewal and subject to AMR. The following component types have material and environment combinations not evaluated in GALL Report (Note J): piping, fittings, valves, heat exchanger shell, flow orifice, pump casing, filters, immersion elements and tank exposed to indoor air or treated water. For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Copper alloy or stainless steel exposed to indoor air experience no aging effects.
- Stainless steel or copper alloy in a treated water environment experiences loss of material due to crevice corrosion and pitting corrosion.
- Stainless steel exposed to treated water also experiences cracking due to SCC and thermal fatigue.

The staff reviewed the information in LRA Section 2.3.3.3, Table 2.3.3-3, Section 3.3.2.1.3, and Table 3.3.2-3. During its review, the staff determined that additional information was needed to complete its review.

General RAI 3.3-2 is applicable to this system. This RAI, the applicant's response, and the staff's evaluation are described at the beginning of SER Section 3.3.2.3.

There are no relevant system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff found that the aging effects of the above reactor building sampling system component types that are not addressed by the GALL Report, are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the reactor building sampling system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

To manage the aging effects described above for the reactor building sampling system components, LRA Table 3.3.2-3 identifies TLAA(s) evaluated in accordance with 10 CFR 54.21(c) and the following AMPs:

- Water Chemistry Program
- One-Time Inspection Program

The staff's detailed review of these AMPs is found in Sections 3.0.3.2.1 and 3.0.3.2.11 of this SER. The staff's evaluation of the TLAAs is addressed in SER Section 4.3.

ISG-12 and GALL AMP XI.M35 contain special augmented one-time inspection requirements applicable to Class 1 piping less than NPS-4. The sample lines identified by Note I appear to be part of the RCPB normally within the GALL Report Section IV C1 scope of review in SER Section 3.1.2.3.5.

In RAI 3.3.2-3-1, dated April 25, 2005, the staff requested that the applicant clarify which stainless steel piping and its aging management programs are part of the RCPB and which piping and its aging management programs are not part of the RCPB. The staff also requested that the applicant clarify if this piping is less than NPS-4. In its response, by letter dated May 11, 2005, the applicant clarified that the RCPB portions of the reactor building sampling system are the 3/4-inch stainless steel reactor sample lines 1/2-reactor building sampling system (RXS)-1. Therefore, this piping within the RCPB is within scope of the GALL Report RCPB (Section IV) review in SER Section 3.1.2.3.5.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff found that the applicant identified the appropriate AMPs and TLAAs for managing the aging effects for the reactor building sampling system component types that are not addressed by the GALL Report. In addition, the staff found the program descriptions in the UFSAR supplement acceptable.

3.3.2.3.4 Post Accident Sampling System

The staff reviewed the AMR of the post-accident sampling system component-material-environment-AERM combinations that are assigned to the staff for review. These combinations use Note J in LRA Table 3.3.2-4 and are identified as not addressed in the GALL Report. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-4 lists individual system components within the scope of license renewal and subject to AMR. The following component types have material and environment combinations not evaluated in GALL Report (Note J): piping, fittings, valves and heat exchanger shell.

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Copper alloy or stainless steel exposed to indoor air experience no aging effects.
- Stainless steel or copper alloy in a treated water environment experiences loss of material due to crevice corrosion and pitting corrosion.
- Copper alloy in treated water is also susceptible to selective leaching.

The staff reviewed the information in LRA Section 2.3.3.4, Table 2.3.3-4, Section 3.3.2.1.4 and Table 3.3.2-4. During its review, the staff determined that additional information was needed to complete its review.

General RAI 3.3-2 is applicable to this system. This RAI, the applicant's response, and the staff's evaluation are described at the beginning of SER Section 3.3.2.3.

There are no system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff found that the aging effects of the above post-accident sampling system component types that are not addressed by the GALL Report, are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the post-accident sampling system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-4 identifies TLAAs and the following AMPs for managing the aging effects described above for the post-accident sampling system components assigned to the staff for review:

- Water Chemistry Program
- Closed-Cycle Cooling Water System Program

- One-Time Inspection Program
- Selective Leaching of Materials Program

The staff's detailed review of these AMPs is found in SER Sections 3.0.3.2.1, 3.0.3.2.5, 3.0.3.2.11 and 3.0.3.2.12.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff found that the applicant identified the appropriate AMPs for managing the aging effects for the post-accident sampling system component types that are not addressed by the GALL Report. In addition, the staff found the program descriptions in the UFSAR supplement acceptable.

3.3.2.3.5 Screen Wash Water System

The staff reviewed the AMR of the screen wash water system component-material-environment-AERM combinations that are assigned to the staff for review. These combinations use Note J in LRA Table 3.3.2-5 and are identified as not addressed in the GALL Report. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-5 lists individual system components within the scope of license renewal and subject to an AMR. The following component types have material and environment combinations not evaluated in GALL Report (Note J): piping, fittings, valves, pump casing and strainer body exposed to indoor air or raw water.

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Copper alloy or stainless steel exposed to indoor air experience no aging effects.
- Stainless steel in a raw water environment experiences loss of material due to crevice corrosion, MIC and pitting corrosion.
- Plastics/polymers exposed to indoor air or raw water experience cracking due to various aging mechanisms.
- Copper alloys exposed to raw water experience loss of material due to crevice corrosion, pitting corrosion, erosion, selective leaching and MIC.
- Carbon steel in a raw water environment experiences loss of material due to crevice, general, MIC and pitting corrosion.

The staff reviewed the information in LRA Section 2.3.3.6, Table 2.3.3-5, Section 3.3.2.1.5, and Table 3.3.2-5. During its review, the staff determined that additional information was needed to complete its review.

General RAIs 3.3-1 and 3.3-2 are applicable to this system. These RAIs, the applicant's responses, and the staff's evaluations are described at the beginning of SER Section 3.3.2.3.

There are no relevant system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's responses to the above RAIs, the staff found that the aging effects of the above screen wash water system component types that are not addressed by the GALL Report, are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the screen wash water system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-5 identifies the following AMPs for managing the aging effects described above for the screen wash water system components assigned to the staff for review:

- One-Time Inspection Program
- Selective Leaching of Materials Program
- Systems Monitoring Program

The staff's detailed review of these AMPs is found in SER Sections 3.0.3.2.11, 3.0.3.2.12, and 3.0.3.3.2.

In RAI 3.3.2-5-1, dated April 25, 2005, the staff stated that the One-time inspection is appropriate where either an aging effect is not expected to occur but there is insufficient data to completely rule it out, or the aging effect is expected to occur very slowly so as not to affect the component intended function. Therefore, the staff requested that the applicant explain why one-time inspection rather than periodic inspections are proposed to manage various components exposed to raw water in the screen wash system. In its response, by letter dated May 11, 2005, the applicant clarified that the screen wash water (SCW) system performs no safety function and is within the scope of license renewal in accordance with 10 CFR 54.4(a)(2) for potential spatial interaction considerations. The applicant explained that as a result of corrosion experienced in both stainless steel and carbon steel cement lining materials, problematic portions of the SCW system were replaced with copper-nickel, a material that has proven itself to be well suited to raw water at BSEP. The applicant stated that approximately 20 years of operating experience supports that age-related degradation of copper-nickel piping components in the SCW system is sufficiently slow to utilize a one-time inspection for aging management. The applicant further explained that the portions of the system constructed of stainless steel or carbon steel are maintained in accordance with the Maintenance Rule requirements or have not been problematic. The remaining in-scope stainless steel piping is limited to small diameter, low-pressure lines used to periodically flush the self-cleaning strainers. The applicant concluded that operating experience with the current SCW system materials has been favorable and all in-scope components within the SCW system are subject to the One-Time Inspection Program. In the event that age-related degradation is found during inspection activities, the extent of the condition will be evaluated under the Corrective Action Program and appropriate follow-up activities will be planned.

Staff reviewed the applicant's response and found the response to be reasonable and acceptable because the applicant identified sufficient plant-specific operating experience to assure that the aging is sufficiently slow in these materials such that a one-time inspection is appropriate to

manage the aging effects. The staff agreed with the applicant that there is reasonable assurance that, in the event that age-related degradation is found during Maintenance Rule or one-time inspection activities, the extent of the condition will be evaluated under the Corrective Action Program and appropriate follow-up activities will ensure that these 10 CFR 54.4(a)(2) components will be capable of performing their intended function. Therefore, the staff's concern described in RAI 3.3.2-5-1 is resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff found that the applicant. with the appropriate AMPs, will manage the aging effects for the screen wash water system component types that are not addressed by the GALL Report. In addition, the staff found the program descriptions in the UFSAR supplement acceptable.

