UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
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March 20, 2003

R. T. Ridenoure
Division Manager - Nuclear Operations
Omaha Public Power District
Fort Calhoun Station FC-2-4 Adm.
P.O. Box 550
Fort Calhoun, Nebraska 68023-0550

SUBJECT: FORT CALHOUN STATION - NRC INSPECTION REPORT 50-285/03-07

Dear Mr. Ridenoure:

On January 23, 2003, the NRC completed an inspection regarding your application for renewal of the operating license for the Fort Calhoun Station. The results of the inspection were discussed with members of your staff on January 23, 2003, in a public exit meeting at the Holiday Inn Express in Southwest Omaha.

The purpose of this inspection was to examine activities that support your application for a renewed license for the Fort Calhoun Station. The inspection consisted of a selected examination of procedures and representative records and interviews with personnel regarding your proposed aging management activities to support license extension. For a sample of plant systems, the team performed visual examination of accessible portions of the systems to observe any effects of equipment aging.

The inspection concluded that the existing aging management activities are being conducted as described in your license renewal application and your plans for new aging management activities appear acceptable to manage plant aging.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response, if any, will be made available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Should you have any questions concerning this report, please contact Wayne Walker at (817) 276-6523.

Sincerely,

/RA/

Claude E. Johnson, Chief
Project Branch C
Division of Reactor Projects

Docket: 50-285
License: DPR-40

Enclosure:
NRC Inspection Report
50-285/03-07

cc w/enclosure:
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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket: 50-285

License: DPR-40

Report: 50-285/03-07

Applicant: Omaha Public Power District

Facility: Fort Calhoun Station

Location: Fort Calhoun Station FC-2-4 Adm.
P.O. Box 550
Fort Calhoun, Nebraska 68023-0550

Dates: January 6-23, 2003

Team Leader: Wayne C. Walker, Senior Project Engineer, Project Branch C, Division of Reactor Projects (DRP)

Inspectors: W. Burton, Senior Project Manager, License Renewal and Environmental Impacts Program
T. Farnholtz, Senior Project Engineer, Project Branch F, DRP
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J. Melfi, Reactor Engineer, Engineering and Maintenance Branch, Division of Reactor Safety (DRS)
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A. Williamson, Nuclear Safety Intern, Office of Nuclear Reactor Regulation
L. Willoughby, Resident Inspector, Project Branch C, DRP

Approved By: Claude E. Johnson, Chief, Project Branch C

Attachment 1: Supplemental Information

Attachment 2: Fort Calhoun Station License Renewal Inspection Sample Aging Management Activities

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SUMMARY OF FINDINGS

IR 05000285-03-07; Omaha Public Power District; 01/06 - 01/23/03; Fort Calhoun Station; License Renewal Application, Aging Management Review Inspection Report.

The inspection of license renewal activities was performed by five regional inspectors and four inspectors from the Office of Nuclear Reactor Regulation. The inspection program followed was NRC Manual Chapter 2516 and NRC Inspection Procedure 71002. This inspection did not identify any "findings" as defined in NRC Manual Chapter 0612.

The team reviewed aging management activities for selected plant systems as described in Attachment 2 of this report to determine if the program requirements were identified correctly and being implemented for the selected systems consistent with the Fort Calhoun Station license renewal application (LRA). Where existing programs are to be expanded or new aging management programs are to be created to support the LRA, the team examined available documentation and discussed future plans with applicant engineers.

The inspection concluded that the existing aging management programs were being implemented as described in the LRA. Discussion with plant staff and review of available documentation for expansion of existing programs and creation of new aging management programs demonstrated that plans were consistent with the LRA.

The team performed numerous visual inspections on portions of plant equipment to attempt to observe aging effects. The overall condition of plant equipment was generally good.

Attachment 1 of this report lists the applicant personnel contacted and the documents reviewed. Attachment 2 of this report lists the Aging Management Activities selected for inspection.

Report Details

Aging Management Inspection

I. NRC Scoping and Screening Inspection

By letters dated January 9 and April 5, 2002, Omaha Public Power District (the applicant) submitted to the NRC an application to renew the operating license for the Fort Calhoun Station to allow an additional 20 years of operation. In support of the NRC Office of Nuclear Reactor Regulation technical review of the application, the NRC Region IV staff conducted two inspections at the plant site in Fort Calhoun, Nebraska. The first inspection was a scoping and screening inspection conducted from November 4-8, 2002. The purpose of this inspection was to verify, through sampling, that the applicant performed license renewal scoping and screening activities consistent with their LRA. With the exception of the open items identified during the inspection, NRC Region IV staff concluded that the applicant's scoping and screening process was successful in identifying those systems, structures, and components required to be considered for aging management. The results of the scoping and screening inspection are presented in NRC Inspection Report 50-285/02-07, dated December 20, 2002, and are available electronically for public inspection in the NRC Public Document Room or from the Publically Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room). The open items are dispositioned in Section III.E of this report.

II. Aging Management Inspection Scope

This inspection was conducted by a team of NRC regional and headquarters inspectors. The purpose of this inspection was to verify that the applicant identified in their LRA the aging effects for those systems, structures, and components determined to be within the scope of license renewal. In addition, this inspection was performed to verify that appropriate measures were taken or will be taken to manage those aging effects such that intended functions of the selected systems, structures, and components are maintained throughout the period of extended operation. Using the same systems, structures, and components selected for review during the NRC's scoping and screening inspection, the team reviewed the results of the applicant's aging management review to determine that the applicant had identified the appropriate aging mechanisms or effects. Accessible portions of these systems, structures, and components were visually examined to verify that all observable aging effects were identified by the applicant. The team also reviewed the applicant's aging management programs to determine if aging effects will be properly managed, so that intended functions of the selected systems, structures and components are maintained throughout the period of extended operation. This included review of: (1) existing programs; (2) existing programs that require enhancement; and (3) available documentation of the applicant's plans for new programs to be created prior to the period of extended operation. In addition, the team held discussions with applicant staff responsible for the implementation of these aging management programs to assess their knowledge and involvement in the license renewal effort. Documents reviewed by the team are listed in Attachment 1 to this report.

The review of the Fort Calhoun Station LRA was unique in that this was the first applicant to use the Generic Aging Lessons Learned (GALL) report. This report is a technical basis

document to the Standard Review Plan for license renewal, which provides the NRC staff with guidance in reviewing a LRA. The GALL report was treated as an approved topical report which is generically applicable. An applicant may reference the GALL report in a LRA to demonstrate that the programs at the applicant's facility correspond to those reviewed in the GALL report and that no further staff review is required.

The team performed the inspection by determining whether the material presented in the GALL report was applicable to the applicant's facility. If the team determined that the applicant identified specific programs as described in the GALL report then this was considered acceptable and a re-review of the substance of the matters contained in the GALL report were not reperformed. The teams review focused on ensuring that the applicant's plant program contained all the elements referenced in the GALL program and that conditions at the plant were bounded by the conditions for which the GALL program was evaluated. The GALL report contains one acceptable way to manage aging effects for license renewal. An applicant may propose alternatives for staff review in its plant specific LRA. Use of the GALL report is intended to facilitate both preparation of a LRA by an applicant and timely, uniform review by the NRC staff.

Specifically, the Fort Calhoun Station application contained three levels of usage for the GALL report. Structures, systems, and components were designated as being consistent with the GALL report, consistent with the GALL report with deviations, or that the components, materials, and environments identified in the GALL report are not applicable to the Fort Calhoun Station.

III. Inspection Results

A. Evaluation of Mechanical Systems Aging Management

The team reviewed the applicant's programs for addressing the effects of aging on selected mechanical systems to verify that the appropriate aging effects were identified and could be managed by the credited programs, consistent with the applicant's LRA. The team reviewed the applicant's LRA and the engineering reports, interviewed cognizant applicant staff members, and performed visual examinations of accessible portions of the selected systems. Documents reviewed by the team are listed in Attachment 1 to this report. The results of the team's evaluations are discussed below, by system.

1. Main Steam System

a. Inspection Scope

The team reviewed the main steam system drawings and the applicant's aging management review of the main steam system documented in Engineering Analysis FC-00-094, "Main Steam and Turbine Extraction Steam System." The team also interviewed the responsible program engineer.

b. Observations

For the main steam system, the applicant identified two new programs, three existing programs, and one enhanced program to manage the effects of loss of material, cracking, loss of mechanical closure integrity, and fouling in the main steam system. The new programs the applicant is crediting for managing the effects of aging are: (1) the General Corrosion of External Surfaces Program; and (2) the One-Time Inspection Program. The existing programs are: (1) the Bolting Integrity Program; (2) the Chemistry Program; and (3) the Flow-Accelerated Corrosion Program. The enhanced program is the Fatigue Monitoring Program. Detailed reviews of these programs are provided in Section D of this report.

c. Conclusions

The team found that, for this system, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

2. Auxiliary Feedwater System

a. Inspection Scope

The team reviewed the auxiliary feedwater system drawings and the applicant's aging management review of the auxiliary feedwater system documented in the Engineering Analysis FC-00-032, "Auxiliary Feedwater System." The team also interviewed the responsible program engineer.

b. Observations

For the auxiliary feedwater system, the applicant identified three new programs, two existing programs, and one enhanced program to manage the effects of loss of material, cracking, loss of mechanical closure integrity, and fouling in the auxiliary feedwater system. The new programs the applicant is crediting for managing the effects of aging are: (1) the General Corrosion of External Surfaces Program; (2) the One-Time Inspection Program; and (3) the Selective Leaching Program. The existing programs are: (1) the Bolting Integrity Program; and (2) the Chemistry Program. The enhanced program is the Periodic Surveillance and Preventive Maintenance Program. Detailed reviews of these programs are provided in Section D of this report.

c. Conclusions

The team found that, for this system, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with

their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

3. Component Cooling Water System

a. Inspection Scope

The team reviewed the component cooling water system drawings and the applicant's aging management review of the component cooling water system documented in Engineering Analysis FC-00-093, "Component Cooling Water System." The team also interviewed the responsible program engineer.

b. Observations

For the component cooling water system, the applicant identified two new programs, one existing program, and two enhanced programs to manage the effects of loss of material, cracking, loss of mechanical closure integrity, and fouling in the component cooling water system. The new programs the applicant is crediting for managing the effects of aging are: (1) the General Corrosion of External Surfaces Program; and (2) the Selective Leaching Program. The existing program is the Chemistry Program. The enhanced programs are: (1) the Cooling Water Corrosion Program; and (2) the Periodic Surveillance and Preventive Maintenance Program. Detailed reviews of these programs are provided in Section D of this report.

c. Conclusions

The team found that, for this system, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

4. Instrument Air System

a. Inspection Scope

The team reviewed the applicant's LRA and the applicant's aging management review documented in Engineering Analyses FC-00-118, "Instrument Air System," credited for managing aging effects in the instrument air system. The team also interviewed responsible system and program engineers and performed a visual examination of selected accessible portions of the system.

b. Observations

The team performed a visual inspection of portions of the instrument air system which were subject to aging management review. Equipment appeared to be in good condition and no evidence of unsatisfactory aging conditions were observed.

In the LRA, the applicant identified the General Corrosion of External Surfaces Program as the program for managing aging effects in the instrument air system. This program manages the effect of loss of material for instrument air components subject to an external ambient environment.

c. Conclusions

The team found that, for this system, the applicant had properly identified the effects of aging and the program that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

5. Fire Protection System

a. Inspection Scope

The team reviewed the applicant's LRA and the applicant's aging management review documented in Engineering Analyses FC-00-85, "Fire Protection Program Evaluation for License Renewal," Revision 0, credited for managing aging effects in the fire protection system. The team also interviewed responsible system and program engineers and performed a visual examination of selected accessible portions of the system.

b. Observations

The team performed a visual inspection of portions of the fire protection system which were subject to aging management review. Equipment appeared to be in good condition and no evidence of unsatisfactory aging conditions was observed.

In the LRA, the applicant identified the Fire Protection Program, One Time Inspection Program, and Selective Leaching Program as the programs for managing aging effects in the fire protection system. The Fire Protection Program was identified for managing fire barriers and fire detection and suppression equipment. The One Time Inspection Program was identified for managing the effects of loss of material in the reactor coolant pump oil collection system and the fire pump diesel fuel oil tank. The Selective Leaching Program was identified for managing leaching effects on fire pump casings.

c. Conclusions

The team found that, for this system, the applicant had properly identified the effects of aging and the program that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

6. Auxiliary Building Ventilation System

a. Inspection Scope

The team reviewed the applicant's LRA and the applicant's aging management reviews documented in Engineering Analyses FC-00-096, "Auxiliary Building Ventilation System," credited for managing aging effects in the auxiliary building ventilation system.

b. Observations

The team performed a visual inspection of portions of the auxiliary building ventilation system which were subject to aging management review. Equipment appeared to be in good condition and no evidence of unsatisfactory aging conditions was observed.