3.3.2.3.6 Service Water System

The staff reviewed the AMR of the service water system component-material-environment-AERM combinations that are assigned to the staff for review. These combinations use Notes F through J in LRA Table 3.3.2-6 and are identified as either not consistent with or not addressed in the GALL Report. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-6 lists individual system components that are within the scope of license renewal and subject to an AMR. The component type with material not identified in the GALL Report is stainless steel pump casing. The following component types have aging effects not identified in the GALL Report (Note H): copper-alloy piping, fittings, and valves and carbon steel basket strainers. The following component types have material and environment combinations not evaluated in GALL Report (Note J): piping, fittings, valves, flow orifice, pump casing and strainer body exposed to indoor air; piping specialties exposed to raw water and heat exchanger coils exposed to LO.

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Copper alloy or stainless steel exposed to indoor air experience no aging effects.
- Stainless steel in a raw water environment experiences flow blockage due to fouling and loss of material due to crevice corrosion, MIC, and pitting corrosion.
- Plastics/polymers exposed to indoor air or raw water experience cracking due to various aging mechanisms.
- Copper alloys exposed to LO experience no aging effects.
- Copper alloys exposed to raw water experience loss of material due to erosion.
- Carbon steel connected to a more noble metal exposed to raw water experiences loss of material due to galvanic corrosion.

The staff reviewed the information in LRA Section 2.3.3.7, Table 2.3.3-6, Section 3.3.2.1.6 and Table 3.3.2-6. During its review, the staff determined that additional information was needed to complete its review.

General RAIs 3.3-1, 3.3-2, and 3.3-3 are applicable to this system. These RAIs, the applicant's responses, and the staff's evaluations are described at the beginning of SER Section 3.3.2.3.

In RAI 3.3.2-6-1, dated April 25, 2005, the staff stated that LRA Table 3.3.2-6 identifies no aging effects for copper-alloy underground piping and fittings in an external air environment. Therefore, the staff requested that the applicant clarify whether underground piping is in a tunnel or buried and to explain why this environment is considered an indoor environment with no sustained wetting. In its response, by letter dated May 11, 2005, the applicant responded to RAI 3.3.2-6-1 by clarifying that the copper-nickel lines connect to the underground nuclear service water in a protected enclosure and then run for a short distance underground before emerging into the basement of the DG Building. The applicant stated that BSEP aging management methodology considers that raw water and buried environments generally produce comparable aging effects consisting of crevice corrosion, pitting corrosion, and MIC. The applicant clarified that BSEP will apply the Buried Piping and Tanks Inspection Program to manage this buried piping.

The staff found that the applicant's response is reasonable and acceptable because the applicant clarified that a portion of the nuclear service water piping is underground with comparable aging effects of a raw water environment and the Buried Piping and Tanks Inspection Program will manage these aging effects on the external surfaces of this piping. Therefore, the staff's concerns described in RAI 3.3.2-6-1 are resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's responses to the above RAIs, the staff found that the aging effects of the above service water system component types that are not addressed by the GALL Report, are consistent with industry experience for these combinations of materials and environments. Other than the aging effect of loss of material for buried copper-alloy piping, the staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the service water system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-6 identifies the following AMPs for managing the aging effects described above for the service water system components assigned to the staff for review:

- Open-Cycle Cooling Water System Program
- Systems Monitoring Program

The staff's detailed review of these AMPs is found in SER Sections 3.0.3.2.4 and 3.0.3.3.2.

LRA Table 3.3.2-6 does not credit the Buried Piping and Tanks Inspection Program for any components in the service water system. In the response to RAI 3.3.2-6-1 the applicant clarified

that BSEP will also apply the Buried Piping and Tanks Inspection program to manage buried piping in this system. The staff's detailed evaluation of this AMP is found in Section 3.0.3.2.17

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff found that the applicant identified the appropriate AMPs for managing the aging effects for the service water system component types that are not addressed by the GALL Report. In addition, the staff found the program descriptions in the UFSAR supplement acceptable.

3.3.2.3.7 Reactor Building Closed Cooling Water System

The staff reviewed the AMR of the reactor building closed cooling water system component-material-environment-AERM combinations that are assigned to the staff for review. These combinations use Notes F and J in LRA Table 3.3.2-7 and are identified as not addressed in the GALL Report. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-7 lists individual system components within the scope of license renewal and subject to aging management review. The following component types materials not included in the GALL Report (Note F): stainless steel piping, valves and piping specialties. The following component types have material and environment not evaluated in the GALL Report (Note J): piping, piping specialties, valves, and pressure regulators exposed to indoor air or dry air.

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Copper alloy, stainless steel or glass exposed to indoor air or dry air/gas experience no aging effects.
- Stainless steel in a treated water environment experiences loss of material due to crevice and pitting corrosion.
- Glass in a treated water environment experiences no aging effects.

The staff reviewed the information in LRA Section 2.3.3.8, Table 2.3.3-7, Section 3.3.2.1.7, and Table 3.3.2-7. During its review, the staff determined that additional information was needed to complete its review.

General RAI 3.3-2 is applicable to this system. This RAI, the applicant's response, and the staff's evaluation are described at the beginning of SER Section 3.3.2.3.

There are no system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff found that the aging effects of the above reactor building closed cooling water system component types that are not addressed by the GALL Report, are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that

the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the reactor building closed cooling water system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine whether they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-7 identifies the Closed-Cycle Cooling Water System Program (B.2.8) for managing the aging effects described above for the reactor building closed cooling water system components assigned to the staff for review.

The staff's detailed review of this AMP is found in SER Sections 3.0.3.2.5.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff found that the applicant identified the appropriate AMPs for managing the aging effects for the reactor building closed cooling water system component types that are not addressed by the GALL Report. In addition, the staff found the program descriptions in the UFSAR supplement acceptable.

3.3.2.3.8 Diesel Generator System

The staff reviewed the AMR of the diesel generator system component-material-environment-AERM combinations that are assigned to the staff for review. These combinations use Notes F through J in LRA Table 3.3.2-8 and are identified as either not consistent with or not addressed in the GALL Report. The staff verified that the applicant identified all the applicable AERMs and credited the appropriate AMPs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-8 lists individual system components within the scope of license renewal and subject to aging management review. The following component types have materials not in the GALL Report (Note F): stainless steel pipe and fittings, and copper-alloy drain traps. The component types with environment not identified in the GALL Report (Note G) for the material are piping, fittings, valves, pump casings and tanks. The following component types have aging effects not identified in the GALL Report (Note H): copper-alloy tubes, tubesheets, pipes and fittings and carbon steel pipe and fittings. The following component types have material and environment combinations not evaluated in GALL Report (Note J): piping, fittings, tubing, valves, immersion element, pump casing, gauge glass, filter shell, strainer, filter media, tanks, heat exchangers, drain trap, inlet and exhaust bellows, muffler, oil separator, fans and piping specialties.

For these component types, the applicant identified the following materials, environments, and AERMs as specified below:

- Copper alloy, stainless steel or glass exposed to indoor air or LO experience no aging effects, except stainless steel bellows are susceptible to loss of material due to crevice and pitting corrosion in an indoor air environment (subject to condensation).

- Carbon steel in an LO environment experiences no aging effects.
- Carbon steel in an outdoor air environment experiences loss of material due to general, crevice and pitting corrosion as well as MIC and general chemical attack for the exhaust muffler.
- Stainless steel, copper alloys, and carbon steel in a fuel oil environment experience loss of material due to MIC.
- Stainless steel in a treated water environment experiences loss of material due to crevice corrosion and pitting corrosion.
- Glass in a treated water environment experiences no aging effects.
- Grey cast iron in a treated water environment experiences loss of material due to crevice corrosion, galvanic corrosion, general corrosion, pitting corrosion and selective leaching.
- Carbon steel in a treated water environment experiences loss of material due to crevice, galvanic, general and pitting corrosion.
- Copper-alloy heat exchanger tubes and tubesheets in a raw water environment experience loss of heat transfer due to fouling and loss of material due to erosion.
- Copper-alloy heat exchanger tubes in a treated water environment experiences loss of heat transfer due to fouling and loss of material due to crevice corrosion, pitting corrosion and selective leaching.

The staff reviewed the information in LRA Section 2.3.3.10, Table 2.3.3-8, Section 3.3.2.1.8, and Table 3.3.2-8. During its review, the staff determined that additional information was needed to complete its review.

General RAIs 3.3-2 and 3.3-3 are applicable to this system. These RAIs, the applicant's responses, and the staff's evaluations are described at the beginning of SER Section 3.3.2.3.

In RAI 3.3.2-8-1, dated April 25, 2005, the staff stated that in LRA Table 3.3.2-8, the materials for strainer (basket) and filter (media) are identified as filter media and strainer element, respectively. Therefore, the applicant was requested to identify the specific materials (carbon steel, stainless steel, etc.) for the strainer (basket) and filter (media). In its response, by letter dated May 11, 2005, the applicant identified the following various configurations of strainers/filters in the diesel generator system:

- lube oil system strainers/filters - carbon steel for coarse straining and stainless for fine
- starting air system basket strainers - Monel
- Intake air oil bath filter - stainless steel

In its response, dated May 11, 2005, the applicant identified that a loss of material aging effect is not predicted by BSEP methodology for these material and environment combinations. The applicant also identified that strainer/filter elements are subject to the Preventive Maintenance Program.

The staff reviewed the applicant's response and found the response reasonable and acceptable because the applicant identified the specific materials and environments for filters/strainers. The staff agreed that, unless contaminants are present, loss of material is not predicted for these

material and environment combinations. Any potential degradation due to the presence of contaminants would be detected and corrected by the Preventive Maintenance Program.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff found that the aging effects of the above diesel generator system component types that are not addressed by the GALL Report, are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the diesel generator system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program, in accordance with 10 CFR 54.21(d).

LRA Table 3.3.2-8 identifies the following AMPs for managing the aging effects described above for the diesel generator system components assigned to the staff for review:

- Open-Cycle Cooling Water System Program
- Closed-Cycle Cooling Water System Program
- Fuel Oil Chemistry Program
- One-Time Inspection Program
- Selective Leaching of Materials Program
- Systems Monitoring Program
- Preventive Maintenance Program

The staff's detailed review of these AMPs is found in SER Sections 3.0.3.2.4, 3.0.3.2.5, 3.0.3.2.9, 3.0.3.2.11, 3.0.3.2.12, 3.0.3.3.2, and 3.0.3.3.3.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff found that the applicant identified appropriate AMPs for managing the aging effects for the diesel generator system component types that are not addressed by the GALL Report. In addition, the staff found the program descriptions in the UFSAR supplement acceptable.

3.3.2.3.9 Heat Tracing System

The staff reviewed the AMR of the heat tracing system relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-9. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs and TLAAs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-9 lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR are piping and fittings (steam drains), and valves (check, control, hand, motor operated, safety valves) (body and bonnet).

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

(a) carbon steel components exposed to treated water (includes steam) (internal) experience loss of material due to general corrosion as well as cracking due to thermal fatigue.

The staff reviewed the information in LRA Section 2.3.3.11, Table 2.3.3-9, Section 3.3.2.1.9, and Table 3.3.2-9. During its review, the staff determined that additional information was needed to complete its review.

General RAI 3.3-2 is applicable to this system. This RAI, the applicant's response, and the staff's evaluation are described at the beginning of SER Section 3.3.2.3.

There are no system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff found that the aging effects of the above heat tracing system component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the heat tracing system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-9 identifies TLAA and the One-Time Inspection Program to manage the aging effects described above for the heat tracing system components that are not addressed by the GALL Report.

The staff's detailed review of this AMP is found in SER Sections 3.0.3.2.11. The staff's evaluation of the TLAAs is addressed in SER Section 4.3.

On the basis of its review of the information provided in the LRA, the staff found that the applicant identified appropriate AMPs and TLAAs for managing the aging effects of the heat tracing system component types that are not addressed by the GALL Report. In addition, the staff found the program description in the UFSAR supplement acceptable.

3.3.2.3.10 Instrument Air (IA) System

The staff reviewed the AMR of the instrument air system relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-10. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs for managing the AERMs.

Aging Effects. LRA Table 2.3.3-10 lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR are piping (piping and fittings), and valves (including check valves and containment isolation valves) (body and bonnet).

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Carbon steel, copper alloys, aluminum alloys or stainless steel components exposed to dry air/gas (internal) experience no aging effects.
- Carbon steel-galvanized components exposed to either indoor air (internal) or indoor air (external) environments have no aging effects.
- Aluminum alloys, carbon steel-galvanized, copper alloys, or stainless steel components exposed to indoor air (external) experience no aging effects.

The staff reviewed the information in LRA Section 2.3.3.12, Table 2.3.3-10, Section 3.3.2.1.10, and Table 3.3.2-10. During its review, the staff determined that additional information was needed to complete its review.

General RAIs 3.3-2 and 3.3-4 are applicable to this system. These RAIs, the applicant's responses, and the staff's evaluations are described at the beginning of SER Section 3.3.2.3.

There are no relevant system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's responses to the above RAIs, the staff found that the aging effects of the above instrument air system component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the instrument air system.

Aging Management Programs. LRA Table 3.3.2-10 identifies no AMP on the basis that no aging effects are identified for the component types described above for the instrument air system.

On the basis of its review of the information provided in the LRA, the staff agreed with the applicant that no AMP is needed for managing the aging effects of the instrument air system component types that are not addressed by the GALL Report.

3.3.2.3.11 Pneumatic Nitrogen System (PNS)

The staff reviewed the AMR of the pneumatic nitrogen system relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-11. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs for managing the AERMs.

Aging Effects. LRA Table 2.3.3-11 lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an

AMR are piping (piping and fittings), valves (including check valves and containment isolation valves) (body and bonnet), filter (shell and access cover), and non-carbon steel components (external surfaces).

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Stainless steel or aluminum-alloy components exposed to dry air/gas (internal) experience no aging effects.
- Aluminum alloys or stainless steel components exposed to indoor air (external) experience no aging effects.

The staff reviewed the information in LRA Section 2.3.3.14, Table 2.3.3-11, Section 3.3.2.1.11, and Table 3.3.2-11. During its review, the staff determined that additional information was needed to complete its review.

General RAIs 3.3-2 and 3.3-4 are applicable to this system. These RAIs, the applicant's responses, and the staff's evaluations are described at the beginning of SER Section 3.3.2.3.

There are no relevant system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's responses to the above RAIs, the staff found that the aging effects of the above PNS component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the PNS.

Aging Management Programs. LRA Table 3.3.2-11 identifies no AMP on the basis that no aging effects are identified for the component types described above for the PNS.

On the basis of its review of the information provided in the LRA, the staff agreed with the applicant that no AMP is needed for managing the aging effects of the PNS component types that are not addressed by the GALL Report.

3.3.2.3.12 Fire Protection (FP) System

The GALL Report describes requirements for aging management of the FP system based on the combination of component type, material, and environment.

Aging Effects. LRA Table 3.3.2-12 for the auxiliary systems for the Units 1 and 2 FP system summarizes the AMP for each of the combinations mentioned above. When the combinations do not exactly match the requirements of the GALL Report, the LRA table includes a note indicating that the prescribed AMP has been modified for use or that another AMP is being used.

For the Fire Protection Water System

For the combination of piping and fittings, aluminum alloys, raw water, the Fire Water System Aging Management Program is used to manage aging effects. A table note indicates the material is not in the GALL Report for this component.

For the combination of piping and fittings, carbon steel, raw water, the Fire Water System Aging Management Program is used to manage aging effects. A table note indicates that the combination for component, material, environment, and aging effect is consistent with the GALL Report.

For the combination of piping and fittings, glass, raw water, no aging effect is anticipated and no AMP is in place. A table note indicates the material is not in the GALL Report for this component, and no aging is anticipated.

For the combination of piping and fittings, stainless steel, and raw water, the Fire Water System Aging Management Program is used to manage aging effects. A table note indicates consistent with the GALL Report for component, material, environment, and aging effect.

For the combination of filter, fire hydrants, mulsifier, pump casing, sprinkler, strainer, valve body, carbon steel, and raw water, the Fire Water System Aging Management Program is used to manage aging effects. A table note indicates consistent with the GALL Report for component, material, environment, and aging effect.

For the combination of filter, fire hydrants, mulsifier, pump casing, sprinkler, strainer, valve body, copper alloys, and raw water, the Fire Water System AMP is used to manage aging effects. A table note indicates consistent with the GALL Report for component, material, environment, and aging effect. The Selective Leaching of Materials AMP is used to manage the aging effects of loss of material due to selective leaching. A table note indicates that this aging effect is not in the GALL Report for this component, material, and environment combination.