In the LRA, the applicant identified the Boric Acid Corrosion Prevention Program, General Corrosion of External Surfaces Program, and the Periodic Surveillance and Preventive Maintenance Program as the programs for managing aging effects in the auxiliary building ventilation system.

c. Conclusions

The team found that, for this system, the applicant had properly identified the effects of aging and the program that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

7. Emergency Diesel Generators and Support Systems

a. Inspection Scope

The team reviewed the applicant's LRA and the applicant's aging management review documented in Engineering Analyses FC-00-109, "Emergency Diesel Generator System," credited for managing aging effects in the emergency diesel generators and support systems.

b. Observations

The team performed a visual inspection of portions of the emergency diesel generators and support systems which were subject to aging management review. Equipment appeared to be in good condition and no evidence of unsatisfactory aging conditions was observed.

The emergency diesel generators are considered active and are excluded from the group that is subject to aging management review. All auxiliary components supplied as part of the engine and located on the engine skid are considered part of the engine for the purpose of license renewal. Support systems, which are the starting air system, jacket water system, fuel oil and lubricating oil systems, and combustion and exhaust air systems, are not considered active and are within the scope of license renewal. In the LRA, the applicant identified the Periodic Surveillance and Preventive Maintenance Program and the General Corrosion of External Surfaces Program as the programs for managing aging effects in the emergency diesel generator support systems.

c. Conclusions

The team found that, for this system, the applicant had properly identified the effects of aging and the program that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

8. Spent Fuel Pool Cooling System

a. Inspection Scope

The team reviewed the Spent Fuel Pool Cooling system drawings, Updated Safety Analysis Report, Section 9.6, and the applicant's aging management review of the Spent Fuel Pool Cooling system. This included a review of Engineering Analysis FC-00-123, Revision 1, "Spent Fuel Pool Cooling: System Scoping, Screening, and Aging Management Review for License Renewal," interviews with the responsible system and program engineers, visual examinations of accessible portions of the Spent Fuel Pool Cooling system, and review of the Spent Fuel Pool Cooling system operating experience at the Fort Calhoun Station and in the industry.

b. Observations

For the Spent Fuel Pool Cooling system, the applicant identified one new program, three enhanced programs, and one existing program to manage the aging effects of: (1) loss of material due to general pitting, crevice, galvanic, and microbiologically-influenced corrosion; (2) loss of material due to boric acid corrosion; and (3) crack initiation and growth due to stress-corrosion cracking,

cyclic loading, or both in the Spent Fuel Pool Cooling system. The new program the applicant is crediting for managing the effects of aging is the General Corrosion of External Surfaces Program. The enhanced programs are: (1) Periodic Surveillance and Preventive Maintenance Program; (2) Boric Acid Corrosion Prevention Program; and (3) Cooling Water Corrosion Program. The existing program is the Chemistry Program. Detailed reviews of these programs are provided in this report. Fort Calhoun has committed to revise the General Corrosion of External Surfaces to include the Spent Fuel Pool Cooling System. Fort Calhoun has initiated Action Request 00029561/09 to track this revision.

c. Conclusions

Based on the applicant's commitment to revise the General Corrosion of External Surfaces Program to include the Spent Fuel Pool Cooling system, the team found that, for this system, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

9. Auxiliary Boiler Fuel Oil and Fire Protection Fuel Oil System

a. Inspection Scope

The team reviewed the Auxiliary Boiler Fuel Oil and Fire Protection Fuel Oil systems drawings, Updated Safety Analysis Report, Sections 8.4, 9.4, and 10.2, and the applicant's aging management review of the Auxiliary Boiler and Fire Protection Fuel Oil systems. This included a review of Engineering Analysis FC-00-112, Revision 1, "Auxiliary Boiler/Fire Protection – Fuel Oil: System Scoping, Screening, and Aging Management Review for License Renewal," interviews with the responsible system and program engineers, performing visual examinations of accessible portions of the Auxiliary Boiler and Fire Protection Fuel Oil systems and reviewing the Auxiliary Boiler and Fire Protection Fuel Oil systems's operating experiences at Fort Calhoun and in the industry.

b. Observations

For the Auxiliary Boiler and Fire Protection Fuel Oil systems, the applicant identified one enhanced program and three new programs to manage the aging effects of: (1) loss of material due to general pitting, crevice, galvanic, and microbiologically-influenced corrosion; (2) external surface corrosion due to the potential for the existence of sufficient oxygen, moisture levels, soil contaminants, or a combination; (3) crevice corrosion due to crevices existing that allow a corrosive environment to develop; (4) loss of material due to dezincification; (5) microbiologically-influenced corrosion due to the potential for microorganism introduction and moisture contamination during bulk fuel oil supply and delivery; and (6) pitting, crevice, and general corrosion due to potential water contamination and water pooling in the Auxiliary Boiler and Fire

Protection Fuel Oil systems. The new programs the applicant is crediting for managing the effects of aging are: (1) General Corrosion of External Surfaces Program; (2) Buried Surfaces External Corrosion Program; and (3) Selective Leaching Program. The enhanced program is the Diesel Fuel Monitoring and Storage Program. There were no applicable existing aging management programs for this system. Detailed reviews of these aging management programs are provided in this report. Fort Calhoun has committed to revise Engineering Analysis FC-00-112, Revision 1, "Auxiliary Boiler/Fire Protection – Fuel Oil: System Scoping, Screening, and Aging Management Review for License Renewal," to include carbon steel piping that was omitted from the analysis.

c. Conclusion

Based on the applicant's commitment to revise Engineering Analysis FC-00-112 to include omitted carbon steel piping, the team found that, for this system, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

10. Reactor Coolant System

a. Inspection Scope

The team reviewed the reactor coolant system drawings, Updated Safety Analysis Report, Section 4.0, and the applicant's aging management review of the reactor coolant system. This included a review of Engineering Analysis FC-00-131, Revision 1, "Reactor Coolant System Scoping, Screening, and Aging Management Review for License Renewal," interviews with the responsible system and program engineers and reviewing the reactor coolant system operating experience at Fort Calhoun and in the industry.

b. Observations

For the reactor coolant system, the applicant identified three new programs, four enhanced programs, and four existing programs to manage the aging effects of: (1) loss of material due to wear, fretting, or both; (2) loss of preload due to stress relaxation; (3) crack initiation and growth due to cyclic loadings, stress corrosion cracking, intergranular stress corrosion cracking, primary water stress corrosion cracking, irradiation assisted stress corrosion cracking, outside diameter stress corrosion cracking, intergranular attack, thermal and mechanical loading, or a combination; (4) loss of material due to boric acid corrosion; (5) cumulative fatigue damage; (6) crevice corrosion in the presence of sufficient levels of oxygen, halogens, sulfates, or copper; (7) stress corrosion cracking or pitting corrosion due to potential exposure to halogen or sulfates; (8) loss of fracture toughness due to thermal aging embrittlement; (9) loss of material due to

general pitting, erosion, galvanic, microbiologically-influenced, and crevice corrosion; (10) loss of material due to fretting; (11) wall thinning due to flow-accelerated corrosion; (12) general and pitting corrosion due to the exposure to dissolved oxygen; (13) deformation due to corrosion at tube support plate intersections; (14) loss of section thickness due to flow accelerated corrosion, and (15) ligament cracking due to corrosion in the reactor coolant system. The new programs the applicant is crediting for managing the effects of aging are: (1) One-Time Inspection Program; (2) Alloy 600 Program; and (3) Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program. The enhanced programs are: (1) Boric Acid Corrosion Prevention Program, (2) Fatigue Monitoring Program; (3) Cooling Water Corrosion Program; and (4) Steam Generator Program. The existing programs are: (1) Bolting Integrity; (2) Inservice Inspection, (3) Chemistry, and (4) Flow Accelerated Corrosion. Detailed reviews of these aging management programs are provided in this report. Fort Calhoun has committed to correct the applicable License Renewal Process Management System and revise Engineering Analysis FC-00-131, Revision 1, "Reactor Coolant System Scoping, Screening, and Aging Management Review for License Renewal," to credit the Boric Acid Corrosion Prevention Program for the following components: RC-2A-BDNOZ, RC-2A-FWNOZ, RC-2A-FWNOZSEEND, RC-2A-INSTNOZ, RC-2A-STMNOZ, RC-2A-STMNOZSFEND, RC-2B-BDNOZ, RC-2B-FWNOZ, RC-2B-FWNOZSEEND, RC-2B-INSTNOZ, RC-2B-STMNOZ, and RC-2B-STMNOZSFEND.

c. Conclusion

Based on the applicant's commitment to correct the License Renewal Process Management System and revise Engineering Analysis FC-00-131, the team found that, for this system, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

11. Containment Heating, Ventilation, and Air Cooling System

a. Inspection Scope

The team reviewed the containment heating, ventilation, and air cooling system drawings and the applicant's aging management review of the containment heating, ventilation, and air cooling system (documented in Engineering Analysis FC-00-090, "Containment Heating and Ventilation and Cooling Systems"). The team also interviewed the responsible system engineer.

b. Observations

For the containment heating, ventilation, and air cooling system, the applicant identified one new program, one existing program, and two enhanced programs

to manage the effects of loss of material. The existing program is the Bolting Integrity Program. The enhanced programs are the Boric Acid Corrosion and Periodic Surveillance Programs. The new program is the General Corrosion of External Surfaces Program. Detailed reviews of these programs are provided in Section D of this report. When reviewing this system, the team inquired if the scope of the inspections included galvanized steel, carbon steel, and low alloy steel components. The applicant stated that there is no difference assumed between these steels for any of the surface corrosion mechanisms. For instance, even though galvanized steel has a protective coating, it is essentially ignored for the purpose of license renewal. The applicant also noted that Procedure SE-PM-AE-1000, "Containment Protective Coatings Inspection," will be expanded to include all components inside containment. This procedure will provide guidance for the inspection for corrosion and actions to be taken upon discovery. The team inquired about whether there are any internal inspections of the ducting. The applicant stated that preventive maintenance Tasks 824 and 98, perform internal inspections of the ventilation housing and dampers.

Walkdowns performed by the Quality Control department, the operators (SO-O-1, "Conduct of Operations," Section 5.12.3, "Operator Rounds") and the system engineers (PED-SEI-20, "Duties and Responsibilities of System Engineering Personnel," Section 5.4.1, "System Walkdowns") assure that the material condition of the containment heating, ventilation, and air cooling system is maintained. These procedures include guidance for inspection, evaluations as needed, and corrective actions. While we were not able to observe any of these components, the team spoke to the system engineer. The system engineer stated the containment heating, ventilation, and air cooling system is in good material condition but noted the aging management program reviews had not been turned over to them as of yet. The system engineer noted that for the postaccident conditions the ducting is not needed for this system to perform its safety-related function. The ducting is necessary to maintain the initial conditions of the accident analysis.

c. Conclusion

The team found that, for this system, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

12. Control Room Heating, Ventilation, and Air Cooling System

a. Inspection Scope

For the control room heating, ventilation, and air cooling system, the applicant identified one new program, one existing program, and one enhanced program to manage the effects of loss of material. The existing program is the Bolting

Integrity Program. The enhanced program is the Periodic Surveillance Program. The new program is General Corrosion of External Surfaces Program. Detailed reviews of these programs are provided in Section D of this report.

b. Observations

The team inquired as to whether the scope of the inspections included galvanized steel, carbon steel, and low alloy steels components during review of this system. The applicant stated that no differences are assumed between these steels for any of the surface corrosion mechanisms. For instance, even though galvanized steel has a protective coating it is essentially ignored for the purpose of license renewal. Inspections by the Quality Control department, the operators, and the system engineers assure that the material condition of the control room heating, ventilation, and air cooling system is maintained. The procedures for these inspections include guidance for inspection, evaluations as needed, and corrective actions. The system engineer stated the control room heating, ventilation, and air cooling was in good material condition but noted that the Aging Management Program Reviews had not been turned over to them. The team was able to observe some of the ducting and it appeared to be in good material condition.

c. Conclusion

The team found that, for this system, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

13. Ventilating Air System

a. Inspection Scope

The ventilating air system consists of the heating, ventilation, and air cooling system for the emergency diesel generator room and intake and exhaust ducts for the emergency diesel generators. For the emergency diesel generator rooms' heating, ventilation, and air cooling system, the applicant identified one new program, one existing program, and one enhanced program to manage the effects of loss of material. The existing program is the Bolting Integrity Program. The enhanced program is the Periodic Surveillance Program. The new program is General Corrosion of External Surfaces. Detailed reviews of these programs are provided in Section D of this report.

b. Observations

The team inquired as to whether the scope of the inspections included galvanized steel, carbon steel, and low alloy steel components during review of

this system. The applicant stated that no differences are assumed between these steels for any of the surface corrosion mechanisms. For instance, even though galvanized steel has a protective coating, it is essentially ignored for the purpose of license renewal. Inspections by the quality control department, the operators, and the system engineers assure that the material condition of the ventilating air system is maintained. In addition, the applicant has an action request to develop an inspection for the emergency diesel generator's exhaust piping and muffler to be included in the Periodic Surveillance and Preventive Maintenance Program. This preventive maintenance will include guidance for inspection, evaluation of degradation, and corrective actions as needed. The system engineer stated the ventilating air system is in good material condition but noted the Aging Management Program Reviews had not been turned over to them. The team observed most of the ducting and exhaust piping in the emergency diesel generator rooms and it appeared to be in good material condition. There were no obvious signs of corrosion or soot buildup on the ducting.

c. Conclusion

The team found that, for this system, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

14. Chemical and Volume Control System

a. Inspection Scope

The team reviewed the chemical and volume control system drawings and the applicant's aging management review of the chemical and volume control system documented in Engineering Analysis FC-00-128, "Chemical and Volume Control System," Revision 0.

b. Observations

For the chemical and volume control system, the applicant identified two new programs, three existing programs, and four enhanced programs to manage the effects of loss of material, crack initiation and growth, corrosion, stress corrosion cracking, and cumulative fatigue damage. The new programs the applicant is crediting for managing the effects of aging are the One Time Inspection Program and the General Corrosion of External Surfaces Program. The existing programs are: (1) Bolting Integrity; (2) Chemistry; and (3) Inservice Inspection. The enhanced programs are: (1) Boric Acid Corrosion Prevention; (2) Cooling Water Corrosion, (3) Periodic Surveillance and Preventive Maintenance; and (4) Fatigue Monitoring. Detailed reviews of these programs are provided in Section D of this report.

c. Conclusion

The team found that, for this system, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

15. High Pressure Safety Injection, Low Pressure Safety Injection, and Containment Spray Systems

a. Inspection Scope

The team reviewed the high pressure safety injection, low pressure safety injection, and containment spray systems drawings and the applicant's aging management review of the systems documented in the applicant's engineering analysis.

b. Observations

For the high pressure safety injection, low pressure safety injection, and containment spray systems, the applicant identified one new program, two existing programs, and four enhanced programs to manage the effects of crack initiation and growth, stress corrosion cracking, loss of material, loss of preload, cumulative fatigue damage, and cracking. The new program the applicant is crediting for managing the effects of aging is the Selective Leaching Program. The existing programs are the Bolting Integrity Program and the Chemistry Program. The enhanced programs are: (1) Boric Acid Corrosion Prevention, (2) Cooling Water Corrosion, (3) Fatigue Monitoring, and (4) Periodic Surveillance and Preventive Maintenance. Detailed reviews of these programs are provided in Section D of this report.

c. Conclusion

The team found that, for these systems, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

16. Containment Penetrations and System Interface Components for Noncritical Quality Equipment Systems

a. Inspection Scope

The team reviewed the containment penetrations and system components for noncritical quality equipment system drawings and the applicant's aging management review of the containment penetrations and system components for noncritical quality equipment systems documented in Engineering Analysis FC-00-064, "Containment."

b. Observations

For the containment penetrations and system components for noncritical quality equipment, the applicant identified two new programs, three existing programs, and two enhanced programs to manage the effects of loss of material and flow accelerated corrosion. The new programs the applicant is crediting for managing the effects of aging are the General Corrosion of External Surfaces Program and the One-Time Inspection Program. The existing programs are: (1) Bolting Integrity; (2) Chemistry; and (3) Flow Accelerated Corrosion. The enhanced programs are the Boric Acid Corrosion Prevention Program and Cooling Water Corrosion Program. Detailed reviews of these programs are provided in Section D of this report.

c. Conclusions

The team found that, for these systems, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with their LRA.

17. Raw Water System

a. Inspection Scope

The team reviewed the raw water system drawings and the applicant's aging management review of the raw water system documented in Engineering Analysis FC-00-100, Raw Water," Revision 1.

b. Observations

For the raw water system, the applicant identified four new programs, one existing program, and four enhanced programs to manage the effects of loss of material crack initiation and growth and biofouling. The new programs the applicant is crediting for managing the effects of aging are: (1) Buried Surfaces External Corrosion; (2) General Corrosion of External Surfaces; (3) One Time inspection; and (4) Selective Leaching. The existing program is the Chemistry Program. The enhanced programs are: (1) Boric Acid Corrosion Prevention;

(2) Cooling Water Corrosion; (3) Fire Protection; and (4) Periodic Surveillance and Preventive Maintenance. Detailed reviews of these programs are provided in Section D of this report.

c. Conclusions

The team found that, for these systems, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

18. Reactor Vessel

a. Inspection Scope

The team reviewed the reactor vessel drawings and the applicant's aging management review of the reactor vessel (documented in engineering analysis).

b. Observations

For the reactor vessel, the applicant identified three new programs, four existing programs, and two enhanced programs to manage the effects of cumulative fatigue, crack initiation and growth, loss of material, loss of preload, primary water stress corrosion cracking, intergranular stress corrosion cracking, thermal and mechanical loading, loss of fracture toughness, and cracking. The new programs the applicant is crediting for managing the effects of aging are: (1) Alloy 600; (2) One Time inspection; and (3) Thermal Aging Embrittlement of Cast Austenitic Stainless Steel. The existing programs are: (1) Bolting Integrity, (2) Chemistry, (3) Inservice Inspection, and (4) Reactor Vessel Integrity. The enhanced programs are the Boric Acid Corrosion Prevention Program and the Fatigue Monitoring Program. Detailed reviews of these programs are provided in Section D of this report.

c. Conclusion

The team found that, for these systems, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

19. Reactor Vessel Internals

a. Inspection Scope

The team reviewed the reactor vessel internals drawings and the applicant's aging management review of the reactor vessel documented in Engineering Analysis FC-00-133, "Reactor Vessel," Revision 2.

b. Observations

For the reactor vessel internals, the applicant identified one new program, four existing programs, and two enhanced programs to manage the effects of cumulative fatigue, loss of material, changes in dimension due to void swelling, loss of fracture toughness, crack initiation and growth, loss of preload, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking, fatigue, and cracking. The new program the applicant is crediting for managing the effects of aging is the Alloy 600 Program. The existing programs are: (1) Bolting Integrity; (2) Chemistry; (3) Inservice Inspection; and (4) Reactor Vessel Integrity. The enhanced programs are: (1) Boric Acid Corrosion Prevention; and Fatigue Monitoring. Detailed reviews of these programs are provided in Section D of this report.

c. Conclusion

The team found that, for these systems, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with their LRA. The team also found that the aging effects will be managed so that there is reasonable assurance that the intended function will be maintained consistent with the current licensing basis throughout the period of extended operation.

B. Evaluation of Electrical Systems

The applicant specified the following electrical components for aging management review: electrical cables, connectors, splices, fuse blocks, terminal blocks, electrical penetrations, and electrical bus bars. The team focused on passive electrical components contained in areas whose environments are conducive to producing aging effects. Cables and their associated connectors perform the function of providing electrical energy (either continuously or intermittently) to power various equipment and components throughout the plant. Cables and connectors associated with the 10 CFR 50.49 program (Environmental Qualification) are addressed either as short lived, periodically replaced, or long-lived Time Limited Aging Analysis candidates and, as such, are not included in the set of cables and connectors requiring additional aging management review. The Team did not review these time-limited aging analysis.

Cables and connectors at Fort Calhoun Station were identified through a review of the design, procurement, and as-built information in lieu of a "spaces" approach. This resulted in a list of cable and connector manufacturers and types instead of a list of

where items were denoted by plant specific designator. The approach consisted of evaluating aging of passive electrical components contained in areas where environments are conducive to producing aging effects, such as areas with elevated temperatures, moisture, and radiation.

1. Electrical Components

a. Inspection Scope

The Team reviewed the applicant's aging management review of electrical components documented in engineering analysis reports, and the applicant's response to the NRC's requests for additional information. The Team also interviewed the responsible system and program engineers and performed a visual inspection of accessible portions of the electrical system. Documents reviewed are listed in Attachment 1 of this report.

b. Observations

Aging mechanisms and effects that are applicable to a component are based upon consideration of materials of construction, operating environment, and stress; therefore, similar components constructed of the same material and subject to the same environment will experience the same aging mechanisms and effects. This facilitates the aging management review process in that many components may be grouped together so that a single aging management review may be performed for the entire group. Based on these considerations, this evaluation categorizes the electrical components considered for the cables and connections into one commodity group.

Cables and Connectors: The potential aging effects for cables and connectors (including fittings that are bolted, physically crimped, welded, soldered, plug into a mating receptacle, or splice insulation systems). The potential aging effects for cables and connectors and the activities that will manage those effects are discussed below:

- Electrical stressors, mechanical stressors, and chemical/electrochemical stressors were all determined not to be significant aging mechanisms.

- Exposure to a wetted environment: This can be a significant aging effect for medium voltage cables. Water and humidity are not a concern for most cables, because they are located in dry areas. A discussion of buried cables exposed to a wet environment is provided below.

Based on operating experience, the bulk of moisture related cable failures has been attributed to wetting in conjunction with manufacturing defects or damaged terminations due to improper installation. These are not considered aging effects.

At Fort Calhoun some medium voltage cables (2kV to 15kV) are located in structures exposed to outside ambient conditions and are evaluated for the potential of moisture produced water trees. Water trees occur when the insulating materials are exposed to long-term, continuous electrical stress and moisture. The applications at Fort Calhoun which are susceptible to water treeing are jacketed in ethylene propylene rubber insulated cable, which is designed to minimize moisture exposure. Additionally, the cables are protected by cast-in-place, high density polyurethane foam, which precludes extended submergence of the cable. Fort Calhoun operating experience and industry experience shows no failures of the medium voltage ethylene propylene rubber cable under various environments including moisture. However, aging effects related to cable potentially exposed to moisture will be periodically inspected under the structures monitoring program and the periodic surveillance and preventive maintenance program.

- Radiation stress: Cables and connectors subject to aging management review will not reach the radiation threshold; therefore, radiation stress is not a concern.

- Thermal aging: A maximum operating temperature was developed for each insulation type based on cable applications at Fort Calhoun. The applicant determined that the useable 60 year life temperature for a typical cable insulation material is significantly higher than the bounding environmental temperatures.

- Mechanical stressors: Mechanical stresses in cables and connections are not considered a credible effect except in those cables frequently manipulated. These cables are manipulated during disconnecting and reconnecting of the connectors. The applicant relies on good maintenance practices, including visual inspection and continuity checks after reconnecting to ensure frequent manipulation does not degrade cables.

c. Conclusions

The team found that, for those portions of the electrical systems reviewed, the applicant had properly identified the effects of aging and programs that will manage those effects in accordance with the applicant's LRA. Although some electrical programs were not finalized, if implemented as described in the LRA, the effects of aging should be managed properly.

C. Evaluation of Structures and Structural Components

The applicant assessed the aging mechanisms and aging effects for structures and structural components. The requirements for aging management of the structures were contained in individual engineering analyses or in generic engineering analyses for structures.

The team also interviewed cognizant applicant staff members and performed a visual inspection of accessible portions of the structures selected below. Documents reviewed by the team are listed in Attachment 1 to the report.

1. Containment

The Fort Calhoun Station containment structure is a Seismic Category I, reinforced concrete pressure vessel, with cylindrical walls, a domed roof, and a bottom mat with a depressed center portion for the reactor. The inner surface of the containment concrete shell, dome, and the base slab is lined with a steel liner plate that forms a continuous steel envelope to provide an essentially leak tight structure. Penetrations through the cylindrical wall for the passage of pipe, ducts, or electrical conduits are welded steel penetrations. These penetrations are welded to the liner plate around their entire perimeter in order to achieve a pressure tight seal to maintain containment integrity. The containment steel envelope is surrounded by a prestressed concrete structure. Tendons are used to maintain the concrete in a prestressed condition.

a. Inspection Scope

The team reviewed license basis documents and the applicant's aging management programs noted in Engineering Analyses FC-00-064, "Containment," Revision 2, and FC-00-111, "Containment Leak Rate," Revision 0.

b. Observations

The team's review of the reactor building steel and concrete components are discussed, separately, below.

Structural Steel and Steel Components:

The applicable aging effect for carbon and low-alloy high strength structural steel and steel components, which includes the containment liner, penetrations, hatches, and post-tensioned wires, is loss of material from general corrosion. The applicant uses American Society of Mechanical Engineers Section XI, Subsection IWE, "Requirements for Class MC and Metallic Liners of Class CC Components of Light-Water Cooled Plants," as an aging management program to manage the corrosion of the liner.

Loss of prestress of the post-tensioning system is a time-limited effect and is monitored by the applicants' program for the tendons.

Concrete Structures and Concrete Components:

The applicable aging effects for the concrete in containment include cracking or damage from freeze-thaw cycles, reaction with aggregates, shrinkage, settlement, elevated temperature, irradiation, and fatigue.