For the combination of filter, fire hydrants, mulsifier, pump casing, sprinkler, strainer, valve body, grey cast iron, and raw water, the Fire Water System AMP is used to manage aging effects. A table note indicates consistent with the GALL Report for component, material, environment, and aging effect. The Selective Leaching of Materials AMP is used to manage the aging effects of loss of material due to selective leaching. A table note indicates that this aging effect is not in the GALL Report for this component, material, and environment combination.

For the combination of filter, fire hydrants, mulsifier, pump casing, sprinkler, strainer, valve body, stainless steel, and raw water, the Fire Water System AMP is used to manage aging effects. A table note indicates consistent with the GALL Report for component, material, environment, and aging effect.

For the combination of HTX, heat exchanger shell and access cover, carbon steel, and treated water (internal), the Fire Protection AMP is used to manage aging effects. A table note indicates that neither the component nor this aging effect is in the GALL Report for this material and environment combination.

For the combination of HTX, heat exchanger tubes, copper alloys, raw water (internal), the Fire Water System AMP is used to manage aging effects due to loss of material. A table note indicates that for the loss of material aging effect the component is different from, but consistent with the GALL Report for component, material, environment, and aging effect.

For the combination of HTX, heat exchanger tubes, copper alloys, and treated water (external), the Fire Protection AMP is used to manage aging effects due to loss of material. A table note indicates that neither the component nor this aging effect is in the GALL Report for this material and environment combination.

For the combination of HTX, Heat exchanger tubes, copper alloys, and raw water (internal), the Fire Water System AMP is used to manage aging effects due to loss of heat transfer effectiveness due to fouling of heat transfer surfaces. A table note indicates that neither the component nor this aging effect is in the GALL Report for this material and environment combination.

For the combination of HTX, heat exchanger tubes, copper alloys, and treated water (external), the Fire Protection AMP is used to manage aging effects due to loss of heat transfer effectiveness due to fouling of heat transfer surfaces. A table note indicates that neither the component nor this aging effect is in the GALL Report for this material and environment combination.

For the combination of diesel-driven fire pump and fuel supply line, grey cast iron, and raw water (internal), the Fire Water System AMP is used to manage aging effects. A table note indicates the component is different from, but consistent with the GALL Report for material, environment, and aging effect. The Selective Leaching of Materials AMP is used to manage the aging effects of loss of material due to selective leaching. A table note indicates that this aging effect is not in the GALL Report for this component, material, and environment combination.

For the combination of carbon steel components (external surfaces)(includes carbon steel fire water tank), and carbon steel, buried (external), the Buried Piping and Tanks Inspection AMP is used to manage aging effects. A table note indicates the environment is not in the GALL Report for this component.

For the combination of carbon steel components (external surfaces)(includes carbon steel fire water tank), carbon steel, and indoor air (external), the Systems Monitoring AMP is used to manage aging effects. A table note indicates consistent with the GALL Report for component, material, environment, and aging effect, but a different AMP is credited.

For the combination of carbon steel components (external surfaces)(includes carbon steel fire water tank), carbon steel, and outdoor air (external), the Aboveground Carbon Steel Tanks AMP is used to manage aging effects. A table note indicates consistent with the GALL Report for component, material, environment, and aging effect, but a different AMP is credited.

For the combination of carbon steel components (external surfaces)(includes carbon steel fire water tank), carbon steel-galvanized, and indoor air (external), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

For the combination of carbon steel components (external surfaces)(includes carbon steel fire water tank), carbon steel-galvanized, and outdoor air (external), the Systems Monitoring AMP is

used to manage aging effects. A table note indicates consistent with the GALL Report for component, material, environment, and aging effect

For the combination of carbon steel components (external surfaces)(includes carbon steel fire water tank), and grey cast iron, buried (external), the Selective Leaching of Materials AMP is used to manage the aging effects of loss of material due to selective leaching. A table note indicates that this aging effect is not in the GALL Report for this component, material, and environment combination. The Buried Piping and Tanks Inspection AMP is used to manage aging effects due to loss of material. A table note indicates the environment is not in the GALL Report for this component.

For the combination of non-carbon steel components (external surfaces), aluminum alloys, and indoor air (external), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

For the combination of non-carbon steel components (external surfaces), copper alloys, and indoor air (external), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

For the combination of non-carbon steel components (external surfaces), glass, and indoor air (external), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

For the combination of non-carbon steel components (external surfaces), stainless steel, and indoor air (external), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

For the Fire Protection CO_2 System

For the combination of CO_2 fire suppression installed in the HPCI, carbon steel, and dry air/gas (internal), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

For the combination of CO_2 fire suppression installed in the HPCI, copper alloys, and dry air/gas (internal), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

For the combination of carbon steel components (external surfaces), carbon steel, and indoor air (external), the Systems Monitoring AMP is credited for managing the aging effect of the loss of material. A table note indicates consistent with the GALL Report for component, material, environment, and aging effect, but a different AMP is credited.

For the combination of carbon steel components (external surfaces), carbon steel-galvanized, and indoor air (external), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

For the combination of non-carbon steel components (external surfaces), copper alloys, and indoor air (external), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

For the Halon System

For the combination of Halon fire suppression installed in the diesel generator building (DGB), aluminum alloys, and dry air/gas (internal), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

For the combination of Halon fire suppression installed in the DGB, carbon steel, and dry air/gas (internal), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

For the combination of Halon fire suppression installed in the DGB, copper alloys, and dry air/gas (internal), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

For the combination of Halon fire suppression installed in the DGB, stainless steel, and dry air-gas (internal), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

For the combination of carbon steel components (external surfaces), carbon steel, and indoor air (external), the Systems Monitoring AMP is credited for managing the aging effect of the loss of material. A table note indicates consistent with the GALL Report for component, material, environment, and aging effect, but a different AMP is credited.

For the combination of non-carbon steel components (external surfaces), aluminum alloys, and indoor air (external), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

For the combination of non-carbon steel components (external surfaces), copper alloys, and indoor air (external), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

For the combination of non-carbon steel components (external surfaces), stainless steel, and indoor air (external), no aging effect is anticipated and no AMP is credited. A table note indicates neither the component nor the material and environment combination is evaluated in the GALL Report.

Conclusion

During its review of the information provided in the LRA, license renewal drawings, and licensing-basis information, the staff did not identify any omissions or discrepancies in the applicant's scoping and screening results for the components of the fire protection systems.

3.3.2.3.13 Fuel Oil System

The staff reviewed the AMR of the fuel oil system relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-13. The staff verified that the applicant has identified all applicable AERMs and credited the appropriate AMPs and TLAAs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-13 lists individual system components within the scope of license renewal and subject to aging management review AMP. The component types that do not rely on the GALL Report for an AMR are diesel-driven fire pump and fuel supply line, valves body and tubing, valves body and tubing, diesel fuel tank, piping (aboveground pipe and fittings), valves (body and bonnet), and tank (internal/external surface).

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Carbon steel components exposed to buried (external) environment experience loss of material due to crevice, general, pitting corrosion, microbiologically induced corrosion (MIC), and aggressive chemical attack.
- Copper-alloy components exposed to fuel oil (internal) are subject to loss of material due to MIC.
- Copper-alloy components exposed to indoor air (external) experience on aging effects.

The staff reviewed the information in LRA Section 2.3.3.16, Table 2.3.3-13, Section 3.3.2.1.13, and Table 3.3.2-13. During its review, the staff determined that additional information was needed to complete its review.

General RAI 3.3-2 is applicable to this system. This RAI, the applicant's response, and the staff's evaluation are described at the beginning of SER Section 3.3.2.3.

There are no system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff found that the aging effects of the above fuel oil system component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the fuel oil system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-13 identifies the following AMPs for managing the aging effects described above for the fuel oil system components that are not addressed by the GALL Report :

- Buried Piping and Tank Inspection
- Fuel Oil Chemistry
- Fire Protection

The staff's detailed review of these AMPs is found in SER Sections 3.0.3.2.13, 3.0.3.2.9, and 3.0.3.2.7.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAIs, the staff found that the applicant identified appropriate AMPs for managing the aging effects of the fuel oil system component types that are not addressed by the GALL Report. In addition, the staff found the program descriptions in the UFSAR supplement acceptable.

3.3.2.3.14 Radioactive Floor Drains System

The staff reviewed the AMR of the radioactive floor drains system relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-14. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effect. LRA Table 2.3.3-14 lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR are piping (piping and fittings), valves (body and bonnet), flow orifice (body), pump (casing), tank (shell), drain system sump pumps.

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Carbon steel components exposed to raw water (internal) are subject to loss of material due to crevice, general, and pitting corrosion, and MIC.
- Grey cast iron exposed to either raw water (external) or raw water (internal) are subject to loss of material due to crevice, general, and pitting corrosion, MIC, and selective leaching.
- Stainless steel components exposed to raw water (internal) are subject to loss of material due to crevice and pitting corrosion, and MIC.
- Copper-alloy components exposed to either dry air/gas (internal) or indoor air (external) experience no aging effects.
- Stainless steel components exposed to indoor air (external) experience no aging effects.

The staff reviewed the information in LRA Section 2.3.3.17, Table 2.3.3-14, Section 3.3.2.1.14, and Table 3.3.2-14. During its review, the staff determined that additional information was needed to complete its review.

General RAIs 3.3-2 and 3.3-4 are applicable to this system. These RAIs, the applicant's responses, and the staff's evaluations are described at the beginning of SER Section 3.3.2.3.

There are no relevant system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's responses to the above RAIs, the staff found that the aging effects of the above radioactive floor drain system component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the radioactive floor drains system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-14 identifies the following AMPs for managing the aging effects described above for the radioactive floor drains system components that are not addressed by the GALL Report:

- One-Time Inspection Program
- Selective Leaching of Materials Program

The staff's detailed review of the Selective Leaching of Materials Program, is found in SER Sections 3.0.3.2.12. In the applicant's supplemental response RAI 3.3.2-5-1, as described at the beginning of SER Section 3.3.2.3, the applicant revised its aging management strategy for managing the aging effects of the components in this system by replacing the One-Time Inspection Program with the Preventive Maintenance Program. The staff's detailed review of the Preventive Maintenance Program is found in SER Section 3.0.3.3.3.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's supplemental response to the above RAI, the staff found that the applicant identified appropriate AMPs for managing the aging effects of the radioactive floor drains system component types that are not addressed by the GALL Report. In addition, the staff found the program description in the UFSAR supplement acceptable.

3.3.2.3.15 Radioactive Equipment Drains System

The staff reviewed the AMR of the radioactive equipment drains system relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-15. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-15 lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an

AMR are piping (piping and fittings), valves (body and bonnet), heat exchanger (shell and access cover), flow orifice (body), pump (casing), and tank (shell).

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Carbon steel components exposed to treated water (internal) are subject to loss of material due to crevice corrosion, general corrosion, and pitting corrosion.
- Stainless steel components exposed to treated water (internal) are subject to loss of material due to crevice corrosion and pitting corrosion.
- Copper-alloy components exposed to either dry air-gas (internal) or indoor air (external) experience no aging effects.
- Stainless steel components exposed to indoor air (external) experience no aging effects.

The staff reviewed the information in LRA Section 2.3.3.18, Table 2.3.3-15, Section 3.3.2.1.15, and Table 3.3.2-15. During its review, the staff determined that additional information was needed to complete its review.

General RAIs 3.3-2 and 3.3-4 are applicable to this system. These RAIs, the applicant's responses, and the staff's evaluations are described at the beginning of SER Section 3.3.2.3.

There are no relevant system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's responses to the above RAIs, the staff found that the aging effects of the above radioactive equipment drains system component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the radioactive equipment drains system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-15 identifies the following AMPs for managing the aging effects described above for the radioactive equipment drains system components that are not addressed by the GALL Report:

- One-Time Inspection Program
- Water Chemistry Program

The staff's detailed review of these AMPs is found in SER Sections 3.0.3.2.11 and 3.0.3.2.1.

On the basis of its review of the information provided in the LRA, the staff found that the applicant identified appropriate AMPs for managing the aging effects of the radioactive equipment drains

system component types that are not addressed by the GALL Report. In addition, the staff found the program description in the UFSAR supplement acceptable.

3.3.2.3.16 Makeup Water Treatment System

The staff reviewed the AMR of the makeup water treatment system relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-16. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-16 lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR are (1) water treatment system: piping (piping and fittings) and valves (body and bonnet); and (2) demineralized water system: piping (piping and fittings), valves (body and bonnet), and tank (shell).

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Carbon steel components exposed to indoor air (external) are subject to loss of material due to general corrosion.
- Carbon steel components exposed to raw water (internal) environment experience loss of material due to crevice corrosion, general corrosion, MIC, and pitting corrosion.
- Stainless steel components exposed to raw water (internal) environment are subject to loss of material due to crevice corrosion, MIC, and pitting corrosion.
- Stainless steel components exposed to indoor air (external) experience no aging effects.
- Stainless steel components exposed to treated water (internal) environment are subject to loss of material due to crevice corrosion and pitting corrosion.
- Carbon steel components exposed to treated water (internal) environment experience loss of material due to crevice corrosion, general corrosion and pitting corrosion.
- Grey cast steel components exposed to treated water (internal) are subject to loss of material due to selective leaching.
- Grey cast iron or aluminum-alloy components exposed to treated water (internal) environment are subject to loss of material due to crevice corrosion, galvanic corrosion, and pitting corrosion.
- Aluminum-alloy components exposed to outdoor air (external) environment are subject to loss of material due to crevice corrosion and pitting corrosion.

The staff reviewed the information in LRA Section 2.3.3.19, Table 2.3.3-16, Section 3.3.2.1.16, and Table 3.3.2-16. During its review, the staff determined that additional information was needed to complete its review.

General RAI 3.3-2 is applicable to this system. This RAI, the applicant's response, and the staff's evaluation are described at the beginning of SER Section 3.3.2.3.

There are no relevant system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff found that the aging effects of the above makeup water treatment system component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the makeup water treatment system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-16 identifies the following AMPs for managing the aging effects described above for the makeup water treatment system components that are not addressed by the GALL Report:

- One-Time Inspection Program
- Selective Leaching of Materials Program
- Systems Monitoring Program
- Water Chemistry Program

The staff's detailed review of these AMPs is found in SER Sections 3.0.3.2.11, 3.0.3.2.12, 3.0.3.3.2, and 3.0.3.2.1. With regard to the use of the One-Time Inspection Program, the applicant's supplemental response to RAI 3.3.2-5-1, as described at the beginning of SER Section 3.3.2.3 is applicable to this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's supplemental response to the above RAI, the staff found that the applicant identified appropriate AMPs for managing the aging effects of the makeup water treatment system component types that are not addressed by the GALL Report. In addition, the staff found the program description in the UFSAR supplement acceptable.

3.3.2.3.17 Potable Water System (PWS)

The staff reviewed the AMR of the potable water system relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-17. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs and TLAAs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-17 lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR are piping (piping and fittings), valves (body and bonnet), and tank (shell).

For this component type, the applicant identified the following materials, environments, and AERMs, as specified below:

- Copper-alloy components exposed to raw water (internal) are subject to loss of material due to MIC. Copper-alloy components exposed to indoor air (external) experience no aging effects.

The staff reviewed the information in LRA Section 2.3.3.21, Table 2.3.3-17, Section 3.3.2.1.17, and Table 3.3.2-17. During its review, the staff determined that additional information was needed to complete its review.

General RAI 3.3-2 is applicable to this system. This RAI, the applicant's response, and the staff's evaluation are described at the beginning of SER Section 3.3.2.3.

There are no system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff found that the aging effects of the above potable water system component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the potable water system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-17 identifies the One-Time Inspection Program (B.2.15) for managing the aging effects described above for the potable water system components that are not addressed by the GALL Report :

The staff's detailed review of this AMP is found in SER Sections 3.0.3.2.11. With regard to the use of the One-Time Inspection Program, the applicant's supplemental response to RAI 3.3.2-5-1, as described at the beginning of SER Section 3.3.2.3 is applicable to this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's supplemental response to the above RAI, the staff found that the applicant identified an appropriate AMP for managing the aging effect of the potable water system component types that are not addressed by the GALL Report. In addition, the staff found the program description in the UFSAR supplement acceptable.

3.3.2.3.18 Process Radiation Monitoring (PRM) System

The staff reviewed the AMR of the process radiation monitoring system relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-18. The staff verified that the applicant identified all applicable AERMs and credited no AMP for managing the AERMs.

Aging Effect. LRA Table 2.3.3-18 lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR are Closed-Cycle Cooling Water System Program (Piping Specialties).

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Carbon steel components exposed to indoor air (external) environment experience no aging effects (This particular line item pertains to instrument wells protected from the external environment, and is not susceptible to external corrosion as explained in plant-specific Note 341 in Table 3.3.2-18).

The staff reviewed the information in LRA Section 2.3.3.22, Table 2.3.3-18, Section 3.3.2.1.18 and Table 3.3.2-18. During its review, the staff determined that additional information was needed to complete its review.