None of these aging mechanisms appear applicable to Fort Calhoun for the following reasons. Freeze-thaw is not applicable, because the concrete was designed such that freeze-thaw would not affect the concrete. Reaction with aggregates occurs only where the aggregates used in the concrete mix contained certain elements that react with chemicals from the cement. Shrinkage will cause cracks to form during initial curing and setting of concrete but, with proper mix and construction, this will not become an applicable aging mechanism. Operational history suggests that shrinkage and reaction with aggregates are not applicable aging effects. Structures settle to some extent during construction and can continue for some time afterward. However, the containment structure at Fort Calhoun is constructed on piles that go to bedrock and continuous settlement is not an applicable aging mechanism. Further, the ground water composition is within the specifications of the GALL report, and degradation of the piles and below-grade concrete is not an applicable aging mechanism.

Reactor building concrete components are generally not located near any substantial source of radioactive material; therefore, irradiation is not an applicable aging mechanism. The concrete that is near a radioactive source, the containment bioshield concrete wall, was constructed to preclude aging effects.

Elevated temperature effects are not applicable, because the geographical location and design used by the applicant around certain penetrations (e.g. main steam, main feedwater) keeps the concrete temperature below 150°F. One concrete location with higher than average temperatures is associated with the Nuclear Detector wells, but the applicant showed trends that the concrete bulk temperature was less than 150°F.

The containment is not subjected to a high cyclic structural loading; therefore, fatigue is not an applicable aging mechanism.

The applicant credited their inspection of the containment in accordance with American Society of Mechanical Engineers Section XI, Subsection IWL, “Requirements for Class CC Concrete Components of Light-Water Cooled Plants,” as an aging management program.

c. Conclusion

The team found that, for this structure, the applicant had properly identified the effects of aging and the programs that will manage those effects in accordance with their LRA.

2. Intake Structure

The Fort Calhoun Station intake structure is a Seismic Category I, reinforced concrete building, with trash racks, rotating screens, and a warm water recirculation tunnel. This structure houses the safety-related water pumps, along with the nonsafety-related circulating water pumps and fire water pumps. The

intake structure has three bays separated by concrete walls perpendicular to the river; two bays contain one raw water pump each and one bay contains two pumps. Flow through each bay is independent of the other two, and the raw water pumps are located 35 feet back from the river. The building has design features to preclude flooding of the rooms with the raw water pump motors.

a. Inspection Scope

The team reviewed license basis documents and the applicants aging management programs noted in Engineering Analysis FC-00-063, "Intake Structure," Revision 2, and Engineering Analysis FC-00-083, "General Corrosion of External Surfaces," Revision 0, to determine if they were consistent with the GALL report recommendations.

b. Observations

Structural Steel and Steel Components:

The applicable aging effect for carbon and low-alloy high strength structural steel and steel components will be loss of material from general corrosion. The environment inside the intake structure, excluding the bays, is generally mild. The applicant will monitor the degradation of the steel inside the intake structure and inside the bays.

Concrete Structures and Concrete Components:

The applicable aging effects for the concrete in the intake structure would include cracking or damage from freeze-thaw cycles, reaction with aggregates, shrinkage, settlement, elevated temperature, abrasion, and fatigue.

Freeze-thaw is not applicable, because the concrete was designed such that freeze-thaw would not affect the concrete. Reaction with aggregates occurs only where the aggregates used in the concrete mix contained certain elements that react with chemicals from the cement. Shrinkage will cause cracks to form during initial curing and setting of concrete but, with proper mix and construction, this will not become an applicable aging mechanism. The applicant has noted some shrinkage/settlement cracks on the intake structure concrete, but these have not grown for several years. Structures settle to some extent during construction and can continue for some time afterward. However, the intake structure is constructed on piles that go to bedrock; therefore, continuous settlement is not an applicable aging mechanism. Further, the ground water composition is within the specifications of the GALL report, and degradation of the piles and below grade concrete is not an applicable aging mechanism.

Intake Structure concrete components generally are not located near any elevated temperatures; therefore, this is not an applicable aging mechanism. The applicant is monitoring some seepage from the warm water recirculation tunnel to the circulating water pump room.

The team did identify one concern, regarding monitoring the concrete in the intake structure bays. Although the bays were to be monitored by the structures monitoring program, the applicable procedure for the intake structure did not have a periodic requirement to inspect the intake structure concrete. The applicant committed to develop a preventive maintenance task to inspect the concrete in the bays. This commitment will be tracked by Action Request 29462, item 17.

The intake structure is not subject to a high cyclic structural loading; therefore, fatigue is not an applicable aging mechanism.

c. Conclusion

The team found that, for this structure, with one exception, the applicant had properly identified the effects of aging and the programs to manage those effects, in accordance with their LRA.

3. Auxiliary Building, including Emergency Diesel Generator Building and Safety Injection and Refueling Water Tank

The auxiliary building is a Seismic Category I, reinforced structure immediately adjacent to the other major Class I structure/containment. Various safety-related components and structures are in this building. Two of the safety-related structures reviewed as part of the auxiliary building were the emergency diesel generator rooms and the safety injection and refueling water tank. The safety injection and refueling water tank is formed by having its metal walls built onto the walls, floor, and ceiling within part of the auxiliary building.

a. Inspection Scope

The team reviewed license basis documents and the applicants aging management programs noted in Engineering Analysis FC-00-065, “Auxiliary Building,” Revision 2, to determine if it was consistent with the GALL Report recommendations.

b. Observations

Structural Steel and Steel Components:

The applicable aging effect for carbon and low-alloy, high-strength structural steel and steel components will be loss of material from general corrosion. The environment inside the intake structure is generally mild, except for the coated walls of the safety injection and fueling water storage tank that could be exposed to boric acid. The applicant will monitor the degradation of the steel inside the auxiliary building and performs routine inspections of the coating in the safety injection and refueling water tank to determine any degradation.

Concrete Structures and Concrete Components:

The applicable aging effects for the concrete in the intake structure would include cracking or damage from freeze-thaw cycles, reaction with aggregates, shrinkage, settlement, elevated temperature, abrasion, and fatigue.

Freeze-thaw and reaction with aggregates is not an applicable aging mechanism, because the concrete was designed to preclude this. Shrinkage will cause cracks to form during initial curing and setting of concrete but, with proper mix and construction, this will not become an applicable aging mechanism. Structures settle to some extent during construction and can continue for some time afterward. However, the auxiliary building structure is constructed on piles that go to bedrock; therefore, continuous settlement is not an applicable aging mechanism. Further, the ground water composition is within the specifications of the GALL report, and degradation of the piles and below grade concrete is not an applicable aging mechanism. The auxiliary building structure is not subject to a high cyclic structural loading; therefore, fatigue is not an applicable aging mechanism.

c. Conclusion

The team found that, for this structure, the applicant had properly identified the effects of aging and the programs to manage those effects in accordance with their LRA.

4. Structures Monitoring

a. Inspection Scope

The team reviewed license basis documents and the applicant's aging management programs noted in Engineering Analysis FC-00-084, "Structures Monitoring," Revision 0, to determine if it was consistent with the GALL report recommendations.

b. Observations

The aging recommendations for steel and concrete were consistent with the approaches in other engineering analyses. The team found that the applicant's approach for structures monitoring for metals and concrete was consistent with the GALL report.

c. Conclusion

The team found that, for this structure, the applicant had properly identified the effects of aging and the programs to manage those effects in accordance with their LRA.

D. Review of Selected Aging Management Programs

The team reviewed selected aging management programs that were credited for managing the effects of aging in certain mechanical systems, electrical systems, and structures and structural components to verify that existing programs were implemented consistent with the information presented in the applicant's LRA, applicant programs and procedures. For new programs not yet created, and for existing programs that will be enhanced or expanded, the team examined available documentation and discussed future plans with cognizant system and program engineers. Documents reviewed are listed in Attachment 1 to this report.

1. Alloy 600 Program

a. Inspection Scope

The team reviewed the applicant's LRA, Engineering Analysis FC-00-138, "Alloy 600 Program," Revision 0, Program Basis Document 18, "Alloy 600," Revision 0, and applicable surveillance test procedures. The team also interviewed knowledgeable program engineers.

b. Observations

The LRA, Sections A.2.1 and B.3.1; Engineering Analysis FC-00-138, "Alloy 600 Program," Revision 0; and Program Basis Document 18, "Alloy 600," Revision 0, contains the applicant's description of the Alloy 600 Aging Management Program.

The Alloy 600 Program is a new program that includes a primary water stress corrosion cracking susceptibility assessment to identify susceptible components and in-service inspection of reactor coolant system penetrations to monitor primary water stress corrosion cracking and its effect on the intended function of the component. All components in the reactor coolant system with a license renewal intended function that are fabricated from nickel-based alloy 600 and alloy 82 and/or 182 welds are within the scope of the Alloy 600 Program, with the exception of the steam generator tubes. Steam generator tubes are managed by the Steam Generator Program.

c. Conclusion

The team concluded that the Alloy 600 Program as described in the applicant's engineering analysis and LRA will be effective in managing aging effects for which it is credited.

2. Fatigue Monitoring Program

a. Inspection Scope

The team reviewed the applicant's LRA, the applicant's engineering analysis, and the current licensing basis for the Fatigue Monitoring Program. The team also discussed this program with knowledgeable applicant staff.

b. Observations

The Fatigue Monitoring Program monitors and tracks the number of critical thermal and pressure transients for selected reactor coolant components in order not to exceed the design limit on fatigue usage. The program includes preventive measures to mitigate fatigue cracking of metal components of the reactor coolant pressure boundary caused by anticipated cyclic strains in the material. The applicant determined that maintaining the fatigue usage factor below the design code limit and considering the effect of the reactor water environment will provide adequate margin against fatigue cracking.

In order to implement this program, the applicant has an existing Procedure SO-O-23, "Systems and Equipment Usage Data," which counts plant thermal transient cycles. In addition, the applicant has made a commitment to add the pressurizer surge line and Class 2 and 3 components, not included in the GALL report, to the scope of the Fatigue Monitoring Program.

c. Conclusion

The team concluded that the Fatigue Monitoring program, as described in the LRA and with the proposed enhancements described above, will provide reasonable assurance that the aging effects of components due to thermal fatigue will be managed during the period of extended operation.

3. Fire Protection Program

a. Inspection Scope

The team reviewed the applicant's LRA, the applicant's Engineering Analysis FC-00-085, "Fire Protection," and the current licensing basis for the Fire Protection Program. The team also discussed this program with knowledgeable applicant staff.

b. Observations

The Fire Protection Program manages the aging effects on the intended function of fire penetration seals, fire barrier walls, ceilings, and floors, and all fire rated doors that perform a fire barrier function. It also manages the aging effect on the fire pumps, diesel fire pump fuel supply line, fire suppression water supply system, and halon/carbon dioxide fire suppression systems.

In order to implement this program the applicant has an existing fire barrier inspection program, fire pump inspection program, and halon/carbon dioxide inspection program using Procedure SO-G-103, "Fire Protection Operability Criteria and Surveillance Requirements." In addition, the applicant has made a commitment to perform a more detailed visual inspection of fire barriers than is currently required. In addition, the applicant committed to enhance the inspection of fire doors to include door clearances and inspect for abnormal or unacceptable wear, corrosion, or missing parts.

c. Conclusion

The team concluded that the Fire Protection Program, as described in the LRA, and with the proposed enhancements described above, will provide reasonable assurance that the aging effects on the fire protection system will be managed during the period of extended operation.

4. Nonenvironmentally Qualified Cable Aging Management Program

a. Inspection Scope

The team reviewed the applicant's LRA, Engineering Analysis FC-00-144, "Non-EQ Cable Aging Management Program," Revision 1, and interviewed knowledgeable program engineers.

b. Observations

The Non-EQ Cable Inspection Program is a new program containing in-scope accessible cables which is credited with managing the deterioration of the material properties of the insulation of cables in adverse environments. The aging effects are managed by performing visual examination of a sample of cables identified to be at risk. The Non-EQ Cable Aging Management Program was reviewed to determine the effectiveness of the program.

The new program will perform periodic visual inspections of non-EQ cables which are in the scope of license renewal. The inspections will look for adverse localized equipment environments caused by heat, radiation, or moisture intrusion in the presence of oxygen which can accelerate aging of electrical cables. The initial inspections on circuits with sensitive low level signals will be maintained by routine calibration tests performed as part of the plant surveillance program to identify any potential aging degradation. The normal calibration frequency specified in the plant Technical Specifications should provide assurance that severe aging will be detected prior to loss of cable intended function.

For inaccessible medium voltage (2kV to 15 kV) cables, actions will be taken to prevent cables from being exposed to significant moisture, that is, modifications were made to duct banks to preclude moisture intrusion. In addition, inspections for moisture in cable manholes and conduit will be conducted periodically

draining water as needed. This portion of the program is still under development and the applicant has assigned Action Request 31799 to track its development. If significant moisture (cables in standing water for more than a few days) is discovered, the cables will be tested using a proven test for detecting deterioration, such as power factor, partial discharge, or polarization index.

The applicant has performed a search of past operating history, maintenance records, license event reports for the past 15 years, and condition reports and consulted with applicable electrical/design engineers to validate plant-specific findings to determine the past failure history of electrical cables. The applicant determined from this review that operating experience indicated that no instances of cable failure due to cable degradation from aging had occurred.

c. Conclusion

The team concluded that the Non-EQ Aging Management Program, as described in the LRA, and with the proposed new aging management activities, will provide reasonable assurance that the aging effects on the non-EQ electrical components will be managed during the period of extended operation.

5. Selective Leaching Program

a. Inspection Scope

The team reviewed the selective leaching aging management program. This included a review of the applicant's Engineering Analysis FC-00-142, Revision 0, "Selective Leaching Program Evaluation for License Renewal," interviews with the responsible program engineer, the GALL report Section XI.M33, "Selective Leaching of Materials," and review of the selective leaching operating experience at Fort Calhoun.

b. Observations

For GALL report Section XI.M33, "Selective Leaching of Materials," the applicant created a new aging management program, consistent with the aforementioned GALL report, called B.3.6 Selective Leaching Program. The Selective Leaching Program is designed to ensure that selective leaching at Fort Calhoun is adequately managed for aging. The NRC guidelines require hardness testing and a one-time inspection to detect selective leaching. Hardness testing is not required in the Fort Calhoun program because of inaccessible equipment and because a visual inspection will detect selective leaching. Fort Calhoun has committed to develop the implementation procedures of this program in Action Request 00030149. Fort Calhoun has committed to track the implementation of the selective leaching inspections in Action Request 29952/08. The Selective Leaching Program manages via inspections the dezincification of brasses, bronzes, and other copper alloys and graphitization of cast and ductile iron. Fort Calhoun has committed to clarify the discussion regarding dissolved oxygen in Engineering Analysis FC-00-142.

c. Conclusion

Based on the applicant's commitments to develop inspection procedures and implement inspections that are consistent with GALL report Section XI.M33, "Selective Leaching of Materials," and revise the Selective Leaching Engineering Analysis, the inspection team found that the Fort Calhoun Selective Leaching Program will adequately manage selective leaching during the license renewal period.

6. Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program

a. Inspection Scope

The team reviewed the applicant's program for Thermal Aging Embrittlement of the Cast Austenitic Stainless Steel Program. This program evaluates the reactor coolant piping as bounded by leak-before-break analysis and assessment of other cast austenitic stainless steel components for susceptibility to thermal embrittlement.

b. Observations

The applicant currently has no program for thermal aging management. The aging effect requiring management that may lead to loss of fracture toughness includes various forms of embrittlement, including neutron and thermal aging. The thermal embrittlement aging mechanism is only applicable to cast austenitic stainless steel components. Based on research performed by Electric Power Research Institute and Argonne National Laboratory, the NRC has developed screening criteria for thermal embrittlement susceptibility based on material specification, casting method, and ferrite content. The screening criteria was provided to the industry by the NRC in May 2000. CE NPSD-1214, Revision 0, "Generic Aging Management Review Report - Reactor Coolant System," performed and documented the review of reactor coolant system components against the screening criteria proposed by the NRC. This evaluation concluded that all but four components were not susceptible to thermal aging. The team noted that Engineering Analysis FC-00-146, "Cast Austenitic Stainless Steel Program Engineering Analysis," did not reflect this conclusion. The applicant agreed that the reactor coolant system Engineering Analysis FC-00-131 and the cast austenitic stainless steel program engineering analysis had not been updated to reflect this analysis and the applicant committed to revise these engineering analyses to reflect the results of the Combustion Engineering report.

For the components that did not meet the screening criteria, the applicant has generated Action Request 30487/02 to evaluate whether these components are susceptible to thermal aging. If found susceptible, a program will be created that includes inspections or component-specific flaw tolerance evaluations for a 60-year plant life.

c. Conclusion

The team found that currently there is no thermal embrittlement aging program. However, the applicant has performed the screening criteria per NRC guidance and determined that most of the reactor coolant system components are not susceptible to thermal aging. For the remaining components, the applicant will perform additional evaluations to determine if any of the components are susceptible to thermal aging and create a thermal aging program if needed. The team found that, for this Aging Management Program, the applicant meets the guidance in Section XI.M12, “Thermal Aging Embrittlement of Cast Austenitic Stainless Steel,” in accordance with their LRA.

7. Boric Acid Corrosion Prevention Program

a. Inspection Scope

The team reviewed the applicant’s program for boric acid corrosion control for carbon steel and low-alloy steel structures or components, and electrical components, on which borated water may leak. The systems included are systems that transport borated water. When reviewing this aging management program, the team inquired if the scope of the inspections included galvanized steel, carbon steel and low alloy steel components. The applicant stated that there is no difference assumed between these steels for any of the surface corrosion mechanisms. For instance, even though galvanized steel has a protective coating it is essentially ignored for the purpose of license renewal. This program has been enhanced to be consistent with the GALL report. The program is described in Engineering Analysis FC-00-91, “Boric Acid Corrosion Prevention Program.” The team also interviewed the responsible system engineer.

b. Observations

The GALL report describes 10 program attributes or elements for determining the adequacy of each generic aging management program. The GALL report states this program should rely on the implementation of NRC Generic Letter 88-05, “Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants," to monitor the condition of the reactor coolant pressure boundary for borated water leakage. The team has confirmed that Program Basis Document-10, "Boric Acid Corrosion Prevention," has implemented the elements recommended in Generic Letter 88-05. The team reviewed letters dated June 9 and August 31, 1988, from Omaha Public Power District in response to Generic Letter 88-05. These letters described the program for detection of boric acid corrosion in the reactor coolant system and the improvements made to the program in response to Generic Letter 88-05. In addition, the team reviewed NRC Inspection Report 50-285/92-08, which verified that Omaha Public Power District had documented and implemented a boric acid corrosion prevention program as required by Generic Letter 88-05. The applicant has enhanced Program Basis Document-10 to include low-alloy steel

and electrical components as specified by the GALL report. The applicant stated that there is no difference assumed between these steels for the inspection of surface corrosion due to boric acid. The team concluded that Program Basis Document-10 includes the recommendations and guidance provided by Generic Letter 88-05 and therefore is consistent with GALL report Aging Management Program Section XI.M.10, "Boric Acid Corrosion."

The team noted that the scope should include components that could be exposed to leaks, not just those components that transport borated water. For instance, nonborated fluid or ventilation systems were not included as part of the scope of this Aging Management Program. The applicant stated that a component-by-component approach, including electrical contacts, was considered to be impractical because of substantial number of man-hours and radiation exposure that would be required to identify susceptible equipment. Program Basis Document-10 provides for periodic walkdowns and inspections to look for evidence of boric acid leakage, which includes those systems that could be leaked on. Program Basis Document-10 includes corrective actions that include damage inspections assessments and engineering evaluations of both the leakage source and any adjacent structures, components, or electrical components that the leakage could adversely affect. The team agreed that scope as defined was acceptable.

There are several programs and procedures referenced in Program Basis Document-10 for the control of boric acid corrosion. These procedures include:

(1) SE-EQT-MX-0002, which requires direct visual examination by quality control of any carbon steel components that boric acid could come in contact with.

(2) Fort Calhoun Station In-service Inspection Program, which specifies that supports for American Society of Mechanical Engineers Class 1, 2, and 3 piping and components require aging management with respect to boric acid corrosion.

(3) PED-SEI-20, "Duties and Responsibilities of System Engineering Personnel," defines responsibilities for system/component monitoring that includes walkdowns. These walkdowns are performed on a quarterly basis, as a minimum, and cover accessible portions of the system to identify various system performance issues including material condition. This procedure has been enhanced to include a visual examination of any component that boric acid comes in contact with. In addition, the procedure has added a reference to Electric Power Research Institute TR-104514, "How to Conduct Material Condition Inspections," to provide guidance for this type of inspection.

(4) Standing Order SO-O-1 requires operator rounds and provides guidelines for the discovery of boric acid crystals or evidence of leakage from systems containing boric acid. Engineering Analysis FC-00-91 noted that SO-O-1 does not currently direct maintenance personnel to immediately notify the boric acid corrosion program engineer of discovery or evidence of boric acid. This engineering analysis stated that the maintenance work practices would be

revised, so that the boric acid corrosion program engineer will have this information for trending and reporting requirements per Program Basis Document-10. At the time of the inspection, this change had not been made.

As an example of the increased diligence for detection of boric acid, the applicant provided a recent memorandum regarding walkdowns during a containment entry in October 2002. A "white chalky" material was detected on the containment floor. The material was found in areas under component cooling water piping where condensation appears to have dripped on the floor. A sample was taken to determine if it was boric acid. It was determined that this material was leached salts from the concrete floor. In addition, the chemistry department noted that containment radiation activity was low, indicative of a "tight primary system." The team agreed that the above procedures and programs will provide adequate monitoring of systems and components for boric acid corrosion.

The one area which appeared to be weak is trending. The applicant references the GALL report guidance which references Generic Letter 88-05, “Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants.” Generic Letter 88-05 does not have specific guidance for trending. Trending should provide for predictability of the extent of degradation and timely corrective or mitigative actions. In response to Generic Letter 88-05, the applicant stated that they trend the overall leakage rate of the reactor coolant system by use of mass balance. This calculation is used as an indicator of primary system integrity. The applicant evaluates the leakage values to assure that any increase in primary system leakage will be addressed. The team inquired whether trending could be used on a smaller scale, i.e., could individual leaks or boric acid crystal buildup be trended. The applicant noted that trending of individual leaks is not amenable to boric acid corrosion, as it is the applicant’s policy to repair all leaks. The boric acid corrosion program engineer keeps records to look for recurring leaks, but he noted that there have not been repeat occurrences identified to date. The team found this to be consistent with the guidance in the GALL report.

c. Conclusion

The team found that the Boric Acid Corrosion Prevention Program is consistent with the elements of GALL report, Aging Management Program, Section XI.M.10 "Boric Acid Corrosion." Therefore, the team found that for this Aging Management Program, the applicant meets the guidance in Section XI.M10 in accordance with their LRA.

8. Periodic Surveillance and Preventive Maintenance Program

a. Inspection Scope

The team reviewed the applicant’s program for discovery and mitigation of various changes in material and loss of material aging effects. This aging

management program is described in Engineering Analysis FC-00-099, “Periodic Surveillance and Periodic Maintenance Program.” The team also interviewed the responsible system engineer. The systems included in this aging management program are:

Auxiliary Building
Auxiliary Building Heating, Ventilation, and Air Cooling
Auxiliary Feedwater
Chemical Volume and Control
Component Cooling
Containment
Containment Heating, Ventilation, and Air Cooling
Control Heating, Ventilation and Air Cooling
Diesel Generator Lube Oil and Fuel Oil Duct Banks
Emergency Diesel Generators
Fuel Handling Equipment /Heavy Load Cranes
Intake Structure
Liquid Waste Disposal
Miscellaneous Systems, Penetrations, and Components
Raw Water
Safety Injection
Ventilating Air

b. Observations

The Periodic Surveillance and Preventive Maintenance Program is credited for managing the following aging effects for all the in-scope structures, systems, and components:

Change in material properties
Cracking
Loss of Material
Loss of Material - Crevice Corrosion
Loss of Material - Galvanic Corrosion
Loss of Material - General Corrosion
Loss of Material - Microbiologically Induced Corrosion
Loss of Material - Pitting Corrosion
Loss of Material - Wear
Reduction of Neutron Absorbing Capacity
Separation

The following programs and procedures are credited by the Periodic Surveillance and Preventive Maintenance Program to meet this aging management program:

Procedure SO-M-2, “Preventive Maintenance Program” - The purpose of this program is to prevent or minimize equipment breakdown and to maintain equipment in a satisfactory condition for normal and emergency use. Procedure SO-M-2 establishes the hierarchy and constraints of the other

procedures that execute the program. For instance, it invokes PED-SEI-13, "Preventive Maintenance Program," for determining and documenting the technical basis for a preventive maintenance task. This program assures the overall effectiveness of the preventive maintenance program is monitored so that specific tasks can be upgraded as appropriate.

PED-SEI-13, "Preventive Maintenance Program" - PED-SEI-13 provides the requirements and guidance for trending the results of preventive maintenance and adjusting the task accordingly. This procedure establishes more specific requirements for controlling the technical content and engineering basis of a preventive maintenance task, such as conditioning monitoring activities and parameters to be monitored or inspected.