General RAI 3.3-2 is applicable to this system. This RAI, the applicant's response, and the staff's evaluation are described at the beginning of SER Section 3.3.2.3.

There are no system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff found that the aging effects of the above process radiation monitoring system component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the process radiation monitoring system.

Aging Management Programs. LRA Table 3.3.2-18 identifies no AMP on the basis that no aging effects are identified for the component types described above for the process radiation monitoring system.

On the basis of its review of the information provided in the LRA, the staff agrees with the applicant that no AMP is needed for managing the aging effects of the process radiation monitoring system component types that are not addressed by the GALL Report.

3.3.2.3.19 Liquid Waste Processing System

The staff reviewed the AMR of the liquid waste processing system relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-19. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-19 lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an

AMR are piping (piping and fittings), valves (body and bonnet), immersion element (pressure-retaining housing) and tank (shell).

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Carbon steel components exposed to treated water (internal) are subject to loss of material due to crevice corrosion, general corrosion, and pitting corrosion.
- Stainless steel components exposed to treated water (internal) are subject to loss of material due to crevice corrosion and pitting corrosion.
- Carbon steel components exposed to dry air/gas (internal) experience no aging effects.
- Stainless steel components exposed to indoor air (external) experience no aging effects.

The staff reviewed the information in LRA Section 2.3.3.24, Table 2.3.3-19, Section 3.3.2.1.19 and Table 3.3.2-19. During its review, the staff determined that additional information was needed to complete its review.

General RAIs 3.3-2 and 3.3-4 are applicable to this system. These RAIs, the applicant's responses, and the staff's evaluations are described at the beginning of SER Section 3.3.2.3.

There are no relevant system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's responses to the above RAIs, the staff found that the aging effects of the above liquid waste processing system component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the liquid waste processing system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-19 identifies the following AMPs for managing the aging effects described above for the liquid waste processing system components that are not addressed by the GALL Report:

- One-Time Inspection Program
- Water Chemistry Program

The staff's detailed review of these AMPs is found in SER Sections 3.0.3.2.11 and 3.0.3.2.1.

On the basis of its review of the information provided in the LRA, the staff found that the applicant identified appropriate AMPs for managing the aging effects of the liquid waste processing system component types that are not addressed by the GALL Report. In addition, the staff found the program description in the UFSAR supplement acceptable.

3.3.2.3.20 Fuel Pool Cooling and Cleanup System

The staff reviewed the AMR of the fuel pool cooling and cleanup system relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-20. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-20 lists individual system components within the scope of license renewal and subject to an AMR. The component types that do not rely on the GALL Report for an AMR are piping (piping, fittings and flanges), valves (check and hand valves)(body and bonnet), heat exchanger (shell and access cover), heat exchanger (channel head and access cover), and pump (casing).

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- carbon steel components exposed to treated water (internal) are subject to loss of material due to crevice corrosion, general corrosion, and pitting corrosion.
- Glass components exposed to either treated water (internal) or indoor air (external) experience no aging effects.
- Stainless steel components exposed to indoor air (external) experience no aging effects.

The staff reviewed the information in LRA Section 2.3.3.26, Table 2.3.3-20, Section 3.3.2.1.20, and Table 3.3.2-20. During its review, the staff determined that additional information was needed to complete its review.

General RAI 3.3-2 is applicable to this system. This RAI, the applicant's response, and the staff's evaluation are described at the beginning of SER Section 3.3.2.3.

There are no relevant system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff found that the aging effects of the above fuel pool cooling and cleanup system component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the fuel pool cooling and cleanup system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-20 identifies the following AMPs for managing the aging effects described above for the fuel pool cooling and cleanup system components that are not addressed by the GALL Report:

- One-Time Inspection Program
- Water Chemistry Program

The staff's detailed review of these AMPs is found in SER Sections 3.0.3.2.11 and 3.0.3.2.1.

On the basis of its review of the information provided in the LRA, the staff found that the applicant identified appropriate AMPs for managing the aging effects of the fuel pool cooling and cleanup system component types that are not addressed by the GALL Report. In addition, the staff found the program description in the UFSAR supplement acceptable.

3.3.2.3.21 HVAC Diesel Generator Building

The staff reviewed the AMR of the HVAC diesel generator building relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-21. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-21 lists individual system components within the scope of license renewal and subject to aging management review. The following component types do not rely on the GALL Report for an AMR: piping (piping and fittings), valves (including check valves and containment isolation valves) (body and bonnet), air receiver (shell and access cover), duct (duct fittings, access doors, and closure bolts), duct (equipment frames and housing), carbon steel and non-carbon steel components (external surfaces).

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Carbon steel, copper alloys, or aluminum-alloy components exposed to dry air/gas (internal) experience no aging effects.
- Carbon steel-galvanized components exposed to either indoor air (internal) or indoor air (external) environments have no aging effects.
- Aluminum alloys, carbon steel-galvanized, or copper-alloy components exposed to indoor air (external) experience no aging effects.
- Stainless steel components exposed to outdoor air (internal) are subject to loss of material due to crevice corrosion and pitting corrosion.
- Carbon steel galvanized components exposed to outdoor air (internal) are subject to loss of material due to aggressive chemical attack and general corrosion.
- Carbon steel components exposed to outdoor air (external) are subject to general corrosion.

- Elastomers exposed to indoor air (external) are subject to cracking due to various degradation mechanisms and loss of material due to wear. Plastics/polymers components exposed to either indoor air (internal) or indoor air (external) are subject to cracking due to various degradation mechanisms.
- Certain plastics/polymers components exposed to indoor air (internal) experience no aging effects.

The staff reviewed the information in LRA Section 2.3.3.27, Table 2.3.3-21, Section 3.3.2.1.21, and Table 3.3.2-21. During its review, the staff determined that additional information was needed to complete its review.

General RAI 3.3-2 and 3.3-4 are applicable to this system. These RAIs, the applicant's responses, and the staff's evaluations are described at the beginning of SER Section 3.3.2.3.

Aging Effects of Piping and Duct Components Made of Plastics/Polymers Exposed to Indoor Air (Internal). In RAI 3.3.2.21-1, dated April 25, 2005, the staff stated that in LRA Table 3.3.2-21 for HVAC diesel generator building, the applicant credited the Preventive Maintenance Program for managing the aging effect of cracking due to various degradation mechanisms for piping (piping and fittings) made of plastics/polymers exposed to indoor air (internal). However, in the same table, no aging effect was identified for the same material exposed to the same environment for duct (duct, fittings, fan housing, damper housing, access doors, and closure bolts). Therefore, the staff requested that the applicant explain the difference between these two cases.

In response, by letter dated May 11, 2005, the applicant stated that, while the material in both cases appears to be the same, they are actually different materials in a group of materials called "plastics/polymers."

The components represented by LRA Table 3.3.2-21, "Piping (Piping and Fittings)," made from plastics/polymers are polyethylene tubing, located indoors. For polyethylene in an indoor air environment, the BSEP methodology predicted the aging effect/mechanism of cracking due to various degradation mechanisms.

The applicant further stated that, components represented by LRA Table 3.3.2-21, "Duct, (Duct, Fittings, Fan Housings, Damper Housings, Access Doors, and Closure Bolts)," made from plastics/polymers, are tornado venting rupture disks constructed of Teflon, located indoors. This Teflon is not expected to be subject to extreme environmental conditions of adverse chemicals, severe thermal stress, high radiation field or continuous ultraviolet rays. For Teflon in this indoor air environment, the BSEP methodology predicted no aging effect/mechanism based upon the above and a review of industry guidance. Therefore, the applicant concluded that the subject materials are different, thus the aging effect/mechanism is different, and there is no inconsistency between the two items.

The staff reviewed the applicant's response to RAI 3.3.2-21-1 and found the response to be reasonable and acceptable because the applicant clarified that the subject materials are different; thus the aging effect/mechanism is different. Therefore, the staff's concern described in RAI 3.3.2-21-1 is resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's responses to the above RAIs, the staff found that the aging effects of the above HVAC diesel generator building component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the HVAC diesel generator building.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-21 identifies the following AMPs for managing the aging effects described above for the HVAC diesel generator building components that are not addressed by the GALL Report:

- Systems Monitoring Program
- Preventive maintenance Program

The staff's detailed review of these AMPs is found in SER Sections 3.0.3.3.2 and 3.0.3.3.3.