SO-G-23, "Surveillance Test Program" - The purpose of this program is to provide instructions for the assessment and management of risk associated with the performance of surveillance tests concurrent with maintenance activities.

PED-SEI-14, "Surveillance Testing Program" - PED-SEI-14 ensures that equipment necessary for safe and reliable plant operation will perform within required limits. This program provides for guidelines for program administration, data management, scheduling, procedure preparation, performance, and maintenance of records.

The Fort Calhoun Station Periodic Surveillance and Preventive Maintenance Program credits the current preventive maintenance and surveillance tests to determine the material condition of the structure, systems, and components within the scope of this aging management program. The applicant noted that this aging management program was directed toward material condition of the internal surfaces of structures, systems, and components which are normally not accessible except during maintenance. Exterior corrosion is addressed in Engineering Analysis FC-00-083, "General Corrosion of External Surfaces." Only the preventive maintenance and surveillance tests for the systems in the scope of this aging management program are credited in Engineering Analysis FC-00-099. However, for license renewal, the applicant has revised procedures, identified some new inspections, and enhanced existing inspections to manage the above aging mechanisms. The team reviewed several action requests (00029458, 00029462/04, and 29894/02-12) and preventive maintenance procedures (MM-PM-AE-0500, PE-RR-AE-1000, and GM-ST-FP-0006) that will be revised to inspect for the above aging mechanisms. The applicant has stated that most preventive maintenance and surveillance tests are condition monitoring in nature. That is, these tasks inspect for presence of degradation and, therefore, are not preventive or predictive in nature. While the team agreed that the procedures have been or will be modified to inspect for various aging mechanisms, in most cases the revisions were very general. For instance, many of the modifications to the preventive maintenance to address aging only added a statement to look for corrosion. The parameters monitored or inspected to detect the presence and extent of aging effects in general were not specially identified in the preventive maintenance. There did not appear to be any

guidance or acceptance criteria for avoiding or detecting loss of material aging effects. While trending is implied, the guidance for its use is vague. The applicant provided the team Procedures PED-SEI-13, "Preventive Maintenance Program" and PED-SEI-19, "System Review, Trending and Reporting," but these documents only provide general guidance for performing an analysis once data has been obtained, not which specific parameters the preventive maintenance should be trending. The applicant has agreed to review the acceptance criteria associated with each of the credited tasks to ensure that there is adequate criteria and guidance to perform the preventive maintenance task relative to license renewal.

The applicant has stated that the objectives of the Maintenance Rule are identical to those of the License Renewal Rule with regard to assuring component intended functions. Therefore, many of the activities that are part of the Maintenance Rule are also relied upon to meet the requirements of the License Renewal Rule. The team noted that, while we agree the objectives may be the same, a performance test may not ensure the structures, systems, and components will meet their intended function without linking the degradation of passive intended functions with the performance being monitored. For instance various surveillance tests may demonstrate operability, but they do not provide assurance of material condition of all of the support systems.

c. Conclusion

The team determined that the proposed review of the acceptance criteria and guidance for monitoring and trending of structures, systems, and components will assure that the aging effects are correctly identified, monitored, and trended under the Periodic Surveillance and Preventive Maintenance Program. The team found that this aging management program should be effective in managing the aging effects for which it is credited in the LRA.

9. Bolting Integrity Program

a. Inspection Scope

The team reviewed Engineering Analysis FC-00-139, Revision 0, "Bolting Integrity Program," as well as Procedures MM-RR-RC-1000, "Cleaning of Reactor Vessel Studs, Nuts, and Washers," Standing Order SO-0-1, "Conduct of Operations," MD-AD-0007, "Bolting," SO-R-2, "Condition Reporting and Corrective Action," and PED-SEI-20, "Duties and Responsibilities of System Engineering Personnel."

b. Observations

In Section B.1.1 of the LRA, the applicant states that the bolting integrity program is consistent with Section XI.M3, "Reactor Head Closure Studs," and Section XI.M18, "Bolting Integrity," as identified in the GALL report, with the exception that Fort Calhoun Station has not identified stress corrosion cracking

as a creditable aging effect for high-strength carbon steel bolting in plant indoor air. Fort Calhoun Station proposes to use American Society of Mechanical Engineers, Section XI, Subsection IWF, visual VT-3 inspection requirements instead of volumetric inspections to inspect supports.

The team reviewed Attachments 2 and 3 of Engineering Analysis FC-00-139, which compare on-site implementation procedures against Sections XI.M3 and XI.M18, respectively, to ensure that the on-site implementation of the program will be consistent with Sections XI.M3 and XI.M18, with the noted exception. The team found that the program implementation was consistent with the GALL programs, except that structural bolting is managed by the structures monitoring program while degradation of bolting due to exposure to boric acid is identified through the boric acid corrosion program. The team reviewed these Aging Management Programs in Section D of this inspection report. The applicant explained that the approach to the management of structural bolting, as well as management of bolting exposed to boric acid, was driven by the GALL approach. With regard to stress corrosion cracking of high-strength bolting, the engineering analysis included aging effect topical Report AETR-38, "Stress Corrosion Cracking of High Strength Carbon Steel in Plant Indoor Air," which provided the basis for the applicant's conclusion that stress corrosion cracking was not a plausible aging effect in this material/environment combination. Procedures SO-0-01 and PED-SEI-20 provided guidance to operations and system engineering personnel to monitor for leakage and loss of material during operator rounds and system walkdowns.

c. Conclusion

The team found that, on the basis of its review of the implementation procedures, the applicant's bolting integrity program should be effective in managing the aging effects for which it is credited for license renewal.

10. Cooling Water Corrosion Program

a. Inspection Scope

The team reviewed Engineering Analysis FC-00-087, "Cooling Water Corrosion Program," Revision 0, as well as program basis Document 17, "Cooling Water Corrosion."

b. Observations

In Section B.2.2 of the LRA, the applicant states that the cooling water corrosion program is consistent with Sections XI.M20, "Open-Cycle Cooling Water System," and XI.M21, "Closed-Cycle Cooling Water System," as identified in the GALL report, with several exceptions, clarifications, and enhancements, including:

(1) Clarification that external coatings are addressed by the Fort Calhoun Station general corrosion of external surfaces program

(2) Clarification that the chemistry-related portions of Section XI.M21 are addressed in the chemistry program

(3) An exception to Section XI.M21 that the license renewal commitment relates only to maintenance of the pressure boundary and not maintenance of fluid flow (an active function) and that EPRI TR-107396, "Closed Cooling Water Chemistry Guiding," does not specify a testing frequency

The team reviewed Attachment 2 of Engineering Analysis FC-00-087, which compares on-site implementation procedures against Sections XI.M20 and XI.M21 to ensure that the on-site implementation of the program will be consistent with Sections XI.M20 and XI.M21, with the noted deviations. The team found that the program implementation is documented in both Program Basis Document 17, and Engineering Analysis FC-00-083, "General Corrosion of External Surfaces Program," for inspection of coatings. However, Attachment 2 also compared the aging management program against GALL Aging Management Program Section XI.M32, "One Time Inspection." The applicant clarified to the team that Section XI.M32 is included in the cooling water corrosion program because Section XI.M21 did not always specify the inspection-related attributes needed for adequate management of aging in the systems to which this Aging Management Program is credited. In such a case, the inspection attributes of the one-time inspection program were applied.

c. Conclusion

The team found that, on the basis of its review of the Program Basis Document, which implements the program, the applicant's cooling water corrosion program should be effective in managing the aging effects for which it is credited for in the LRA.

11. Buried Surfaces External Corrosion Program

a. Inspection Scope

The team reviewed Engineering Analysis FC-00-119, Revision 0, "Buried Surfaces External Corrosion Program," as well as implementing Procedures GM-PM-MX-0300, "Defuel, Clean, Inspect, and Refuel Emergency Generator Fuel Oil Storage Tanks (FO-1 and FO-10);" SO-M-100, "Conduct of Maintenance;" and NACE-RP-1069, "Standard Recommended Practice Control of External Corrosion on Underground or Submerged Metallic Piping Systems."

b. Observations

In Section B.3.2 of the LRA, the applicant states that the Buried Surfaces External Corrosion Program will be consistent with Section XI.M34, "Buried

Piping and Tanks Inspection," as identified in the GALL report. The buried carbon steel piping and components that will be managed by this aging management program are in the raw water, auxiliary boiler fuel oil, and emergency diesel generator fuel oil systems. In addition, buried cast iron and ductile iron piping and cast iron valves in the fire protection system and some buried copper instrument tubing associated with the auxiliary boiler fuel oil storage tank are included in this Aging Management Program. Loss of material due to general pitting and crevice corrosion is the aging effect managed by this program. Section XI.M34 includes: (a) preventive measures to mitigate corrosion; and (b) periodic inspection to manage the effects of corrosion on the pressure-retaining capacity of buried carbon steel piping and tanks. Preventive measures are in accordance with standard industry practice for maintaining external coatings and wrappings. Buried piping and tanks are inspected when they are excavated during maintenance and when a pipe is dug up and inspected for any reason.

The team reviewed Attachment 2 of Engineering Analysis FC-00-119, which compares on-site implementation procedures against Section XI.M34 to ensure that the on-site implementation of the program will be consistent with Section XI.M34. The team found that the applicant has not fully implemented the procedures to ensure that the program will meet Section XI.M34. However, the applicant has created an action request to develop the program basis document for this aging management program (an action request is used by the applicant to document its commitment to perform a task). Attachment 6 of the Engineering Analysis provides an outline of what the program basis document will address, including the 10 aging management program elements. Attachment 7 of the Engineering Analysis identifies proposed changes to the implementing procedures identified above to ensure that the program basis document and procedures are consistent with Section XI.M34. These changes include inspection of the diesel and auxiliary boiler fuel oil tanks every 6th refueling outage.

Although the program basis document has not been developed for license renewal, the team discussed with the applicant current operating experience with regard to aging management of the storage tanks. The applicant provided the results from the maintenance activities performed on the emergency diesel generator fuel oil storage tank in 1987. The inspection included an ultrasonic test inspection. The results showed that the original tank wall thickness has been maintained, the welds were satisfactory, and there was no evidence of pitting. In general, the inspection showed the tank to be in excellent condition.

c. Conclusion

The team found that, on the basis of the tank inspection results, along with the applicant's commitment to develop a program basis document for the aging management program and the program basis document outline and proposed revisions to the implementing procedures, as identified in Engineering Analysis

Attachments 6 and 7, respectively, the Buried Surfaces External Corrosion Program should be effective in managing the aging effects for which it is credited in the LRA.

12. General Corrosion of External Surfaces Program

a. Inspection Scope

The team reviewed Engineering Analysis FC-00-083, Revision 0, "General Corrosion of External Surfaces Program," as well as implementing Procedures SO-O-1, "Conduct of Operations," PED-SEI-20, "Duties and Responsibilities of System Engineering Personnel," and SE-PM-AE-1000, "Containment Protective Coatings Inspection."

b. Observations

In Section B.3.3 of the LRA, the applicant identifies the General Corrosion of External Surfaces Program as a plant-specific aging management program that is not consistent with the GALL report. Loss of material and cracking are managed by this program for piping, valves, supports, tanks, and bolting made of cadmium-plated steel, carbon steel, cast iron, copper alloy, galvanized steel, low-alloy steel, and neoprene in various plant systems.

Plant personnel, including operators and system engineers, perform periodic inspections to identify fluid leaks, significant coating damage, or significant corrosion. Plant procedures provide criteria for determining the acceptability of as-found conditions and for initiating the appropriate corrective action. The acceptance criteria and guidance are related to avoiding unacceptable degradation of the component intended functions, and include existence of leakage, presence of corrosion products, coating defects, and elastomer cracking.

The team reviewed various attachments to the engineering analysis, which documented how the implementing procedures would meet the 10 aging management program elements in Branch Technical Position RLSB-1, along with proposed revisions to the procedures to ensure that they will meet the 10 program elements during the period of extended operation.

The team reviewed the implementing procedures and found that proposed revisions were identified. Though the team found the proposed revision acceptable, it did not find where aging management of elastomers was addressed. In response, the applicant generated an action request committing to revise Procedures PED-SEI-20 and SO-O-1 to include acceptance criteria for a visual indication of loss of material or cracking of elastomer ventilation components identified during walkdowns or operator rounds.

The applicant also provided condition reports to demonstrate the effectiveness of operator rounds and engineer walkdowns in identifying fluid leaks, cracks, and

corrosion. Although the team found that the operator rounds and engineer walkdowns appeared to effectively identify degradation, it was unclear to the team how coatings and insulation would be addressed by this program. In response to questions from the team, the applicant clarified that the use of coatings is not credited with managing component aging. However, the applicant will demonstrate that wall thinning will remain within acceptable limits, Procedure SE-PM-AE-1000 inspects and manages containment coatings. Also, in response to the team's inquiries, the applicant generated an action request committing to determine whether insulation should be removed for inspection on a regular frequency, or whether inspections should be performed when insulation is removed for maintenance.

c. Conclusion

The team found that, on the basis of the information provided in the condition reports, along with the applicant's proposed revisions to the implementing procedures and its commitments regarding inspection of elastomers, coatings, and insulation, the general corrosion of external surfaces program should be effective in managing the aging for which it is credited in the LRA.

13. One-Time Inspection Program

a. Inspection Scope

The team reviewed Engineering Analysis FC-00-088, Revision 0, "One Time Inspection Program," as well as Action Request 29952.

b. Observations

In Section B.3.5 of the LRA, the applicant states that the one-time inspection program will be consistent with Section XI.M32, "One-Time Inspections," as identified in the GALL report.

The team reviewed Attachment 3 of Engineering Analysis FC-00-088, which compares on-site implementation procedures against Section XI.M32 to ensure that the on-site implementation of the program will be consistent with Section XI.M32. The team found that the on-site implementation procedures for this program have not yet been developed. However, the applicant has generated Action Request 29952 to track the implementation of the commitment to develop the on-site procedures. The team noted that Engineering Analysis FC-00-088 identified the key high-level criteria that should be included in the on-site implementation procedures.

c. Conclusion

The team found that, on the basis of the applicant's commitment to develop on-site implementation procedures to ensure that the program will be consistent with

GALL Section XI.M32, the one-time inspection program will be effective in managing the aging effects for which it is credited for in the LRA.

14. Flow Accelerated Corrosion Program

a. Inspection Scope

The team reviewed Section B.1.5 of the LRA, Engineering Analysis FC-00-089, Revision 0, and various flow accelerated corrosion program procedural support documents (i.e., FAC-PBD-68, Fort Calhoun Station Condition Reports, and Fort Calhoun Station outage reports) and interviewed the responsible system and program engineers.

b. Observations

The Flow Accelerated Corrosion Program, as described in GALL report XI.M17, is designed to assure that the structural integrity of all carbon steel piping and other components containing high-energy line fluids (two phase and single phase) are maintained. General guidelines for the flow accelerated corrosion program are outlined in the Electric Power Research Institute's Nuclear Safety Analysis Center 202L-R2 (April 1999), NUREG-1344, and further described in Generic Letter 89-08. The Fort Calhoun Station flow accelerated corrosion program uses CHECWORKS (a predictive computer code) to analyze and predict degradation in susceptible plant systems. The team noted a few minor differences between the Fort Calhoun Station flow accelerated corrosion program and the GALL program requirements, but these differences were resolved upon interviewing the flow accelerated corrosion program engineer.

c. Conclusion

Based on the applicant's commitment to GALL report Section XI.M17, "Flow Accelerated Corrosion Program," the team found that, for this system, the applicant properly identified the effects of aging and the programs that will manage those effects, in accordance with Section B.1.5 of their LRA.

15. Chemistry Program

a. Inspection Scope

The team reviewed Section B.1.2 of the LRA, Engineering Analysis FC-00-082, Revision 0, and various Chemistry Program procedural support documents. The team verified the Electric Power Research Institute guidelines (TR-105714, and TR-102134) described in the engineering analysis met the requirements as described in Section XI.M2 and related portions of Section XI.M21 of the GALL report.

b. Observations

The Chemistry Program as described by GALL report Section XI.M2, "Water Chemistry," and related portions of Section XI.M21, "Closed Cycle Cooling Water System," is designed to mitigate damage caused by corrosion and stress cracking. This function is accomplished using the Electric Power Research Institute guideline TR-105714 for primary water chemistry and TR-102134 for secondary water chemistry. Periodic monitoring, sampling, and frequency analysis of known and detrimental contaminants (i.e., chlorides, sulfates, dissolved oxygen) assist in minimizing the known damage causing levels.

c. Conclusion

Based on the applicant's commitment to GALL report Section XI.M2, "Chemistry Program," and related parts of Section XI.M21, "Closed Cycle Cooling Water System," the team found that, for this system, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with Section B.1.2 of their LRA.

16. Inservice Inspection Program

a. Inspection Scope

The team reviewed Section B.1.6 of the LRA, Engineering Analysis FC-00-137, "Inservice Inspection," Revision 0, the inservice inspection program procedural document (10-year inservice inspection program plan Interval 3), and interviewed the responsible system and program engineers. The primary requirements for the inservice inspection program is a part of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, Class 1, 2, and 3, pressure-retaining components and their integral attachments in light-water cooled power plants as described in Section XI.M1 of the GALL report.

b. Observations

Fort Calhoun Station addresses all GALL report Section XI.M1, "American Society of Mechanical Engineers Code," Section XI, inservice inspection program requirements within their 10-year inservice inspection plan Interval 3. Currently, 10-year inservice inspection plan Interval 4 (2003-2013) is being reviewed by appropriate Fort Calhoun Station staff. The revised plan will include measures exclusively acknowledging license renewal, as well as updated American Society of Mechanical Engineers Code, Section XI, updates. The American Society of Mechanical Engineers Code, Section XI, provides requirements for inservice inspection, repair, and replacement of specific components in scope as specified in various subsections. These component inspections look to discover cracks (initiation and growth), corrosion, leakage, and degradation before loss of integrity and intended function of the components occurs.

Interval 3 (1993-2003) of the Fort Calhoun Station 10-year inservice inspection plan, followed all requirements as instructed by American Society of Mechanical Engineers, Section XI, 1989 edition, per GALL report Section XI.M1. Some discrepancies were encountered between the Fort Calhoun Station 10-year plan Interval 3 (as provided in the inservice inspection engineering analysis) and American Society of Mechanical Engineers, Section XI, 1995 edition. This was noted in Sections 2-2 through 2-22. The program engineer stated that the differences are due to the Fort Calhoun Station 10-year plan Interval 3 being based upon American Society of Mechanical Engineers Section XI, 1989 edition, while Interval 4 will be based on the American Society of Mechanical Engineers XI, 1995 edition, which was the edition the team used for reference during the inspection.

The preparer of the engineering analysis agreed, with the suggestion of the team, to identify the specific subsections within the American Society of Mechanical Engineers Code, Section XI, within the engineering analysis. This will assist in ensuring American Society of Mechanical Engineer requirements are met.

c. Conclusion

Based on the applicant's commitment to GALL report Section XI.M1, "Inservice Inspection Program," the team determined that, for this system, the applicant properly identified the effects of aging and the programs that will manage those effects, in accordance with Section B.1.6 of their LRA.

17. Diesel Fuel Oil Monitoring and Storage Program

a. Inspection Scope

The team reviewed Section B.2.3 of the LRA, Engineering Analysis FC-00-082, "Diesel Fuel Monitoring and Storage Program," Revision 0, and various surveillance and maintenance guidelines of the American Society for Testing Materials Standards (D 2709) within the engineering analysis and conducted interviews with the responsible system and program engineers.

b. Observations

The Diesel Fuel Oil Monitoring and Storage Program manages conditions that cause general pitting and microbiologically induced corrosion of diesel fuel tank internal surfaces. The procedures not followed as specified in the GALL report, Section XI.M30, included the absence of the American Society of Testing Materials 2276 particulate analysis procedure and no ultrasonic testing procedure for fire protection diesel fuel oil storage tank (FO-27). The applicant clarified the issues by providing the vendor program under which particulate analysis (American Society for Testing Materials 2276) was performed and provided justification (inaccessibility) per RAI B.2.3-1, regarding why diesel storage tank (FO-27) is not tested using the GALL report method. Clarification

of the above discrepancy was included within Section B.2.3 of the LRA. Also, there is one enhancement to be made to the program prior to the period of extended operation. This includes removal of sediment and water at the bottom of the fire protection diesel fuel oil tank (FO-27), inspection of diesel day tanks for corrosion, and fuel analysis of the fire protection day tanks.

c. Conclusion

Based on the applicant's commitment to GALL report Section XI.M30, "Fuel Oil Chemistry," the team determined that, for this system, the applicant properly identified the effects of aging and the programs that will manage those effects in accordance with Section B.2.3 of their LRA.

18. Overhead Load Handling Systems Inspection Program

a. Inspection Scope

The team reviewed the Overhead Load Handling Systems Inspection Program. This included the applicant's Engineering Analysis FC-00-143, "Overhead Load Handling Systems," Revision 0, interviews with system and program engineers, and visual examinations of accessible portions of the Overhead Load Handling Systems.

b. Observations

For the Overhead Load Handling Systems Inspection Program the applicant identified three enhancements which will be made to the current inspection program for the period of extended operation. These enhancements include specific guidance which will be added to inspect for degradation of expansion anchors and surrounding concrete, guidance to identify acceptance criteria for general corrosion, and applicable inspection procedures to initiate Fort Calhoun Station corrective action documentation if excessive general corrosion or cracking of concrete around expansion anchors is identified. Fort Calhoun Station has created Action Request 30174/05, in which the above enhancements will be added.

c. Conclusion

Based on the applicant's commitment to GALL report Section XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems," the team determined that, for this system, the applicant properly identified the effects of aging and the programs that will manage those effects, in accordance with Section B.2.6 of their LRA.

19. Reactor Vessel Internals Program

a. Inspection Scope

The team reviewed the applicant's LRA, applicable program documentation, and records associated with the Reactor Vessel Internals Program. The implementation of this program was verified by review of the existing and review of the specific enhancements to the program for aging management. In addition, the team interviewed knowledgeable program engineers.

b. Observations

The Reactor Vessel Internals Program is an existing program which will have specific age management enhancements made to it prior to the period of extended operation. The program consists primarily of inservice inspections, evaluations of loadings, the calculation of neutron fluence of reactor vessel internals components, identification of critical locations, flaw evaluation, identification of critical cracks, and detection of cracks.

c. Conclusion

The team concluded that the Reactor Vessel Internals Inspection Program as described in the applicant's engineering analysis and LRA will be effective in managing aging effects for which it is credited.

E. Open Items

During the license renewal scoping and screening inspection conducted November 4-8, 2003, the NRC identified inspection open items, which were documented in NRC Inspection Report 50-285/02-07. These open items were either discrepancies that the applicant agreed to correct or were items that needed further review to reach a conclusion. The team reviewed these open items during this inspection, and their resolutions are discussed below.

1. (Closed) Nonsafety Portion of Component Cooling Water System Omitted from License Renewal Scope

During the NRC's scoping and screening inspection conducted November 4-8, 2003, the team identified nonsafety-related components in the component cooling water system that were not included within the scope of license renewal (Open Item 50-285/0207-01). This subsystem uses component cooling water as the cooling medium for the safety injection leakage coolers. A failure in this portion of the component cooling water system could impact safety-related components. The applicant reviewed this issue and committed to include these components within the scope of license renewal. A revision to the applicable documents will be made. This item is closed.

2. (Closed) Functional Realignment

In Section II A.21 of NRC Inspection Report 50-285/02-07, the inspection team identified Open Item 50-285/02-07/03 regarding the functional realignment of components for license renewal scoping. Specifically, "functional realignment" for license renewal is defined as the scoping of components from one system into another system based on a common in-scope function. This normally occurs when the components from a system that otherwise would have no in-scope function share a common in-scope function with components from other systems. The containment isolation function is an example. There are many systems which contain containment isolation valves. If any of these systems have no other in-scope function, applicants will sometimes functionally realign the containment isolation valves to a single system. In such a case, the components are scoped based on the common in-scope function.

During the scoping and screening inspection, the team found that both the LRA and the on-site Engineering Analysis FC-00-127, “Miscellaneous Systems, Penetrations, and Components,” did not clearly described the methodology used to functionally realign components between systems. In response, the applicant clarified that components with in-scope functions that are contained in systems which have no other in-scope functions are functionally realigned to the "Containment Penetration and System Interface Components for Non-CQE Related System," while components with in-scope functions in systems which have other in-scope functions are not functionally realigned. This item is closed.

3. (Closed) Unqualified Portion of Safety Injection Tank Level and Pressure Instrumentation Omitted from License Renewal Scope

During the NRC’s scoping and screening inspection conducted November 4-8, 2003, the team identified that the unqualified safety injection tank level and pressure indicators need to be considered in scope. These indicators are used to ensure accident analysis assumptions are met for the mitigation of a loss of coolant accident. A failure in this portion of the instrumentation could impact the mitigation of a loss of coolant. The applicant reviewed this issue and committed to include these components within the scope of license renewal. A revision to the applicable documents will be made. This item is closed (50-285/02-07/02).

4. (Closed) Warm Water Recirculation Path Omitted from License Renewal Scope

During the NRC’s scoping and screening inspection conducted November 4-8, 2003, the team identified that the warm water recirculation path would need to be considered in scope based on criterion 10 CFR 54.4(a)(2). Criterion 10 CFR 54.4(a)(2) involves the evaluation of nonsafety-related systems, structures, and components whose failure could prevent safety related systems, structures, and components that are relied upon during and following design-basis events.