On the basis of its review of the information provided in the LRA, the staff found that the applicant identified an appropriate AMP for managing the aging effects of the HVAC diesel generator building component types that are not addressed by the GALL Report. In addition, the staff found the program description in the UFSAR supplement acceptable.

3.3.2.3.22 HVAC Reactor Building

The staff reviewed the AMR of the HVAC reactor building relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-22. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-22 lists individual system components within the scope of license renewal and subject to aging management review. The following component types do not rely on the GALL Report for an AMR: piping (piping and fittings), valves (including check valves and containment isolation valves) (body and bonnet), air receiver (shell and access cover), duct (duct fittings, access doors, damper housing, and closure bolts), duct (flexible collars between ducts and fans), air handler heating/cooling (heating/cooling coils),filters (elastomer seals), carbon steel and non-carbon steel components (external surfaces), and non-carbon steel components (external surfaces) (heat exchanger).

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Carbon steel, copper alloys, or aluminum-alloy components exposed to dry air/gas (internal) experience no aging effects.

- Carbon steel components exposed to either indoor air (internal) or indoor air (external) are subject to loss of material due to general corrosion.
- Either carbon steel-galvanized or stainless steel components exposed to indoor air (internal) environments experience no aging effects.
- Plastics/polymers exposed to either indoor air (internal) or indoor air (external) experience no aging effects.
- Copper alloys exposed to raw water (internal) are subject to (1) loss of material due to erosion, galvanic corrosion, and MIC, and (2) loss of heat transfer effectiveness due to fouling of heat transfer surfaces.
- Elastomers exposed to either indoor air (internal) or indoor air (external) are subject to loss of material due to wear, and cracking due to various degradation mechanisms.
- Carbon steel components exposed to outdoor air (external) are subject to general corrosion. Aluminum alloys, carbon steel-galvanized, copper-alloy or stainless steel components exposed to indoor air (external) experience no aging effects.
- Stainless steel components exposed to outdoor air (internal) are subject to loss of material due to crevice corrosion and pitting corrosion.
- Copper alloys (heat exchanger) (external surfaces) exposed to indoor air (external) are subject to (1) loss of material due to crevice corrosion and pitting corrosion, and (2) loss of heat transfer effectiveness due to fouling of heat transfer surfaces.

The staff reviewed the information in LRA Section 2.3.3.28, Table 2.3.3-22, Section 3.3.2.1.22, and Table 3.3.2-22. During its review, the staff determined that additional information was needed to complete its review.

General RAI 3.3-2 and 3.3-4 are applicable to this system. These RAIs, the applicant's responses, and the staff's evaluations are described at the beginning of SER Section 3.3.2.3.

Aging Effect of Non-Carbon Steel Components Made of Plastics/Polymers Exposed to Indoor Air (External) In RAI 3.3.2-22-1, dated April 25, 2005, the staff stated that in LRA Table 3.3.2-21 for the diesel generator building HVAC, the applicant credited the Systems Monitoring Program for managing the aging effect of cracking due to various degradation mechanisms for non-carbon steel components made of plastics/polymers exposed to indoor air (external). However, in LRA Table 3.3.2-22 for the reactor building HVAC, no aging effect was identified for the same component commodity made of the same material exposed to the same environment. Therefore, the staff requested that the applicant explain the inconsistency between these two items.

In response, by letter dated May 11, 2005, the applicant stated that while the material in both cases appears to be the same, they are actually different materials in a group of materials called "plastics/polymers."

The components represented by LRA Table 3.3.2-21, HVAC diesel generator building system, component commodity "Non-Carbon Steel Components (External Surfaces)," made from plastics/polymers, are polyethylene tubing located indoors. For polyethylene in an indoor air environment, the BSEP methodology predicted the aging effect/mechanism of cracking due to various degradation mechanisms.

The applicant further stated that components represented by LRA Table 3.3.2-22, HVAC reactor building system, component commodity "Non-Carbon Steel Components (External Surfaces)," made from plastics/polymers, are ductwork viewing panels constructed of polycarbonate and located indoors. This polycarbonate is not expected to be subject to extreme environmental conditions of adverse chemicals, severe thermal stress, high radiation field or continuous ultraviolet rays. For polycarbonate in this indoor air environment, the BSEP methodology predicted no aging effect/mechanism based upon the above and a review of industry guidance.

The applicant noted that the subject materials are different, thus the aging effect/mechanism is different, and there is no inconsistency between the two items.

The staff reviewed the applicant's response to RAI 3.3.2-22-1 and found the response to be reasonable and acceptable because the applicant clarified that the subject materials are different, thus the aging effect/mechanism is different. Therefore, the staffs concern described in RAI 3.3.2-22-1 is resolved.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's responses to the above RAIs, the staff found that the aging effects of the above HVAC reactor building component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the HVAC reactor building.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-22 identifies the following AMPs for managing the aging effects described above for the HVAC reactor building components that are not addressed by the GALL Report:

- Systems Monitoring Program
- Preventive maintenance Program
- Open-Cycle Cooling Water System Program

The staff's detailed review of these AMPs is found in SER Sections 3.0.3.3.2, 3.0.3.3.3, and 3.0.3.2.4.

On the basis of its review of the information provided in the LRA, the staff found that the applicant identified appropriate AMPs for managing the aging effects of the HVAC reactor building component types that are not addressed by the GALL Report. In addition, the staff found the program description in the UFSAR supplement acceptable.

3.3.2.3.23 Torus Drain System

The staff reviewed the AMR of the torus drain system relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-23. The staff verified that the applicant identified all

applicable AERMs and credited the appropriate AMPs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-23 lists individual system components within the scope of license renewal and subject to an AMR. The following component types do not rely on the GALL Report for an AMR: piping and fittings (miscellaneous auxiliary and drain piping and valves).

For these component types, the applicant identified the following materials, environments, and AERMs, as specified below:

- Carbon steel components exposed to treated water (internal) are subject to loss of material due to crevice corrosion, general corrosion, and pitting corrosion.
- Stainless steel components exposed to indoor air (external) experience no aging effects.
- Stainless steel components exposed to treated water (internal) are subject to loss of material due to crevice corrosion and pitting corrosion.

The staff reviewed the information in LRA Section 2.3.3.32, Table 2.3.3-23, Section 3.3.2.1.23, and Table 3.3.2-23. During its review, the staff determined that additional information was needed to complete its review.

General RAI 3.3-2 is applicable to this system. This RAI, the applicant's response, and the staff's evaluation are described at the beginning of SER Section 3.3.2.3.

There are no relevant system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff found that the aging effects of the above torus drain system component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the torus drain system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-23 identifies the following AMPs for managing the aging effects described above for the torus drain system components that are not addressed by the GALL Report:

- One-Time Inspection Program
- Water Chemistry Program

The staff's detailed review of these AMPs is found in SER Sections 3.0.3.2.11 and 3.0.3.2.1.

On the basis of its review of the information provided in the LRA, the staff found that the applicant identified appropriate AMPs for managing the aging effects of the torus drain system component types that are not addressed by the GALL Report. In addition, the staff found the program description in the UFSAR supplement acceptable.

3.3.2.3.24 Civil Structure Auxiliary System

The staff reviewed the AMR of the civil structure auxiliary system relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-24. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-24 lists individual system components within the scope of license renewal and subject to aging management review. The following component types do not rely on the GALL Report for an AMR: (1) primary containment auxiliary systems: piping (piping and fittings), and valves (body and bonnet); (2) service water intake structure auxiliary systems: piping (piping and fittings), valves (body and bonnet), pump (casing), and gauge glasses (pressure-retaining housing); (3) diesel generator building auxiliary systems: piping (piping and fittings), valves (body and bonnet), and pump (casing); and (4) control building auxiliary systems: piping (piping and fittings), valves (body and bonnet), and pump (casing).

For these component types, the applicant identified the following materials, environments, and AERMs:

(1) In primary containment auxiliary systems:

- Stainless steel components exposed to either indoor air (external) or indoor air (internal) experience no aging effects.

(2) In service water intake structure auxiliary systems:

- Neither plastics/polymers nor glass components exposed to indoor (external) and raw water (internal) experience aging effects; copper-alloy components exposed to indoor air (external) experience no aging effects, but when exposed to raw water (internal) are subject to loss of material due to crevice corrosion, MIC, pitting corrosion and selective leaching.
- Grey cast iron components exposed to either raw water (external) or raw water (internal) are subject to loss of material due to crevice corrosion, general corrosion, MIC, pitting corrosion, and selective leaching.

(3) In diesel generator building auxiliary systems:

- Carbon steel components exposed to raw water (internal) are subject to loss of material due to crevice corrosion, general corrosion, MIC, and pitting corrosion.
- Grey cast iron components exposed to either raw water (external) or raw water (internal) are subject to loss of material due to crevice corrosion, general corrosion, MIC, pitting corrosion, and selective leaching.

(4) In control building auxiliary systems:

- Carbon steel components exposed to raw water (internal) are subject to loss of material due to crevice corrosion, general corrosion, MIC, and pitting corrosion; grey cast iron components exposed to either raw water (external) or raw water (internal) are subject to loss of material due to crevice corrosion, general corrosion, MIC, pitting corrosion, and selective leaching.

The staff reviewed the information in LRA Section 2.3.3.33, Table 2.3.3-24, Section 3.3.2.1.24, and Table 3.3.2-24. During its review, the staff determined that additional information was needed to complete its review.

General RAI 3.3-2 is applicable to this system. This RAI, the applicant's response, and the staff's evaluation are described at the beginning of SER Section 3.3.2.3.

Aging Effect of Piping (Piping and Fittings) Components Made of Plastics/Polymers Exposed to Indoor Air (External) and Raw Water (Internal) In RAI 3.3.2-24-1, dated April 25, 2005, the staff stated that in LRA Table 3.3.2-24 for civil structure auxiliary system, no aging effects were identified for piping (piping and fittings) made of plastics/polymers exposed to indoor air (external) and raw water (internal); however, different conclusions were reached for the same components of the same material exposed to the same environments as described in Table 3.3.2-5 and Table 3.3.2-6. Therefore, the staff requested that the applicant explain the apparent inconsistencies cited above. The applicant was also requested to clarify why loss of material from erosion is not identified for plastics/polymer piping and fittings exposed to raw water (internal), and what AMP will be used to manage this aging effect (Refer to General RAI 3.3-1, which is addressed at the beginning of SER Section 3.3.2.3).

In response, by letter dated May 11, 2005, the applicant stated that the plastics/polymer piping noted in LRA Table 3.3.2-24 for civil structure auxiliary systems is polyvinylchloride (PVC) piping associated with the service water intake system (SWIS) sump pumps. These pumps only operate periodically and do not create the high flow velocities needed for erosion. BSEP methodology does not predict aging effects requiring management for PVC exposed to indoor air (external) and raw water (internal) environments. In actual practice, this piping will be visible for inspection as part of the preventive maintenance activities associated with the SWIS sump pumps.

The applicant further stated that the butyl rubber expansion joints noted in LRA Table 3.3.2-5 and Table 3.3.2-6 were conservatively evaluated as potentially susceptible to the cracking due to aging as explained in the response to RAI 3.3-1. The SCW system is subject to continuous, high-flow, high-vibration operation in a brackish water environment. The SW coupling to the diesel service water system noted in LRA Table 3.3.2-6 is of the same design, but used infrequently. Aging effects for these expansion joints are expected to be more likely in the SCW system application.

Therefore, the applicant concluded that the material composition and operating conditions are different between the plastics/polymers components noted in LRA Table 3.3.2-24 and LRA Tables 3.3.2-5 and 3.3.2-6, thus warranting different assessments of AERMs.

The staff reviewed the applicant's response to RAI 3.3.2-24-1 and found the response to be reasonable and acceptable because the applicant clarified that the subject materials are different,

thus the aging effect/mechanism is different. Therefore, the staff's concern described in RAI 3.3.2-24-1 is resolved.

During the scoping review, in the applicant's response to RAI 2.3.3.29-1, dated June 14, 2005, the applicant added three line items (one for fan housing, one for damper housing, and one for bird screens) to the AMR associated with LRA Table 3.3.2-24. The applicant stated that, in the SWIS auxiliary systems, components such as duct (equipment frames and housing), duct (debris screens), and fans (pressure retaining housing), all made of carbon steel, exposed to either outdoor air (external) or outdoor air (internal) are subject to loss of material due to general corrosion. The Systems Monitoring Program will manage this aging effect. The staff found the applicant's response to be reasonable and acceptable because the identified aging effect will be adequately managed.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's responses to the above RAIs, the staff found that the aging effects of the above civil structure auxiliary system component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the civil structure auxiliary system.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-24 identifies the following AMPs for managing the aging effects described above for the civil structure auxiliary system components that are not addressed by the GALL Report:

- Selective Leaching of Materials Program
- Preventive Maintenance Program
- Systems Monitoring Program

The staff's detailed review of these AMPs is found in SER Sections 3.0.3.2.12, 3.0.3.3.3, and 3.0.3.3.2.

On the basis of its review of the information provided in the LRA, the staff found that the applicant identified appropriate AMPs for managing the aging effects of the civil structure auxiliary system component types that are not addressed by the GALL Report. In addition, the staff found the program description in the UFSAR supplement acceptable.

3.3.2.3.25 Non-contaminated Water Drainage System (NCWDS)

The staff reviewed the AMR of the NCWDS relating to those component-material-environment-AERM combinations that are not addressed in the GALL Report. These combinations use Notes F through J in LRA Table 3.3.2-25. The staff verified that the applicant identified all applicable AERMs and credited the appropriate AMPs and TLAAs for managing the AERMs. The staff also reviewed the applicable UFSAR supplements for the AMPs to ensure that the program descriptions adequately describe the AMPs.

Aging Effects. LRA Table 2.3.3-25 lists individual system components within the scope of license renewal and subject to aging management review. The component type that does not rely on the GALL Report for an AMR is piping (piping and fittings).

For this component type, the applicant identified the following material, environment, and AERMs, as specified below:

- Carbon steel components exposed to raw water (internal) are subject to loss of material due to crevice corrosion, general corrosion, MIC, and pitting corrosion.

The staff reviewed the information in LRA Section 2.3.3.34, Table 2.3.3-25, Section 3.3.2.1.25, and Table 3.3.2-25. During its review, the staff determined that additional information was needed to complete its review.

General RAI 3.3-2 is applicable to this system. This RAI, the applicant's response, and the staff's evaluation are described at the beginning of SER Section 3.3.2.3.

There are no system-specific RAIs associated with this system.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's response to the above RAI, the staff found that the aging effects of the above NCWDS component types that are not addressed by the GALL Report are consistent with industry experience for these combinations of materials and environments. The staff did not identify any omitted aging effects. Therefore, the staff found that the applicant identified the appropriate aging effects for the materials and environments associated with the above components in the NCWDS.

Aging Management Programs. After evaluating the applicant's identification of aging effects for each of the above components, the staff evaluated the AMPs to determine if they are appropriate for managing the identified aging effects. The staff also verified that the UFSAR supplement contains an adequate description of the program.

LRA Table 3.3.2-25 identifies the One-Time Inspection Program for managing the aging effects described above for the non-contaminated water drainage system components that are not addressed by the GALL Report.

As a result of the applicant's supplemental response to RAI 3.3.2-5-1 as described at the beginning of SER Section 3.3.2.3, the applicant revised the aging management strategy in replacing the One-Time Inspection Program by the Preventive Maintenance Program for managing the aging effects of the components in this system. The staff's detailed review of the Preventive Maintenance Program, is found in SER Section 3.0.3.3.3.

On the basis of its review of the information provided in the LRA and the additional information included in the applicant's supplemental response to the above RAI, the staff found that the applicant identified appropriate AMPs for managing the aging effects of the NCWDS component types that are not addressed by the GALL Report. In addition, the staff found the program description in the UFSAR supplement acceptable.

3.3.3 Conclusion

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

The staff also reviewed the applicable UFSAR supplement program summaries and concluded that they adequately describe the AMPs credited for managing aging of the auxiliary systems, as required by 10 CFR 54.21(d).

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 steam and power conversion system components and component groups associated with the following systems:

- main steam system
- extraction steam system
- moisture separator reheater drains system and reheat steam system
- auxiliary boiler
- feedwater system
- heater drains and miscellaneous vents and drains
- condensate system
- turbine building sampling system
- main condenser gas removal system
- turbine electro-hydraulic control system
- turbine lube oil system
- stator cooling system
- hydrogen seal oil system

3.4.1 Summary of Technical Information in the Application

In LRA Section 3.4, the applicant provided AMR results for components. In LRA Table 3.4.1, "Summary of Aging Management Evaluations in Chapter VIII of NUREG-1801 for Steam and Power Conversion Systems," the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the steam and power conversion system components and component groups.

The applicant's AMRs incorporated applicable operating experience in the determination of AERMs. These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of 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 operating experience issues identified since the issuance of the GALL Report.