The warm water recirculation prevents the formation of icing conditions on the traveling screens and grids. Icing on the traveling screens or grids would adversely affect the operation of the raw water system, which is a safety-related system and is relied upon in design-basis events.

The team discussed this issue with the applicant and agreed that this issue affects the applicant's current license basis and requires resolution under their current license. Since the licensing basis for the renewed license includes the current licensing basis, this issue will be documented after clarification of the current licensing basis issue. The team agreed with this and closed the issue (50-285/02-07-04).

IV. Exit Meeting Summary

The team leader presented the inspection results to Mr. Gates, and other members of applicant's management at the conclusion of the onsite inspection on January 23, 2003, in an exit meeting open for public observation. The applicant acknowledged the findings presented and voiced no dissenting comments.

ATTACHMENT 1

SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Applicant

C. Bloyd, Supervisor, Component Testing
D. Bock, Design Engineer
K. R. Henry, Supervisor, Nuclear Projects
G. Miller, IST Program Engineer
L. N. Sturdevant, Civil Structural Engineer (Constellation Nuclear Services)
K. D. Woods, Senior Nuclear Design Engineer
T. Matthews, Supervisor Licensing
D. Bannister, Manager, Fort Calhoun Station
R. Ridenoure, Division Manager, Nuclear Operations

NRC

C. Johnson, Branch Chief, Project Branch C, Division of Reactor Projects

ITEMS OPENED, CLOSED, AND DISCUSSED

Closed

50-285/0207-01	Nonsafety Portion of Component Cooling Water System Omitted From License Renewal Scope (Section E)
50-285/0207-02	Unqualified Portion of Safety Injection Tank Level and Pressure Instrumentation Omitted from License Renewal Scope (Section E)
50-285/0207-03	Functional Realignment (Section E)
50-285/0207-04	Warm Water Recirculation Path Omitted from License Renewal Scope (Section E)

LIST OF DOCUMENTS REVIEWED

The following documents were selected and reviewed by the team to accomplish the objectives and scope of the inspection.

Condition Reports

200202844
199800979
199800993
200100672
200202844

200100759
200102020
200102169
200102170

Drawings

11405-M-100, “Raw Water Flow Diagram P&ID,” revision 87
11405-E-109, “Lightning Protection Plant Containment and Auxiliary Building,” Revision 8
11405-A-278, “Intake Structure Floor Plans,” Revision 5
11405-A-279, “Intake Structure Floor Plans,” Revision 12
11405-A-281, “Intake Structure Building Sections and Panel Details,” Revision 9
11405-A-282, “Intake Structure Elevations and Door Details,” Revision 4
11405-M-80, “Containment Pipe Penetrations, Sheet 7,” Revision 1
11405-S-11, “Containment Structure Prestressing System, Sheet 1 of 2,” Revision 5
11405-S-12, “Containment Structure Prestressing System, Sheet 2 of 2,” Revision 4
11405-S-22, “Reactor Plant Sections & Details Outline, Sheet 1,” Revision 4
13007.18-EC-18A-1, Diesel Generator Enclosure Plan & Details, Sheet 1,” Revision 5
11405-M-266, Sheet 1, “Fire Protection Flow Diagram P & ID,” Revision 76
11405-M-266, Sheet 1A, “Fire Protection Flow Diagram P & ID,” Revision 16
11405-M-266, Sheet 1B, “Fire Protection Flow Diagram P & ID,” Revision 24
11405-M-266, Sheet 10, “Halon Piping System - Switchgear Room, Cable Spread Room, Control Room & Q.A. Vault,” Revision 2
11405-M-266, Sheet 1, “Fire Protection Flow Diagram P & ID,” Revision 76
11405-M-266, Sheet 1A, “Fire Protection Flow Diagram P & ID,” Revision 16
11405-M-266, Sheet 1B, “Fire Protection Flow Diagram P & ID,” Revision 24
11405-M-266, Sheet 10, “Halon Piping System - Switchgear Room, Cable Spread Room, Control Room & Q.A. Vault,” Revision 2
11405-M-11, Auxiliary Coolant Spent Fuel Pool Cooling System P&ID, Revision 48
11405-M-6, Waste Disposal System Flow Diagram P&ID, Sheet 2
11405-M-262, Fuel Oil System Fire Protection and Security Diesels P&ID, Sheet 3, Revision 7
11405-M-262, Fuel Oil Flow Diagram P&ID, Sheet 1, Revision 54
11405-A-5, Primary Plant Ground Floor Plan P&ID, Revision 38
11405-M-27, Auxiliary Building Composite Piping Plan
Stainless Steel Gate Valve (150 P.S.I), Drawing K-1326, Revision 14
Reactor Coolant System Flow Diagram P&ID, Drawing E-23866-210-110, Sheet 1, Revision 73
Reactor Coolant System Flow Diagram P&ID, Drawing E-23866-210-110, Sheet 1A, Revision 7
Reactor Coolant Pump RC-3A P&ID, Drawing D-23866-210-11, Sheet 1, Revision 43
Reactor Coolant Pump RC-3B P&ID, Drawing D-23866-210-11, Sheet 2, Revision 18
Reactor Coolant Pump RC-3C P&ID, Drawing D-23866-210-11, Sheet 3, Revision 19
Reactor Coolant Pump RC-3D P&ID, Drawing D-23866-210-11, Sheet 4, Revision 19

Engineering Analysis (EA)

EA-FC-00-063, “Intake Structure,” Revision 2
EA-FC-00-064, “Containment,” Revision 2
EA-FC-00-065, “Auxiliary Building,” Revision 2
EA-FC-00-066, “Turbine Building,” Revision 1

EA-FC-00-067, “Building Piles,” Revision 1
EA-FC-00-068, “Component Supports,” Revision 1
EA-FC-00-118, “Scoping, Screening and Aging Management Review - Instrument Air,” Revision 1
EA-FC-00-85, “Fire Protection Program Evaluation for License Renewal,” Revision 0
EA-FC-00-143, “Overhead Load Handling System,” Revision 0
EA-FC-00-138, “Alloy 600 Program,” Revision 0
EA-FC-00-146, “Cast Austenitic Stainless Steel Program Engineering Analysis,” Revision 0
EA-FC-00-91, “Boric Acid Corrosion Prevention Program,” Revision 0
EA-FC-00-088, “One Time Inspection Program,” Revision 0
EA-FC-00-082, “Diesel Fuel Monitoring and Storage Program,” Revision 0
EA-FC-00-087, “Cooling Water Corrosion Program,” Revision 0
EA-FC-00-139, “Bolting Integrity Program,” Revision 0
EA-FC-00-99, “Periodic Surveillance and Periodic Maintenance Program,” Revision 0
EA-FC-00-095, “Scoping, Screening and Aging Management Review - Fire Protection,” Revision 1
EA-FC-00-096, “Scoping, Screening and Aging Management Review - Fire Protection,” Revision 2
EA-FC-00-132, “Fatigue Monitoring Program,” Revision 0
EA-FC-00-135, “Reactor Vessel Internals Inspection Program,” Revision 0
EA-FC-00-133, “Reactor Vessel,” Revision 1
EA-FC-00-134, “Reactor Vessel Internals,” Revision 1
EA-FC-00-100, “Raw Water,” Revision 1
EA-FC-00-127, “Miscellaneous Systems, Penetrations and Components,” Revision 1
EA-FC-00-126, “High Pressure Safety Injection, Low Pressure Safety Injection and Containment Spray Systems,” Revision 1
EA-FC-00-128, “Chemical and Volume Control”
EA-FC-00-083, “General Corrosion of External Surfaces,” Revision 0
EA-FC-00-084, “Structures Monitoring,” Revision 0
EA-FC-00-111, “Buried Surfaces External Corrosion Program,” Revision 0
EA-FC-00-119, “Buried Surfaces External Corrosion Program,” Revision 0
EA-FC-01-015, “Duct Banks,” Revision 2
EA-FC-00-118, “Scoping, Screening and Aging Management Review - Instrument Air,” Revision 1
EA-FC-00-095, “Scoping, Screening and Aging Management Review - Fire Protection,” Revision 1
EA-FC-00-096, “Scoping, Screening and Aging Management Review - Auxiliary Building Ventilation System”
EA-FC-00-132, “Fatigue Monitoring Program,” Revision 0
EA-FC-00-131, “Reactor Coolant System Scoping, Screening, and Aging Management Review for License Renewal,” Revision 1
EA-FC-00-142, “Selective Leaching Program Evaluation for License Renewal," Revision 0
EA-FC-00-112, “Auxiliary Boiler/Fire Protection – Fuel Oil: System Scoping, Screening, and Aging Management Review for License Renewal,” Revision 1
EA-FC-00-123, “Spent Fuel Pool Cooling: System Scoping, Screening, and Aging Management Review for License Renewal,” Revision 1
EA-FC-00-106, “Electrical Penetrations,” Revision 1
EA-FC-00-032, “Auxiliary Feedwater System”

EA-FC-00-093, “Component Cooling Water System”
EA-FC-00-109, “Emergency Diesel Generator System”
EA-FC-00-102, “Electrical Cables, Connectors, Splices, Fuse Blocks, Terminal Blocks,” Revision 2
EA-FC-00-144, “Non-EQ Cable Aging Management Program,” Revision 1
EA-FC-00-090, “Containment Heating, Ventilation, and Cooling Systems, Revision 0

Miscellaneous Documents

Action Request Number 00029462
IN 96-36, “Degradation of Cooling Water Systems due to Icing,” 6/12/96
LER 50-482/96-002, “Loss of ‘A’ train Essential Service water due to Icing on the Trash Racks,” 1/30/96
NUREG/CR-0548, “Ice Blockage of Water Intakes”
(Proprietary Document) TR-104514, “How to Conduct Material Condition Inspections,” September, 1994. [Prepared for the Nuclear Maintenance Applications Center]
Fort Calhoun Station 30th Year (8th Period) Tendon Surveillance, Volumes II and III
Fort Calhoun Station, Unit 1, IWE Expedited Examinations Report, Spring 2001 Outage

NRC Identified Condition Reports

200300227 Documentation WO’s for repair work on SIWRT not readily found 1/23/02

PM Tasks

1116
2756
2919
2998
3564

Procedures

MM-PM-AE-0500, “Periodic Inspection and Maintenance of Personnel Air Lock AE-2,” Revision 1
PED-SEI-20, “Duties and Responsibilities of System Engineering Personnel,” Revision 3
SE-PM-AE-1001, “Auxiliary Building Structural Inspections,” Revision 0
SO-O-1, “Conduct of Operations,” Revision 52
Procedure SO-G-103, “Fire Protection Operability Criteria and Surveillance Requirements,” Revision 14
Procedure SO-O-23, “Systems and Equipment Usage Data,” Revision 9

WORK ORDERS

00054335
00108801

ATTACHMENT 2

FORT CALHOUN STATION LICENSE RENEWAL INSPECTION SAMPLE
AGING MANAGEMENT ACTIVITIES

Auxiliary Boiler Fuel Oil
Auxiliary Feedwater
Component Cooling Water
Main Steam
Turbine Steam Extractions
Reactor Coolant
Spent Fuel Pool Cooling
Auxiliary Building HVAC
Containment HVAC
Control Room HVAC
Diesel Generators and Support Systems
Fire Protection
Instrument Air
Ventilation Air
Chemical and Volume Control
Containment Isolation
Safety Injection (HPSI, LPSI, CONT. SPRAY)
Raw Water
Reactor Vessel
125 Volt dc
4.16 Volt Electrical
480 Volt Electrical
Communications
Containment Electrical Penetrations
Reactor Protection System
Engineered Safeguards
Radiation Monitoring
Qualified Safety Parameter Display
Containments
Diesel Fuel Oil Tank Foundation
Emergency Diesel Generator Buildings
Intake Structures
Auxiliary Building
Turbine Building
Service Building
Safety Injection and Refueling Water Tank
Building Piles
Component Supports
Duct Banks
Reactor Vessel Internals

<u>Existing Aging Management Activities</u>

Bolting Integrity Program
Chemistry Program

Containment Inservice Inspection Program
Containment Leak Rate Program
Flow Accelerated Corrosion Program
Inservice Inspection Program
Reactor Vessel Integrity Program

Enhanced Aging Management Programs

Boric Acid Corrosion Prevention Program
Cooling Water Corrosion Program
Diesel Fuel Monitoring and Storage Program
Fatigue Monitoring Program
Fire Protection Program
Overhead Load Handling Systems Inspection Program
Periodic Surveillance and Preventive Maintenance Program
Reactor Vessel Internals Inspection Program
Steam Generator Program
Structures Monitoring Program

New Aging Management Activities

Alloy 600 Program
Buried Surfaces External Corrosion Program
General Corrosion of External Surfaces Program
Non-EQ Cable Aging Management Program
One-Time Inspection Program
Selective Leaching Program
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel