UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TEXAS 76011-8064

April 23, 2001

Craig G. Anderson, Vice President,
Operations
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S.R. 333
Russellville, Arkansas 72801-0967

SUBJECT: ARKANSAS NUCLEAR ONE - INSPECTION REPORT
50-313/01-03; 50-368/01-03 AND PUBLIC EXIT MEETING SUMMARY

Dear Mr. Anderson:

On February 28, 2001, the NRC completed onsite inspection at your Arkansas Nuclear One, Unit 1, facility. Open items were subsequently discussed with your staff. The enclosed inspection report documents the inspection findings, which were discussed on March 9, 2001, with you and members of your staff, in an exit meeting open for public observation at the Arkansas Nuclear One facility.

The purpose of this inspection was to confirm that the activities that support your application for a renewed license for Arkansas Nuclear One, Unit 1, were conducted consistent with that application and with the NRC's "Safety Evaluation Report with open items related to the license renewal of Arkansas Nuclear One, Unit 1," dated January 2001. The inspection consisted of a selected examination of procedures and representative records and interviews with personnel regarding your programs and plans for managing aging in those systems, structures, and commodity groups within your scope of license renewal.

This inspection concluded that you have identified the aging mechanisms for the systems, structures, and commodity groups within your scope of license renewal and that you have taken or plan to take appropriate actions to manage these aging mechanisms in accordance with your license renewal application and the NRC's "Safety Evaluation Report with open items related to the license renewal of Arkansas Nuclear One, Unit 1," dated January 2001. In addition, your existing aging management programs were generally being conducted as described in your license renewal application. Discussion with plant staff and review of available documentation concerning your plans regarding enhancement of existing programs and creation of new aging management programs was generally consistent with your license renewal application. We were unable to judge the acceptability of your planned new and enhanced aging management programs due to their incompletion.

In accordance with 10 CFR 2.790 of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be 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/NRC/ADAMS/index.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Linda Joy Smith, Chief
Project Branch D
Division of Reactor Projects

Docket Nos.: 50-313, 50-368
License Nos.: DPR-51, NPF-6

Enclosure: Inspection Report 50-313/01-03, 50-368/01-03

Attachments: (1) Supplemental Information
(2) NRC Public Exit Meeting Presentation

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Only inspection reports to the following:
Scott Morris **(SAM1)**
NRR Event Tracking System **(IPAS)**
ANO Site Secretary **(VLH)**
Dale Thatcher **(DFT)**

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RIV:DRP/D	RIV:DRP/D	RIV:DRS/EMB	RIV:DRS/EMB	RII:DRS
RLNease	KDWeaver	WMMcNeill	RPMullikin	CAJulian
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NRR:DRIP	NRR:DRIP	RIV:DRP/D		
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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Docket Nos:	50-313, 50-368
License Nos:	DPR-51, NPF-6
Report No:	50-313/01-03, 50-368/01-03
Applicant:	Entergy Operations, Inc.
Facility:	Arkansas Nuclear One, Units 1
Location:	Junction of Hwy. 64W and Hwy. 333 South Russellville, Arkansas
Dates:	January 22-26, 2001; February 5-9, 2001; and February 27-28, 2001
Team Leader:	R. Nease, Acting Senior Project Engineer
Inspectors:	C. Julian, Technical Assistant, Region II R. Mullikin, Senior Reactor Inspector, Region IV W. McNeill, Reactor Inspector, Region IV K. Weaver, Resident Inspector, ANO H. Wang, Operations Engineer, NRR
Accompanying Personnel:	R. Prato, Project Manager, NRR
Approved By:	L. Smith, Chief, Project Branch D Division of Reactor Projects

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EXECUTIVE SUMMARY

Arkansas Nuclear One, Units 1 and 2
NRC Inspection Report No. 50-313/01-03, 50-368/01-03

IR 05000313-01-03, IR 05000368-01-03, on 1/22-26/2001; 2/5-9/2001; and 2/28-29/2001, Entergy Operations, Inc., Arkansas Nuclear One, Units 1 and 2. License Renewal Inspection Program, Aging Management.

This inspection of license renewal activities for Unit 1 was performed by four NRC Region IV inspectors, one NRC Region II inspector, and two staff members from the NRC's Office of Nuclear Reactor Regulation. The team was onsite from January 22-26, 2001, February 5-9, 2001, and February 27-28, 2001. The inspection was conducted in accordance with the guidance presented in NRC Manual Chapter 2516 and NRC Inspection Procedure 71002.

This inspection included a review of available documentation of your aging management programs and an examination of a sample of plant systems, structures, and commodity groups equipment that support Entergy, Inc.'s application for renewal of the Arkansas Nuclear One, Unit 1, license.

- For the seven mechanical systems reviewed, the team found, in general, that the applicant properly identified the effects of aging and identified programs that will manage those effects, in accordance with their license renewal application and the NRC's "Safety Evaluation Report with open items related to the license renewal of Arkansas Nuclear One, Unit 1," dated January 2001, (Section 111.A).

- The team found the following discrepancies in the license renewal documentation associated with the service water system, all of which the applicant corrected.

  - The applicant failed to include service water pipe Class JBD in Engineering Report 93-R-1016-06 as requiring an aging management review (Section 111.A.3).

  - The applicant failed to include service water tubing in Engineering Report 93-R-1016-06 as requiring an aging management review (Section 111.A.3).

  - The applicant failed to include in Engineering Report 93-R-1016-06, the Service Water integrity Program as managing loss of material in the service water system (Section 111.A.3).

  - The applicant failed to include in their license renewal boundary, three decay heat removal and reactor building spray pump cooling water lines on service water system Boundary Drawings LRA-M-232 and -236 (Section 111.A.3).

- For the electrical systems reviewed, the team found that the applicant properly identified the effects of aging and identified programs that will manage those effects, in accordance with their license renewal application and the NRC's "Safety Evaluation Report with open items related to the license renewal of Arkansas Nuclear One, Unit 1," dated January 2001," (Section 111.B).

- For the four structures and structural commodity groups reviewed, the team found that, in general, the applicant properly identified the effects of aging and identified programs that will manage those effects, in accordance with their license renewal application and the NRC's "Safety Evaluation Report with open items related to the license renewal of Arkansas Nuclear One, Unit 1," dated January 2001, (Section 111.C).

- However, in Engineering Report 93-R-1015-07, the applicant mischaracterized chemical spills as an aging mechanism, and erroneously credited housekeeping activities as a program to manage the effects of chemical spills. Chemical spills are event-driven and as such are not aging mechanisms. In addition, housekeeping activities cannot be credited as managing the effects of aging. The applicant revised the engineering report to correct the characterization and application of chemical spills (Section 111.C.4).

- For the existing aging management programs reviewed, the team found that, in general, these programs are being conducted as described in plant procedures and will be effective in managing aging effects for which they are credited in their license renewal application and as approved in the NRC's "Safety Evaluation Report with open items related to the license renewal of Arkansas Nuclear One, Unit 1," dated January 2001, (Section 111.D).

- The applicant was unable to locate program records from the last ANO-1 inspections performed under the Boric Acid Corrosion Prevention Program. In addition, there was no evidence that results of past inspections under this program had been trended. The applicant initiated Condition Reports CR-ANO-1-2001-0041 and CR-ANO-1-2001-0050 to document and correct these problems (Section 111.D.1).

- The team found the following discrepancies in the documentation associated with existing aging management programs all of which the applicant has corrected:

  - In Appendix B of their license renewal application, the applicant erroneously identified American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI (ASME Section XI), Subsection IWC pressure testing and the Heat Exchanger Monitoring Program as programs that will manage fouling in the decay heat removal coolers. The Service Water Integrity Program is the correct aging management program for managing the effects of fouling on thermal performance (Section 111.D.7).

  - In Appendix B of their license renewal application, the applicant erroneously identified ASME Section XI, Subsection IWC and the Heat Exchanger Monitoring Program as programs that will manage loss of material in the decay heat removal coolers. The Heat Exchanger Monitoring Program is the correct aging management program for managing loss of material (Section 111.D.7).

  - Appendix B to the license renewal application erroneously stated that the polar crane is inspected annually, when it is actually inspected every refueling outage (Section 111.D.16).

  - The list of augmented inspections in Appendix B to the license renewal application omitted three ASME Section XI augmented inspections which were credited in Engineering Report 93-R-1011-01 for managing aging (Section 111.D.25).

- For the proposed new and proposed enhanced aging management programs reviewed, the team found that if implemented in accordance with the license renewal application and as approved in the NRC's "Safety Evaluation Report with open items related to the license renewal of Arkansas Nuclear One, Unit 1," dated January 2001, these programs will be effective in managing aging effects for which they are credited (Section 111.D).

During this inspection, the team closed open items resulting from the license renewal scoping and screening inspection conducted December 11-15, 2000, and documented in NRC Inspection Report 50-313/00-17; 50-368/00-17, dated February 2, 2001, (Section 111.E).

Report Details

Aging Management Inspection

I. NRC Scoping and Screening Inspection

By letter dated January 31, 2000, Entergy Operations, Inc. (the applicant) submitted to the NRC an application to renew the operating license for Arkansas Nuclear One, Unit 1 (ANO-1), to allow an additional 20 years of operation. In support of the NRC Office of Nuclear Reactor Regulation (NRR) technical review of the application, the NRC Region IV staff conducted two inspections at the plant site in Russellville, Arkansas. The first inspection was a scoping and screening inspection conducted from December 11-15, 2000. The purpose of this inspection was to verify, through sampling, that the applicant performed license renewal scoping and screening activities consistent with their license renewal application. With the exception of the followup 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 commodity groups required to be considered for aging management. The results of the scoping and screening inspection are presented in NRC Inspection Report 50-313/00-17; 50-368/00-17, dated February 2, 2001, and are 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/NRC/ADAMS/index.html (the Public Electronic Reading Room). The followup items are dispositioned in Section 111.E of this inspection report.

II. Aging Management Inspection Scope

This inspection was conducted by a team of NRC regional and headquarters inspectors and two members of NRR. The purpose of this inspection was to verify that the applicant identified in their license renewal application the aging effects for those systems, structures, and commodity groups 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 commodity groups are maintained throughout the period of extended operation. Using the same systems, structures, and commodity groups 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 commodity groups were visually examined to verify that all observable aging effects were identified by the applicant. The team also reviewed the applicant's aging management documents to determine if aging effects will be properly managed, so that intended functions of the selected systems, structures, and commodity groups are maintained throughout the period of extended operation in accordance with the license renewal application and the NRC's "Safety Evaluation Report with open items related to the license renewal of Arkansas Nuclear One, Unit 1," (SER) dated January 2001. 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.

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 license renewal application and the NRC's SER. The team reviewed the applicant's license renewal application, the SER, and 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. Emergency Feedwater System

a. Scope

The team reviewed the emergency feedwater (EFW) system drawings and the applicant's aging management review of the EFW system (documented in engineering reports). The team also interviewed the responsible system and program engineers, and performed visual examinations of accessible portions of the EFW system.

b. Observations

For the EFW system, the applicant identified two new programs and five existing programs to manage the effects of loss of material, cracking, loss of mechanical closure integrity, and fouling in the EFW system. The new programs the applicant is crediting for managing the effects of aging are: (1) the Heat Exchanger Monitoring Program, and (2) the Wall Thinning Inspection. The existing programs are: (1) American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI (ASME Section XI), Subsection IWC inservice inspections; (2) Chemistry Control, Secondary Chemistry Monitoring; (3) Maintenance Rule; (4) Oil Analysis Program; and (5) the System and Component Monitoring, Inspection, and Testing, (Emergency Feedwater Pump Testing). Detailed reviews of these programs are provided in Section III.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 license renewal application and the NRC's SER.

2. Main Feedwater System

a. Scope

The team reviewed the main feedwater (MFW) system drawings and reviewed the applicant's aging management review of the MFW system (documented in engineering reports). In addition, the team interviewed the responsible system and program engineers, and performed a visual inspection of the accessible portions of the MFW system.

b. Observation

For the MFW system, the applicant identified the following five existing programs to manage the effects of loss of material, cracking, and loss of mechanical closure integrity: (1) ASME Section XI, Subsection IWC inservice inspection, and augmented inspections; (2) Chemistry Control, Secondary Chemistry Monitoring; (3) Flow Accelerated Corrosion Prevention; (4) Maintenance Rule; and (5) Leakage Detection in the Reactor Building. Detailed reviews of these programs are provided in Section III.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 license renewal application and the NRC's SER.

3. Service Water System

a. Scope

The team reviewed the service water (SW) system drawings and the applicant's aging management review of the SW system (documented in engineering reports). The team also interviewed the responsible system and program engineers and performed a visual examination of accessible portions of the SW system.

b. Observations

For the SW system, the applicant identified two new programs and four existing programs to manage the effects of loss of material, cracking, and fouling. The new programs are: (1) Buried Pipe Inspection, and (2) Heat Exchanger Monitoring. The existing programs are: (1) ASME Section XI, Subsections IWC and IWD; (2) Maintenance Rule; (3) Oil Analysis; and (4) Service Water Integrity Program. Detailed reviews of these programs are provided in Section III.D of this report.

Line Class JBD is shown on SW license renewal boundary Drawing LRA-M-209, Sheet 2, as being within the boundary of license renewal. However, the team

found that the applicant's aging management review for the SW system, documented in Engineering Report 93-R-1016-06, Revision 1, did not identify line class JBD as requiring an aging management review. During this inspection, the applicant revised Engineering Report 93-R-1016-06, Attachment 1, to include line Class JBD. The team also found that both Attachments 1 and 2 to Engineering Report 93-R-1016-06 did not list SW tubing as requiring an aging management review. Subsequently, the applicant revised Engineering Report 93-R-1016 to add SW tubing.

The SW system aging management review documented in Engineering Report 93-R-1016-06 identified cracking, loss of mechanical closure integrity, and loss of material as the aging effects of Class 3 pressure retaining components and their integral attachments. Engineering Report 93-R-1016-06 credited ASME Section XI, Subsection IWD inservice inspections for managing these aging effects. However, Subsection IWD specifies visual examinations, which will not reveal loss of material. Therefore, it is the team's position that ASME Section XI, Subsection IWD, alone, would not be effective in managing the aging effects of loss of material in the SW system. The applicant agreed and stated that ASME Section XI, Subsection IWD, together with the Service Water Integrity Program will manage the effect of loss of material. The applicant subsequently revised Engineering Report 93-R-1016-06 to clearly state that these effects of aging are managed by ASME Section XI, Subsection IWD, together with the Service Water Integrity Program.

License renewal boundary Drawing LRA-M-210 for the SW system showed decay heat and reactor spray pump cooling water lines HCD-47-1½, HCD-48-1½, HCD-49-1½, and HCD-50-1½ as being within the boundary of license renewal. However, these same lines on SW system license renewal boundary Drawings LRA-M-232 and LRA-M-236 were not shown as being in the license renewal boundary. The applicant revised LRA-M-232 and LRA-M-236 to correct the error.

c. Conclusions

With the corrections discussed above, the team found that, for this system, the applicant had properly identified the effects of aging and the programs that will manage those effects, in accordance with their license renewal application and the NRC's SER.

4. Low Pressure Injection/Decay Heat Removal System

a. Scope

The team reviewed the license renewal application and the applicant's aging management review (documented in engineering reports) credited for managing aging effects in the low pressure injection/decay heat removal system. The team

also interviewed the responsible system and program engineers and performed a visual examination of accessible portions of the low pressure injection/ decay heat removal system.

b. Observations

The team, accompanied by the system engineer, conducted visual examination of portions of the low pressure injection/decay heat removal system. The equipment was observed to be in good condition and no evidence of unsatisfactory aging conditions was observed.

The license renewal application credited the following aging management programs for maintaining the pressure boundary function of this system. These programs are discussed further in Section III.D of this report.

- The Primary Chemistry Monitoring program is credited with managing the aging effect of material cracking in a borated water environment.

- ASME Section XI, Subsection IWC inservice inspection is credited with managing the aging effects of loss of material and loss of mechanical closure integrity for carbon steel bolting and external valve parts.

- The Boric Acid Corrosion Prevention Program is credited with managing the aging effect of loss of material from carbon steel.

- The Reactor Building Leak Rate Testing and the Maintenance Rule programs are credited with managing loss of mechanical closure integrity.

- The Reactor Building Sump Closeout Inspection will manage the effects of loss of material in the reactor building sump.

- Primary Chemistry Monitoring, the ASME Section XI, Subsection IWC pressure tests, and the Heat Exchanger Monitoring programs will ensure that the pressure boundary and heat transfer functions of the decay heat cooler heat exchangers are maintained.

- The Oil Analysis Program will ensure that the pressure boundary and heat transfer functions of the pump lube oil cooler will be maintained.

- Preventive maintenance inspections will manage the effects of aging of the borated water storage tank.

c. Conclusions

The team found that, for this system, the applicant had properly identified the effects of aging and the programs that will manage those effects, in accordance with their license renewal application and the NRC's SER.

5. High Pressure Injection/Makeup and Purification System

a. Scope

The team reviewed the license renewal application and the applicant's aging management review (documented in engineering reports) credited for managing aging effects in the high pressure injection/makeup and purification system. The team also interviewed responsible system and program engineers and performed a visual examination of accessible portions of the system.

b. Observations

The team, accompanied by the applicant's system engineer, conducted visual examination of portions of the high pressure injection/makeup and purification system. The equipment was observed to be in good condition and no evidence of unsatisfactory aging conditions was observed.

The license renewal application credited the following programs with managing the aging effects of the portion of this system that was determined to be in the scope of licence renewal. These programs are discussed further in Section III.D of this report.

- ASME Section XI, Subsection IWC inservice inspection is credited with managing aging effects of this system.
- The Boric Acid Corrosion Prevention Program is credited with managing loss of material aging for this system.
- The Reactor Building Integrated Leak Rate Testing Program is credited for managing the aging effects of the reactor building penetrations.
- The Maintenance Rule Program is credited for managing aging effects of this system.
- The Oil Analysis Program will maintain the pressure boundary and heat transfer functions of the pump lube oil cooler.

c. Conclusions

The team found that, for this system, the applicant had properly identified the effects of aging and the programs that will manage those effects, in accordance with their license renewal application and the NRC's SER.

6. Instrument Air System

a. Inspection Scope

The team reviewed the license renewal application and the applicant's aging management review (documented in engineering reports) 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 accessible portions of the system.

b. Observations

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

In the license renewal application, the applicant identified two existing programs for managing the effects of aging in the instrument air system: (1) the Instrument Air Quality Program; and (2) the Maintenance Rule Program. The Instrument Air Quality Program was credited for managing the effect of loss of material and cracking in instrument air system components which are subjected to a gas-air environment. The Maintenance Rule Program was identified for managing the effect of loss of material and cracking in instrument air system components which are subjected to an external ambient environment. These programs are further discussed in Section III.D of this report.

c. Conclusions

The team found that, for this system, the applicant had properly identified the effects of aging and the programs that will manage those effects, in accordance with their license renewal application and the NRC's SER.

7. Chilled Water System

a. Inspection Scope

The team reviewed the license renewal application and the applicant's aging management review (documented in engineering reports) credited for managing aging effects in the chilled water system. The team also interviewed responsible system and program engineers, and performed a visual examination of accessible portions of the system.

b. Observations

During this inspection, the team performed a visual inspection of portions of the chilled water system. The equipment was observed to be in good condition with no evidence of unsatisfactory aging conditions.

The license renewal application credited the following seven aging management programs for managing the effects of aging in the chilled water system. These programs are discussed further in Section III.D of this report.

- The Auxiliary Systems Chemistry Monitoring Program is credited with managing the aging effects of loss of material and cracking of components which are located in a treated water environment in the chilled water system.

- The Heat Exchanger Monitoring Program is credited with managing the aging effects of loss of material for carbon steel, copper, brass, and bronze heat exchangers which are located in a treated water environment.

- The Reactor Building Leak Rate Testing Program and ASME Section XI Subsection IWC (pressure tests) are credited for managing the aging effects of the reactor building penetrations in the chilled water system.

- The Maintenance Rule Program was identified for managing the effect of loss of material and cracking for chilled water system components which are subjected to an external ambient environment.

- The Wall Thinning Inspection Program is credited for managing loss of material for the carbon steel piping.

- The Oil Analysis Program is credited for managing cracking and loss of material aging effects for chilled water components located in an oil environment.

c. Conclusions

The team found that, for this system, the applicant had properly identified the effects of aging and the programs that will manage those effects, in accordance with their license renewal application and the NRC's SER.

B. Evaluation of Electrical Systems

The applicant grouped most electrical passive components together for the purposes of identifying the effects of aging and proposing programs for managing those effects. The applicant used a spaces approach in identifying the electrical components subject to aging and in identifying the aging effects. This approach consisted of evaluating aging of passive electrical components contained in areas whose environments are conducive to producing aging effects, such as areas with elevated temperatures, humidity, and radiation. In addition, the applicant included electrical components subjected to ohmic heating, frequent manipulation, and corrosive chemicals. The team focused its review on passive electrical components contained within harsh

environments to verify that the appropriate aging effects were identified and can be managed by the credited programs, consistent with the applicant's license renewal application and the NRC's SER.

For those electrical components involving time-limited assumptions and/or that fall under 10 CFR 50.49, the applicant performed time-limited aging analyses as required by 10 CFR 54.21(c) to demonstrate that these components are qualified for duty through the extended period of operation. The team did not review these time-limited aging analyses.

1. Electrical Components

a. Scope

The team reviewed the electrical system drawings, the applicant's aging management review of electrical components (documented in engineering reports), the NRC's SER, and the applicant's responses 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 to this report.

b. Observations

The electrical components considered for aging management review are electrical cables, terminal blocks, and connectors (including splices).

Terminal Blocks: The potential aging effects for terminal blocks and the activities that will manage those effects are listed below:

- Terminal block corrosion due to high humidity and exposure to hazardous chemicals: None of the terminal blocks, which were subject to aging management review at ANO-1, were exposed to high humidity or hazardous chemicals; therefore, corrosion is not considered to be an aging effect requiring aging management.

- Damage to terminal blocks due to frequent manipulation of the conncections: The terminal blocks subject to frequent manipulation are those tested using periodic maintenance and surveillance procedures. The applicant determined that existing good maintenance practices, which include visual inspection and continuity checks after reconnecting, will ensure frequent manipulation does not degrade terminal blocks.

- Electrical stresses: No deterioration from electrical stresses is expected since the current capability of the terminal blocks are much larger than the actual current. Therefore, aging resulting from electrical stresses is not a concern.

- Mechanical stresses: The terminal blocks are not utilized as structural members; therefore, mechanical aging is not a concern.

- Thermal or radiation aging: Insulating materials used in ANO-1 terminal block connections are rated at very high service temperatures and radiation exposures and therefore not susceptible to thermal or radiation aging.

Connectors: Connectors include splices, multipin connectors, screw terminals, battery posts, and terminal blocks. Terminal blocks are discussed separately, above. The potential aging effects for connectors and the activities that will manage those effects are listed below.

- Connector corrosion at the terminals due to high humidity and exposure to hazardous chemicals: During normal operation, most connectors are exposed primarily to dry conditions; therefore, corrosion is not considered to be an aging effect requiring aging management. The applicant determined that, for those electrical splices subjected to harsh environments, the Electrical Component Inspection Program will be established to inspect and monitor their condition. In addition, the applicant identified those connectors that terminate impedance-sensitive circuits (coaxial and triaxial connectors). Corrosion of the connector pins of these connectors could interfere with the operation of these circuits. The Electrical Component Inspection Program will be established to periodically inspect these connectors. Further discussion of the proposed Electrical Component Inspection Program is provided in Section III.D of this report.

- Damage to connectors due to frequent manipulation of the connectors: The applicant identified those connectors subject to frequent manipulation. The applicant relies on good maintenance practices, including visual inspection and continuity checks after reconnecting to ensure frequent manipulation does not degrade connectors.

- Electrical stresses: No deterioration from electrical stresses is expected since the connectors are large compared to the actual current.

- Mechanical stresses: Connectors do not provide any substantial structural support; therefore, mechanical aging is not a concern.

Cables: The potential aging effects for cables and the activities that will manage those effects are listed below:

- Corrosion of conductors: Corrosion of conductors is not expected since the conductors are covered by insulation.

- Electrical stress: Deterioration of low voltage cables from electrical stress is not expected due to low voltage.

- Ohmic heating: Ohmic heating can be significant for those cables which are routinely or continuously operated under high currents. The applicant identified 3 cables that were subject to ohmic heating (i.e., operating at greater than 50 percent of their ampacity limit). To ensure the aging effects will not degrade these cables, the applicant will establish the Electrical Component Inspection Program that is described in Section 111.D. of this report.

- Thermal aging: Thermal aging applies to the insulation surrounding cables, which could result in reduced insulation resistance to ground and potential failure of the circuit. The Electrical Component Inspection Program will be established to monitor the condition of cables in the scope of license renewal. Further discussion of the proposed Electrical Component Inspection Program is provided in Section III.D. of this report.

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

- Mechanical stresses: Mechanical stresses in cables 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.

- Exposure to a wetted environment: This can be a significant aging effect for medium and high 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.

The team reviewed condition reports written involving cables in the last 3 years. The applicant identified 18 condition reports initiated during that time, three of which involved buried cables and two concerned cable failures due to thermal aging. The team also requested a complete maintenance history review of buried cables, which revealed three failures, one each in 1995, 1999, and 2001. Each of the failures occurred in cabling between the turbine building and the intake structure and was thought to be due to exposure to ground water. A visual inspection is credited for managing the aging of cables exposed to ground water. In its SER, the NRC technical staff concluded that a visual inspection is not sufficient for managing a significant aging effect, resulting in reduced insulation resistance to ground and potential electrical failure due to moisture intrusion, water treeing, and contamination. This is identified in the NRC's SER as Open Item 3.3.7.3-1, which will be resolved by the NRC technical staff in NRR prior to issuing its final SER.

The team performed a walkdown of selected plant areas to determine whether the applicant had appropriately identified cables subject to aging management

review. The team inspected plant areas where cables could be exposed to elevated temperatures, chemicals, or wetting. The team also reviewed the loading of selected power cables that may require aging management due to being subjected to high current. The team did not identify any cables requiring aging management review that the applicant had not previously identified.

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 their license renewal application and the NRC's SER. Although not finalized, the team determined that, with adequate resolution of the open item discussed above, the Electrical Component Inspection Program, if implemented as described in the license renewal application and in the NRC's SER, should manage the effects of aging in the electrical components within the scope of license renewal.

C. Evaluation of Structures and Structural Components

The applicant assessed the aging mechanisms and aging effects for structures and structural components together as one group, subdivided into structural steel and steel components, structural steel and steel components in fluid environments, concrete structures and concrete components, earthen structures, and commodities. The applicant then evaluated each aging effect under various environmental conditions.

The team reviewed the applicant's programs for addressing the effects of aging on selected structures and structural components to verify that the aging effects were identified and can be managed by the credited programs, consistent with the applicant's license renewal application and the NRC's SER. The applicant's license renewal application, the NRC's SER, and engineering reports were reviewed. In addition, the team interviewed cognizant applicant staff members and performed a visual inspection of accessible portions of the selected structures. Documents reviewed by the team are listed in Attachment 1 to this report. The results of the team's evaluations are discussed below, by structure or structural group.

1. Reactor Building

a. Scope

The team reviewed the NRC's SER and the applicant's aging management review of the reactor building, documented in Engineering Report 93-R-1014-01, "Aging Effects for Structures and Structural Components;" and Engineering Report 93-R-1015-01, "Aging management Review of the Reactor Building." The team also interviewed the responsible program engineers.

b. Observations

The ANO-1 reactor building is a seismic Category 1, continuous, reinforced prestressed concrete cylindrical structure with a shallow dome roof and a mat foundation slab. The concrete shell, dome, and the base slab are lined with a welded steel liner plate attached to the inside of the structure to assure a high degree of leak tightness. All penetrations through the cylindrical wall for the passage of pipe, ducts, and 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.

Engineering Report 93-R-1014-01 provides the generic aging effect review of structural steel, steel components, concrete structures, and concrete components. The report reviews all possible aging mechanisms and aging effects and assesses the applicability of each aging effect to the ANO-1 reactor building under various environmental and material condition combinations. The team's review of the reactor building steel and concrete components are discussed, separately, below.

Structural Steel and Steel Components: For the reactor building, the only applicable aging effect for carbon and low-alloy high strength structural steel and steel components, which includes the containment liner, penetrations, hatches, and post-tension wires, is loss of material from general corrosion. Loss of prestress of the post-tension system is a time-limited effect and is evaluated together with other time-limited aging effects in Engineering Report 93-R-1020-01, "TLAA and Exemption Evaluation Summary."

The aging management program that the applicant credits for managing the corrosion of the liner is ASME Section XI, Subsection IWE, "Requirements for Class MC and Metallic Liners of Class CC Components of Light-Water Cooled Plants." The applicant stated that this is a newly-adopted program and will be used for the first time at ANO-1 during the next refueling outage. A more detailed review of ASME Section XI, Subsection IWE inservice inspections is provided Section III.D of this report.

Concrete Structures and Concrete Components: Table 5-1 of Engineering Report 93-R-1014-01 lists the aging effects of concrete components in the reactor building as loss of material, cracking, and change in material properties from elevated temperatures. Loss of material in concrete structures or structural components could be caused by borated water leakage from bolted closures. The applicant considered this condition to be event-driven, therefore, not an aging mechanism. The team agreed.

Cracking of concrete structures and concrete structural components could occur as a result of freeze-thaw cycles, reaction with aggregates, shrinkage, settlement, elevated temperature, irradiation, and fatigue. Engineering Report 93-R-1014-01 stated that, none of these aging mechanisms are applicable to the ANO-1 reactor building for the following reasons. Freeze-thaw

and elevated temperature are not applicable, because the geographical location of the site would not support such mechanisms. 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 at ANO-1 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. The ANO-1 reactor building is constructed on rock formations, therefore continuous settlement is not an applicable aging mechanism. Reactor building concrete components are not located near any substantial source of radioactive material, therefore irradiation is not an applicable aging mechanism. The ANO-1 reactor building is not subjected to a high cyclic structural loading; therefore, fatigue is not an applicable aging mechanism. The ANO-1 containment penetrations are protected from elevated temperature aging mechanisms by design; therefore, elevated temperature is not an applicable aging mechanism. The team agreed with the applicant.

Change of material properties could be caused by leaching of calcium hydroxide, aggressive chemical attack, elevated temperature, irradiation, and creep. Leaching of calcium hydroxide occurs when water passes through the concrete such as flowing water, ponding, or high hydraulic pressure. Concrete with low permeability will resist leaching. The ANO-1 containment was designed and constructed with the proper water-cement ratio resulting in a very low permeability; therefore, leaching of calcium hydroxide is not an applicable aging mechanism.

In reviewing concrete structures and structural components exposed to weather, such as the exterior of the containment cylindrical wall, dome, and foundation slab, the team requested information about the ground water chemistry which could contain an unacceptable high concentration of chemicals that could pose a threat to the foundation slab. The applicant stated that the site ground water had been tested during construction and was found to be benign. In 1996 the ground water was again tested and found to contain chemicals are below the thresholds of NUREG-1557 (pH < 5.5, chloride solutions > 500 ppm, and sulfate > 1500 ppm) therefore, also benign. The team agreed.

The applicant credited their inspection of the containment in accordance with ASME Section XI, Subsection IWL, “Requirements for Class CC Concrete Components of Light-Water Cooled Plants,” as an aging management program. A more detailed review of ASME Section XI, Subsection IWL inservice inspections is discussed in Section III.D of this report.

c. Conclusions

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 license renewal application and the NRC's SER.

2. Intake Structure

a. Scope

The team reviewed the NRC's SER and the applicant's aging management review of the intake structure, documented in Engineering Report 93-R-1014-01, "Aging Effects for Structures and Structural Components," and Engineering Report 93-R-1015-04, "Aging Management Review of the Intake Structure." The team also interviewed the responsible program engineers and performed a visual inspection of accessible portions of the intake structure.

b. Observations

In Engineering Reports 93-R-1014-01 and 93-R-1015-04, the applicant identified that the aging effect for structural steel and steel components in the intake structure is corrosion which can cause loss of material to carbon steel and low-alloy steel. The applicant also identified that the aging effects for concrete structures and concrete components in the intake structure are abrasion and cavitation for above grade exterior concrete.

. Steel Structures and Structural Components: Most steel components and commodities within the Intake Structure are made of carbon steel; however, the applicant has recently installed new SW bay strainers made of stainless steel. The applicant relies on the Maintenance Rule Program to manage the aging effect of loss of material from corrosion for steel components and threaded fasteners. For underwater steel components, the applicant relies on the Maintenance Rule Program in conjunction with the inspection of the SW and circulating water bays. These bays are periodically drained so that they can be inspected and cleaned. The applicant also relies on the Service Water Chemical Control Program to maintain the SW bay strainers. Further discussion of the Maintenance Rule Program is provided in Section III.D of this report.

Concrete Components: All concrete components are in the scope of license renewal and subject to an aging management review. There are no known applicable aging effects for concrete protected from the weather in the intake structure. The potential aging effects to concrete exposed to weather above grade are loss of material from abrasion and cavitation due to running water. However, because the greatest average water velocity in the intake structure is 6.3 feet per second, loss of material due to cavitation is not a credible aging effect. For concrete below grade, the water velocity is so low that abrasion and cavitation from running water are not a concern. The applicant relies on the Maintenance Rule Program structural walkdowns to detect the loss of material

due to abrasion on the intake structure's exterior concrete wall at normal lake level. The team agreed with this assessment.

c. Conclusions

The team found that, for the intake structure, the applicant had properly identified the effects of aging and the programs that will manage those effects, in accordance with their license renewal application and the NRC's SER.

3. Emergency Diesel Fuel Oil Storage Tank Vault

a. Scope

The team reviewed the NRC's SER; Engineering Report 93-R-1015-06, "Aging Management Review of Above Ground/Underground Yard Structures and Associated Pipe Trenches;" and Engineering Report 93-R-1014-01, "Aging Effects for Structures and Structural Components." The team also interviewed the responsible program engineers.

b. Observations

The applicant determined that the walls, floor slab, and columns of the emergency diesel fuel oil storage tank vault require aging management review. The only potential applicable aging effect for above grade exterior concrete of the emergency diesel fuel oil storage tank vault identified was the loss of material from abrasion and cavitation. However, because the exterior concrete of the emergency diesel fuel oil storage tank vault is not exposed to continuous running water with high velocity (greater than 40 fps), loss of material from abrasion and cavitation is not a credible aging effect.

c. Conclusions

The team found that, for the emergency diesel fuel oil storage tank vault structure, the applicant had properly identified the effects of aging and the programs that will manage those effects, in accordance with their license renewal application and the NRC's SER.

4. Bulk Commodities - Threaded Fasteners

a. Scope

The team reviewed the applicant's license renewal application, the NRC's SER, and the applicant's aging management review documented in Engineering Report 93-R-1015-07, "Aging Management Review of Bulk Commodities."

b. Observations

In their license renewal application, the applicant included threaded fasteners for fire damper mounts as a bulk commodity. The components that make up this commodity group are made of galvanized steel and are found in sheltered environments protected from weather. Table 3.6-8 of the license renewal application indicated that these threaded fasteners have no applicable aging effects and, therefore, do not require any aging management. Components protected from the weather may be exposed to interior ambient temperature conditions of up to 140°F, relative humidity between 20 and 90 percent, and various radiation levels. The applicant stated that this environment is below the radiation threshold levels necessary to cause embrittlement and below the necessary temperature and humidity levels that may cause a potential change in material properties and loss of material. The team agreed.

In Engineering Report 93-R-1015-07, the applicant stated that bolted joints and threaded connections are collectively referred to as threaded fasteners and include bolts, studs, screws, nuts, washers, and member facing surfaces. This engineering report stated that these fasteners could be exposed to aggressive chemicals resulting from a spill; however, the potential aging effects from being exposed to aggressive chemicals were considered to be negligible, because cleanup is expected to be implemented quickly and in accordance with plant housekeeping procedures. This is incorrect. Housekeeping activities to clean up a chemical spill cannot be used to determine aging effects and, therefore, cannot be an aging management program. However, for license renewal, spills are not considered aging mechanisms, but events. Effects from event-initiated occurrences are not age related and need not be considered in an aging management review. The applicant revised Engineering Report 93-R-1015-07 to correct the characterization and application of chemical spills.

The team performed a visual inspection of a number of heating, ventilation, and air conditioning ducts and dampers located in the auxiliary building. The team found that all bolts were in place, secured, and without indication of corrosion, loss of material, change in material property, or other forms of damage.

The team also reviewed plant maintenance history for the previous 4 years to verify that aging of galvanized steel thread fasteners have not been experienced at ANO-1. Two maintenance packages were found that involved fire damper bolts. One of the two packages, FD-183-19, identified two bolts needing replacement due to physical damage, not aging. The other package identified missing bolts. The team's review of this maintenance history failed to identify any aging of galvanized steel threaded fasteners for fire damper mounts.

c. Conclusions

The team found that, for threaded fasteners reviewed, the applicant had properly identified the effects of aging and the programs that will manage those effects, in accordance with their license renewal application and the NRC's SER.

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 the existing programs were implemented consistent with the information presented in the applicant's license renewal application, applicant programs and procedures, and the NRC's SER. 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. Boric Acid Corrosion Prevention Program

a. Scope

The team reviewed Procedures 5000.05, "Boric Acid Corrosion Prevention Program Administration," and 1032.037, "Inspection and Evaluation of Boric Acid Leaks," and interviewed program engineers to determine if the boric acid corrosion prevention program can address the effects of aging on systems, structures, and commodity groups for which it is credited in the applicant's license renewal application and aging management reviews.

b. Observations

The Boric Acid Corrosion Prevention Program, primarily controlled by existing Procedures 5000.05, "Boric Acid Corrosion Prevention Program Administration," and 1032.037, "Inspection and Evaluation of Boric Acid Leaks," is given credit, in the license renewal application for managing the loss of material due to boric acid corrosion of carbon steel. The Boric Acid Corrosion Prevention Program consists primarily of a walkdown of the systems within the reactor building, after reactor shutdown and before final reactor building closure prior to restart. This walkdown includes a visual inspection of the components to detect the presence of leakage, as evidenced by moisture or the presence of boric acid powder or crystals on the exterior of valves, connections, and insulated surfaces. If such evidence is found, the presence and characteristics of the leak are recorded on a form entitled, "Identification & Evaluation of Boric Acid Leakage," and turned over to the boric acid corrosion coordinator for evaluation and disposition.

The team discussed this program's attributes and results with engineers responsible for the program and examined the available records generated by the program for several years and found them to be adequate. However, during this inspection, the applicant was unable to locate the program records from the last Unit 1 outage, 1R15. The applicant stated that the last person designated as the boric acid coordinator left the position in approximately August of 2000, and the position has been vacant since. The applicant speculated that this vacancy may have contributed to the misplaced records. While the records were not available, the applicant stated that the boric acid leak inspection had been

performed. The applicant initiated Condition Report CR-ANO-1-2001-0041 to document the lack of records in their corrective action system. The team observed that ANO management attention should be placed on filling this vacancy soon.

Procedure 5000.005, step 6.4, states, "System Engineering shall trend and maintain all boric acid evaluations and determine repetitive problem areas that can be addressed during each refueling outage." The team was shown a computerized data base into which the applicant intends to load future boric acid leak records, but there were only two entries at present for Unit 1. The team saw no evidence of an established trending program. Applicant representatives acknowledged that there is no formally-established trending program, but stated they plan to develop one when the boric acid coordinator vacancy is filled. The applicant initiated Condition Report CR-ANO-C-2001-0050 to document this failure to perform trending as required by procedure. These observations were referred to the resident inspector for disposition in accordance with the reactor oversight program. See NRC Inspection Report 50-313/2001-002; 50-368/2001-002.

c. Conclusions

Although the program could be improved, the team found that the Boric Acid Corrosion Prevention Program has been functioning for past years and, therefore, should be effective to manage the aging effect of boric acid corrosion of susceptible materials.

2. Reactor Building Sump Closeout Inspection

a. Scope

The team reviewed the applicant's license renewal application, the NRC's SER, existing plant procedures, and results of reactor building sump inspections and interviewed program engineers to determine if the reactor building sump closeout inspection can address the effects of aging on systems, structures, and commodity groups for which it is credited in the applicant's license renewal application and aging management reviews. Because the unit was in full operation during this inspection, the team reviewed available photographs of the reactor sump.

b. Observations

The purpose of the reactor building sump closeout inspection is to detect significant degradation of the sump components and remove any foreign objects that could impede suction from the sump. The aging effects addressed by the reactor building sump closeout inspection are loss of material for the carbon steel components and cracking for stainless steel components due to the presence of borated water. The reactor building sump closeout inspection is a visual inspection of the exterior and interior surfaces of the sump. The team also

reviewed Plant Procedure 1015.036, “Containment Building Closeout, Attachment E, Unit 1 Sump Closeout, Change 006-03-0." The team also reviewed Quality Control Procedure QCI-S-1, “Containment Sump Inspection-Maintenance/Modification,” Revision 7, which is used by quality control personnel to perform a sump inspection in parallel with the operating staff. As a minimum, this inspection is performed at the end of each refueling outage. If in a limited scope outage, the screens are not unbolted or controls for a foreign material exclusion area are in place, then only exterior surfaces of the sump are inspected. During the closeout inspection procedure, surfaces are inspected for evidence of significant structural distress, corrosion, excessive rust, significant physical degradation, obvious loose or missing bolts, excessive hatch gap, or tears in sump screens. The reactor building sump screen is inspected for excessive openings or gaps in the screen. The sump internal inspection also verifies that there is no obvious loose bolting in the internal area of the sump and that no excessive corrosion or loss of material exists on the bolting and yokes of valves or on the divider plate. The inspection verifies that there is no excessive pitting or corrosion on piping external surfaces or flued heads. The team reviewed records of sump closeout inspections completed October 5, 1999, at the end of Refueling Outage 1R15 and April 30, 1998, at the end of Refueling Outage 1R14. The documented results were acceptable.

The team also reviewed documented results of a special April 6, 1998, inspection conducted to support license renewal. Wetted portions of the sump were inspected for indications of aging effects. Structural members showed very little evidence of corrosion. Some light boron was removed, which had formed due to a leaking valve above the sump. No service-induced, or environmentally-induced deficiencies were found with respect to carbon or stainless steel valve parts. The carbon steel portions of the divider plate were beginning to show light corrosion and rust along the bottom edge and up both sides. Flued heads showed no signs of service-induced or environmentally-induced pitting, cracking, or corrosion.

The team reviewed available photographs of the sump and discussed its condition with applicant engineers. The walls and floor of the sump are concrete and, with repeated pressure cleaning over the years, the floor has become rough with exposed aggregate. Applicant engineers described a proposed plant modification which would cover the sump floor with stainless steel plate sealed by an epoxy grout. There was uncertainty as to when such a modification would be performed, but this modification, when installed, should make future cleaning and decontamination easier.

c. Conclusions

The team concluded that the sump closeout inspections are being conducted as described in plant procedures and are effective in managing aging effects for which is it credited.

3. Borated Water Storage Tank Inspections

a. Scope

The team reviewed the applicant's license renewal application, the NRC's SER, preventive maintenance (PM) tasks for the borated water storage tank (BWST), and the results of several BWST inspections and interviewed program engineers to determine if the BWST external and internal inspections can address the effects of aging for which it is credited in the applicant's license renewal application and aging management reviews.

b. Observations

In their license renewal application, the applicant took credit for 10 preventive maintenance activities in managing the effects of aging in the borated water storage tank. The BWST internal inspection, preventive maintenance Task 18414, is credited with prevention loss of material from the carbon steel tank walls and is performed each refueling outage. The team reviewed the results of inspections completed September 19, 1999, during Refueling Outage 1R15, and April 10, 1998, during Refueling Outage 1R14. The documented results showed no debris or defects of any kind.

The BWST external inspection, preventive maintenance Task 18522, is credited with prevention of loss of material and loss of mechanical closure integrity and is performed each refueling outage. The team reviewed records of inspections performed October 19, 1999, March 2, 1998, and May 20, 1996. The documented results showed no unsatisfactory results.

The team observed that the BWST internal inspection, preventive maintenance Task 18414, does not specify that the inspection be performed with the tank empty or nearly empty, and apparently past inspections have been performed with the tank filled to varying levels. The applicant stated they had already identified this as a future enhancement to the preventive maintenance task. In addition, Appendix A, "Program Enhancement," to Engineering Report 93-R-1011-01, Revision 0, included an enhancement to the inspections of the BWST to ensure the tank is periodically fully drained and inspected to verify coating integrity. It was unclear when such enhancements would be implemented. Additionally, an applicant engineer provided the team with the latest procedure which allowed the use of an underwater television camera to enhance inspections.

c. Conclusions

The team concluded that the existing preventive maintenance internal and external inspection activities to inspect the BWST are being performed as specified by plant procedures and, with the above-discussed enhancement, will be effective in managing the effects of aging for which it is credited.

4. Wall Thinning Inspection

a. Scope

The team reviewed the applicant's license renewal application, the NRC's SER and the aging management report (Engineering Report 93-R-1011-11-01). In addition, the team interviewed knowledgeable program engineers.

b. Observations

The wall thinning inspection program is not an existing or established program and not documented beyond a brief description in the applicant's license renewal application and Engineering Report 93-R-1011-01. The inspections are planned to be volumetric, nondestructive examinations and will be performed on the following systems: emergency feedwater, main steam, chemical addition, condensate storage and transfer, and reactor building isolation. As described, this inspection program should manage the effects of loss of material due to corrosion of the internal surfaces of carbon steel piping and components.

c. Conclusion

The team concluded that, if implemented as described in the license renewal application, the aging management report (Engineering Report 93-R-1011-01), and the NRC's SER, the Wall Thinning Inspection will manage the effects of aging for which it is credited.

5. SW Integrity Program

a. Scope

The team reviewed the applicant's license renewal application, the NRC's SER, applicable program documentation and records of the program testing. The implementation of this program was verified by reviewing a sample of testing performed in 1999 and 2000. In addition, the team interviewed knowledgeable program engineers.

b. Observations

The SW Integrity Program (SWIP) is a combination of testing, nondestructive examination, and chemistry and maintenance activities performed on various SW components. This program satisfies the requirements of Generic Letter 89-13 and other commitments such as inservice testing and maintenance rule performance monitoring. The testing is documented in various documents such as test reports and maintenance action items which are listed in Attachment 1.

Engineering Report 93-R-1011-01 states that nondestructive examination commitments in Generic Letter 89-13 include visual inspections of a sample of the safety-related heat exchangers and valves for the reactor building spray pump lube oil coolers, decay heat removal pump bearing coolers, reactor building coolers, makeup pump room coolers, and decay heat room coolers.

This is consistent with Table 3.4-10 of the license renewal application and the applicant's response to Request for Additional Information RAI 3.3.4.3.2.10-1, where the applicant takes credit for the service water integrity and heat exchanger monitoring programs for managing the effects of loss of material and fouling. Tube side inspections, however, for some of these coolers is not possible or practical. In the NRC's SER, the staff concluded that the SWIP in combination with the Heat Exchanger Monitoring Program, ASME Section XI, Subsection IWD inservice inspection, the Maintenance Rule Program, and the Buried Pipe Program, together, could adequately manage the effects of aging.

Engineering Report 93-R-1011-01 identifies loss of material as an applicable aging effect for emergency cooling pond (ECP) return line epoxy coating. However, the applicant's license renewal application does not identify loss of material of emergency cooling pond return line epoxy coating as an applicable aging effect. Further review by the inspection team verified that the applicant had addressed this issue in its response to the NRC dated September 12, 2000, to Request for Additional Information RAI 3.3.4.3.2.10-1g, stating that the ECP return line epoxy coating is inspected each refueling outage to manage fouling and loss of material.

In the license renewal application, the applicant addresses reactor building coolers and sluice gate testing as part of the SWIP testing. However, in Engineering Report 93-R-1011-01, the applicant did not include reactor building coolers and sluice gate testing as part of the SWIP testing. In response to this concern, the applicant revised Engineering Report 93-R-1011-01 to include reactor building coolers and sluice gate testing as part of the SWIP testing.

In the applicant's license renewal application, the applicant lists cleaning and flushing pump bearing coolers as SWIP activities. However, in Engineering Report 93-R-1011-01, the applicant did not include cleaning and flushing pump bearing coolers as SWIP activities. In response to this concern, the applicant revised Engineering Report 93-R-1011-01 to include cleaning and flushing pump bearing coolers as part of the SWIP testing.

c. Conclusions

The team concluded that the SWIP is being conducted as described in plant procedures and will be effective in managing aging effects for which is it credited.

6. Emergency Feedwater Pump Testing

a. Scope

The team reviewed the applicant's license renewal application, the NRC's SER, and test and maintenance procedures for the EFW system. The implementation of this program was verified by reviewing a sample of testing results performed in 2000. In addition, the team interviewed the responsible program engineer.

b. Observation

The EFW pump test is a functional test of the pump and flow loop and is required by Technical Specification 4.8 to demonstrate that the pump is operable. The testing is described in a surveillance test procedure and results of the testing are documented in supplements to the surveillance test procedure.

c. Conclusions

The team concluded that the EFW test program is being conducted as described in plant procedures and will be effective in managing aging effects for which is it credited.

7. Heat Exchanger Monitoring Program

a. Inspection Scope

The team reviewed the description of the planned new Heat Exchanger Monitoring Program as documented in the applicant's license renewal application, the applicant's responses to Requests for Additional Information, Requests for Additional Information, and engineering reports. The team also discussed particulars of this program with knowledgeable applicant personnel, and NRC technical staff in NRR.

b. Observations

The applicant described the Heat Exchanger Monitoring Program in Section 3.3 of Appendix B of the license renewal application. The applicant stated that the Heat Exchanger Monitoring Program is a planned new future inspection program which will utilize nondestructive examinations, such as eddy-current testing or visual inspections of a sample of heat exchangers. The applicant stated that the aging effects addressed by the future Heat Exchanger Monitoring Program are cracking and loss of material that could result in degradation in the seismic qualification of the heat exchangers in the SW system, control room ventilation system, and emergency feedwater system. The applicant stated that the Heat Exchanger Monitoring Program inspections will be implemented by yet-to-be-issued plant procedures prior to the end of the initial 40-year license term for ANO-1. Because this program has not yet been implemented, the team could not evaluate its content and implementation.

During review of the Heat Exchanger Monitoring Program, the team identified the following two discrepancies between the license renewal application and on-site documentation.

Managing Fouling in Heat Exchangers: The team identified that in Table 3.3-2, "Low Pressure Injection/Decay Heat Removal System," of Appendix B of the license renewal application, the applicant identified that fouling is an applicable aging effect for the decay heat cooler stainless steel tubing in a borated

environment. In one section of Table 3.3-2, ASME Section XI, Subsection IWC pressure testing and the Heat Exchanger Monitoring Program were identified as the programs which will manage fouling. In another section, the SWIP was listed as managing fouling. The applicant acknowledged this discrepancy and informed the inspection team that the SWIP should have been credited for managing fouling in the decay heat removal cooler stainless steel tubes on the borated water side of the tubes.

Upon further review, the inspection team verified that the applicant specifically addressed fouling on the service water side of the decay heat removal coolers in Request for Additional Information RAI 3.3.4.3.2.10-2. Specifically, the applicant stated that only the SWIP, not the Heat Exchanger Monitoring Program, is used to manage fouling in this application. Because the SWIP monitors the heat transfer across the tubes to monitor fouling, the program would be equally effective at monitoring fouling on the SW and the borated water sides of the tubes. The inspection team discussed this issue with the NRC technical staff in NRR, and they agreed that the SWIP, in itself, is acceptable for monitoring fouling on either side of the decay heat removal coolers.

Loss of Material Effects in Decay Heat Removal Coolers: The team identified that, in Table 3.3-2 of Appendix B of the license renewal application, the applicant identified cracking and loss of material as applicable aging effects associated with the decay heat side of the decay heat removal coolers (which are stainless steel in borated water). Table 3.3-2 listed ASME Section XI, Subsection IWC, and the Heat Exchanger Monitoring Program as the programs used to manage loss of material effects. In addition, Table 3.3-2 identified Primary Chemistry Monitoring as the program used to manage cracking in decay heat removal coolers. Engineering Report 93-R-1016-10, “Aging Management Review of the Decay Heat/Low Pressure Injection System,” states that cracking and loss of material in stainless steel components are aging effects that will be prevented by the Primary Chemistry Monitoring Program. However, this engineering report did not credit ASME Section XI, Subsection IWC, or the Heat Exchanger Monitoring Program for managing loss of material. The applicant acknowledged this discrepancy and informed the inspection team that Table 3.3-2 should not have identified ASME Section XI, Subsection IWC, and the Heat Exchanger Monitoring Program as the programs used to manage loss of material in the decay heat removal coolers.

The applicant documented and corrected these discrepancies in a letter to NRC dated January 31, 2001.

c. Conclusions

The team concluded that, with the exception of the two discrepancies discussed above, which the applicant has corrected, the Heat Exchanger Monitoring Program, if implemented as described in the license renewal application, will manage the effects of aging for which it is credited.

8. Instrument Air Quality Program

a. Inspection Scope

The team reviewed the Instrument Air Quality Program described in the license renewal application, applicable plant procedures and the NRC's SER to verify that the program was being implemented consistent with the information presented in the applicant's license renewal application. In addition, the team interviewed the responsible instrument air system engineer and applicant chemistry personnel.

b. Observations

Appendix B, Section 4.11, of the applicant's license renewal application described the Instrument Air Quality Program. The Instrument Air Quality Program is an existing program which the applicant credits for managing cracking and loss of material aging effects for components exposed to a gas-air environment in the instrument air system. The Instrument Air Quality Program is implemented by preventive maintenance Task 17708. The team reviewed the requirements contained in preventive maintenance Task 17708 and discussed the implementation of these requirements with the applicant's responsible personnel. The team found that preventive maintenance Task 17708 required sampling and testing of the instrument air system air at specific points for the desired dewpoint and contaminants. This is consistent with the information provided in the license renewal application. In addition, the team reviewed several previously-completed monthly preventive maintenance tasks and found that these sampling and testing activities were appropriately performed, no foreign contaminants were identified during these tests, and the dewpoints that were measured during the tests were within the specified acceptance limit of less than or equal to -20°F.

c. Conclusions

The team concluded that the existing Instrument Air Quality Program was implemented as described in the license renewal application and, therefore, will manage the effects of aging for which it is credited.

9. Maintenance Rule System and Structural Walkdowns

a. Scope

The team reviewed the license renewal application, plant procedures, and the NRC's SER. The team also walked-down accessible portions of the turbine building, cable spreading rooms, intake structure, the emergency diesel generators, and the high pressure injection system with knowledgeable applicant personnel.

b. Observations

The applicant takes credit for its maintenance rule activities to manage cracking, loss of material, loss of mechanical closure integrity, and change in material properties on the exterior surface of structures and components within the scope of license renewal and subject to an aging management review. The applicant describes its system and structures walkdown activities as including visual inspection of steel components and commodities, concrete components and commodities, prestress components and commodities, and threaded fasteners for no unacceptable visual indications of cracking, loss of material, loss of mechanical closure integrity, and change in material properties. The applicant also takes credit for its maintenance rule activities managing aging effects associated with coated surfaces of structures and components within the scope of license renewal.

Maintenance rule activities at ANO, Unit 1, are governed by Engineering Standard 96-ER-0003-01, to ensure: (1) that important systems are capable of performing its intended function; and (2) that failure resulting in scrams and unnecessary safety system actuation are minimized. Implementation of the maintenance rule program is controlled by desk guides and other plant procedures such as CES-19, “Maintenance Rule Structural Monitoring at Arkansas Nuclear One.” The team reviewed the inspection criteria documented in these guidance documents and found that they agreed with acceptance criteria described in the license renewal application and accepted by the staff in its SER.

The turbine building is a Seismic Class 2 structure and houses the turbine generator and other Seismic Class 2 equipment. The ANO Unit 1 Final Safety Analysis Report (FSAR) states that the failure of seismic Category 2 equipment and piping systems may interrupt power generation and defines Category 2 equipment as those whose failure would not result in the uncontrolled release of radioactivity and would not prevent reactor shutdown and the immediate and long-term operation following a loss-of-cooling accident. However, a catastrophic failure of seismic Category 2 equipment may result in the interruption of power generation, but would only do so by impacting and causing a failure of other systems, structures, and commodity groups. Since the turbine building is identified as a trip initiator and nonrisk significant/normal operating, it is required by the Maintenance Rule to be monitored against plant-level criteria and the applicant uses Procedure CES-19 to fulfill this requirement.

The inspection team performed a walkdown of turbine building, cable spreading rooms, intake structure, emergency diesel generators, and the high pressure injection system with an applicant staff member that was familiar with maintenance rule program walkdown requirements. No discrepancies between the maintenance rule walkdown activities and acceptance criteria were noted.

c. Conclusions

The inspection team concluded that for the systems and structures sampled during this inspection, the applicant's Maintenance Rule walkdown activities were implemented as described in the license renewal application and the NRC's SER and will be adequate to manage the aging effects for which they were credited.

10. Buried Piping Inspection Program

a. Scope

The team reviewed the license renewal application, plant procedures, condition reports concerning buried piping failures, and the NRC's SER. The team also interviewed knowledgeable program engineers.

b. Observations

The license renewal application, Section 3.1, of Appendix B contains the applicant's description of the buried pipe aging management program. The staff's SER of this aging management program is documented in Section 3.3.1.4.1.2 of the SER. The buried pipe inspection program is credited for managing damage to protective coating and loss of material for the SW and fuel oil systems buried piping that are within the scope of license renewal. The buried pipe program includes excavation, visual inspection of carbon steel piping for damage to protective coating, and inspection of the external surface of the piping for corrosion.

The buried pipe inspection program is a new program not yet implemented at ANO-1. The applicant has yet to develop specific procedures for the implementation of this program; therefore, there was little documentation of the program itself. Because this program is based on plant experience and operating history, the inspection team requested a 10-year maintenance history review of corrective action activities involving buried pipe. The applicant identified seven condition reports involving buried pipe. A review of each condition report revealed only one leak in 1995, due to failure of exterior coating (documented in Condition Report CR-C-95-0167). The root cause analysis identified the presence of acid or caustic soda in the soil from a spill from an abandoned and corroded acid pipe that caused the fuel oil pipe coating to fail and accelerated corrosion of the carbon steel piping. The SW intake structure and the Unit 2 acid and caustic building were identified as potential areas of future concern, and operational changes were implemented to minimize the potential affects of future pipe failures. The applicant stated that this was the only time a chemical spill caused a buried pipe to leak at ANO-1.

c. Conclusions

The team concluded that the Buried Pipe Program, if implemented as described in the license renewal application and the NRC's SER, will manage the effects of aging for which it is credited.

11. Oil Analysis Program

a. Scope

The team reviewed the license renewal application, the NRC's SER, plant procedures, preventive maintenance evaluations, and past test results. The team discussed the oil analysis program with a knowledgeable applicant engineer.

b. Observations

Appendix B, Section 4.14, of the applicant's license renewal application describes the oil analysis program and states that its purpose is to ensure that the oil environment in mechanical systems is maintained to the quality required. The Oil Analysis Program maintains oil systems free of contaminants (primarily water and particulates), thereby preserving an environment that is not conducive to corrosion, thereby managing the aging effects of cracking and loss of material. The scope of the Oil Analysis Program, with respect to license renewal, is limited to sampling and analysis of lubricants in the following components:

- Auxiliary building electrical room chillers
- Emergency diesel generators
- Decay heat pumps
- Reactor building spray pumps
- Primary makeup pumps
- Diesel-driven fire pump and engine
- EFW pumps and EFW turbine
- Alternate ac diesel generator
- Control room ventilation compressors

The team reviewed Procedure 1025.029, "Oil Analysis Program," Change 003-02-0, which describes the oil sampling program. In addition, the team reviewed Preventive Maintenance Engineering Evaluation 085, "Oil Analysis," which specified for various pieces of plant equipment the oil sample frequencies and the types of oil analysis to be performed. The team discussed the oil analysis program with an applicant engineer and looked at past test results. Computerized trending data was examined for oil samples of decay heat removal Pump P-34A, primary makeup Pump P-36A, and Compressor C-51 from the VCH-4 auxiliary building electrical room emergency chiller. The team found that the trend analysis for the decay heat removal pump was somewhat dated as no data had been entered since March 2000 when those pumps were

disassembled for bearing problems. The applicant stated that the oil samples had been taken as required and all data reviewed was within allowable specifications. The team concluded that the oil analysis program is being implemented as described in plant procedures and is an effective preventive maintenance program.

Table 3.3-2, "Low Pressure Injection/Decay Heat Removal System," and Table 3.3-3, "Makeup and Purification/High Pressure Injection System," in the license renewal application credits the Oil Analysis Program as managing the aging effects of loss of material and fouling of the pump lube oil coolers. The team questioned whether oil sampling could detect or prevent loss of material or fouling of pump lube oil heat exchangers. However, further review revealed that, in Section 3.3.1.4.7.3 or the NRC's SER, the NRC staff found this acceptable, stating that this program is not aimed at, or credited for, detecting aging effects.

c. Conclusions

The team concluded that the Oil Analysis Program is being implemented as described in the license renewal application, plant procedures, and the NRC's SER.

12. Bolting and Torquing Activities

a. Scope

The team reviewed the license renewal application, the NRC's SER, plant procedures, planned work packages, and results of completed work packages to verify that the applicant implemented their torquing and bolting activities as described in the application and as accepted in the NRC's SER. The team also interviewed knowledgeable program engineers.

b. Observations

In their license renewal application, the applicant states that the aging effects in pressure boundary bolting applications associated with Class 1 piping components within the scope of license renewal are cracking, loss of material, and loss of mechanical closure. These aging effects are prevented or identified and corrected by bolting and torquing activities. In Appendix B of their license renewal application, the applicant describes its bolting and torquing activities as including inspection of mating surfaces to ensure that they are smooth and free of major defects. Male and female threads are inspected for major defects (such as nicks, burrs, evidence of galling, etc.). Other criteria includes proper and adequate thread engagement, no loose fasteners, and use of proper torquing values.

At ANO-1, bolting and torquing activities are governed by Procedure/Work Plan 1025.020. Bolting and torquing activities are used to prepare, install, and tighten threaded fasteners. This procedure, as stated within, applies to all maintenance activities that involve threaded fasteners. This procedure provides

guidance for determining the two basic conditions required of fasteners, including “snug tight” (where all mechanical slack has been removed from the mating surfaces of a bolted joint) and “tensioned” (where a specific amount of preload is applied). In addition, this procedure specified visual inspections of nuts, bolts, washers, and surfaces to identify any degradation.

The team found that the criteria described in this procedure agreed with that provided in the license renewal application. The team reviewed three randomly-selected, planned maintenance packages, and four completed maintenance packages for Class 1 components. Each of the seven packages referenced Procedure/Work Plan 1025.020 for torquing requirements. In addition, the four completed packages contained sign-off sheets for torquing activities.

c. Conclusions

The team concluded that the applicant implemented its bolting and torquing activities consistent with the license renewal application and the NRC’s SER.

13. Reactor Building Integrated Leak Rate Test

a. Scope

The team reviewed the applicant’s license renewal application, the NRC’s SER, engineering reports, and plant procedures to verify that the applicant implemented the reactor building Integrated Leak Rate Test (ILRT) as described in the application and accepted in the NRC's SER. The team also discussed this program with knowledgeable applicant personnel.

b. Review

The ANO-1 reactor building ILRT is an inservice inspection to test the leak tightness of the ANO-1 reactor building to ensure the containment pressure boundary. The ILRT is performed every 10 years, as long as the calculated leak rate is less than the allowable, in accordance with ANO Engineering Standard HES-02, “Containment Leak Rate Testing Program.” The last ILRT of the ANO-1 reactor building was completed in April 14, 1992 (Type A). After that test, ANO management adopted the Type B test, which detects local leaks and measures leakage across each pressure containing or leakage-limiting boundary for the reactor containment penetrations.

Section 6.3.1 of HES-02 states that Type A ILRTs are required once per 10 years as long as calculated leakage remains below the allowable. The 10-year interval for completion of an ILRT may be extended up to 15 months to be consistent with standard outage scheduling practices. If an ILRT fails acceptable performance then it must be reperformed within 48 months. Following a successful ILRT, the surveillance frequency may be returned to 10 years.

Procedure/Work Plan 5120.400 provides instructions for conducting an ANO-1, ILRT in accordance with Technical Specification 4.4 and 10 CFR Part 50, Appendix J. The team reviewed this test procedure and results and found that the procedure is implemented in accordance with Engineering Standard HES-02.

The team reviewed Procedure/Work Plan 5120.513 Inservice Inspection (ISI) Visual Examinations which describes the requirements for performing a Type B visual inspection. The next Type B ILRT for ANO-1 is scheduled for the next refueling outage (March 2001).

c. Conclusions

The team concluded that the Types A and B ILRTs are implemented as described in the applicant's license renewal application and the NRC's SER.

14. Annual Emergency Cooling Pond Sounding Inspection

a. Scope

The team reviewed the license renewal application, the NRC's SER, engineering reports, maintenance action items, and procedures to verify that the applicant implemented the Annual Emergency Cooling Pond (ECP) Sounding Inspection as described in the application and accepted in the SER. The team also interviewed knowledgeable applicant personnel.

b. Observations

The purpose of the Annual ECP Sounding Inspection is to verify that a sufficient supply of cooling water is available to handle design basis accidents with a concurrent loss of the Dardanelle Reservoir. This inspection is performed annually and measures the average depth of the pond to ensure an average pond volume of 70 acre-feet of water below the overflow level. The average area of the pond is 14 acres, so a minimum average depth of 5 feet is necessary.

Section 4.21.1 of Engineering Report 93-R-1011-01, "Review of the Programs Credited in the License Renewal Evaluations describes the Annual ECP Sounding Inspection. Past ECP Soundings have identified deficiencies, such as torn sandbags, out-of-place rip-rap, eroded banks, and a broken drain. These deficiencies were documented in Condition Report CR-ANO-C-1995-0220, and corrective action was taken.

The team reviewed the results of the most recent Annual ECP Sounding Inspection which was performed on September 16, 2000, in accordance with Inspection and Procedure/Work Plan 1306.019. The team found that it was adequately implemented.

c. Conclusion

The team concluded that the Annual ECP Sounding Inspection was implemented as described in the license renewal application and as accepted by the NRC's SER, and that it will provide reasonable assurance that the aging effects of the ECP will be managed such that the ECP will continue to perform its intended function consistent with the licensing basis for the period of extended operation.

15. Spent Fuel Pool Level Monitoring

a. Scope

The team reviewed the license renewal application, the NRC's SER, engineering reports, Technical Specifications, and procedures to verify that the applicant will implement Spent Fuel Pool (SFP) Level Monitoring as described in the application and accepted in the SER. The team also discussed this program with knowledgeable applicant staff.

b. Observations

The existing SFP Level Monitoring program requires the level of the SFP be recorded by an operator once per shift. In addition, at 0.5 feet below normal level, a low level alarm occurs in the control room to alert the operators to a low level condition in the SFP.

The team reviewed Engineering Reports 93-R-1011-01, "Review of the Programs Credited in the License Renewal Evaluations," and 93-R-1016-04, "Aging Management Review of the Spent Fuel System." As described in these reports, Spent Fuel Pool Level Monitoring is credited for managing cracking of the SFP liner. The team reviewed SFP levels recorded during December 2000 and January 2001 and noted that the Unit 1 SFP level dropped from +0.5 feet to -0.5 feet (equivalent to about 7000 gallons) every 10 to 14 days, an equivalent loss of approximately 7000 gallons. The team compared the Unit 1 SFP loss to that of Unit 2 and found that the Unit 2 SFP loss was much less. This was attributed to a higher temperature in the Unit 1 SFP and greater leakage through the cask loading and fuel tilt pits for Unit 1. The applicant indicated that the trench drains of the SFP liner were currently not monitored for leakage. However, the SFP Level Monitoring Program will be enhanced to include monitoring of the trench drains, as described in Engineering Report 93-R-1011-01. The team found this to be acceptable.

c. Conclusion

The team concluded that the SFP Level Monitoring Program, as described in the license renewal application, and with the proposed enhancement described above, will provide reasonable assurance that the aging effects of the SFP liner will be managed during the period of extended operation.

16. Inspection and Preventive Maintenance of the Polar Crane

a. Scope

The team reviewed the license renewal application, the NRC's SER, engineering reports, engineering evaluations, maintenance action items, maintenance records, and procedures to verify that the Inspection and Preventive Maintenance of the Polar Crane is implemented as described in the application and accepted in the SER. The team also discussed this program with knowledgeable applicant staff.

b. Observations

The ANO-1 reactor building polar crane is designed to handle heavy loads during and after construction of the reactor building. As described in the license renewal application, the Inspection and Preventive Maintenance of the Polar Crane is credited with managing the aging effects of loss of material.

The Inspection and Preventive Maintenance of the Polar Crane was described in Procedure/Work Plan 1402.134, "Inspection and Preventive Maintenance of the Unit 1 Polar Crane (L-002)," Revision 5, and Procedure/Work Plan 1411.002, "Polar Crane Lubrication and Inspection," Revision 4. Procedure/Work Plan 1402.134 specified the polar craned be inspected annually; however, Procedure/Work Plan 1411.002 specified it be inspected every refueling outage. The team also noted that Appendix B of the license renewal application stated that the polar crane is inspected annually. Furthermore, the manufacturer recommended maintenance be performed annually. The applicant told the team that they are using Procedure/Work Plan 1411.002 for managing aging in the polar crane, and the appropriate frequency is every refueling outage. The applicant planned to deactivate Procedure/Work Plan 1402.134. The team reviewed Preventive Maintenance Engineering Evaluation, PMEE 020, Revision 7, which justified changing the inspection frequency from the manufacturers recommendation to every refueling outage. In response to the team's identification of this discrepancy, the applicant, in a letter to the NRC dated January 31, 2001, corrected the frequency of the polar crane inspection in Appendix B of the license renewal application to be every refueling outage.

The team also reviewed records of past polar crane inspections, documented in Maintenance Action Item 8554, Task 3835. The team noted, that during the performance of the polar crane inspection on September 20, 1999, the applicant replaced one of the lubricants with one from a different manufacturer. The applicant used the Preventive Maintenance Change Document, Form1000.115A, to justify the change. The team found that this inspection and lubrication of the polar crane was performed in accordance Procedure/Work Plan 1411.002.

c. Conclusions

The team concluded that the Inspection and Preventive Maintenance of the Polar Crane, as described in the license renewal application and as accepted by the NRC's SER, will provide reasonable assurance that the aging effects of the polar crane will be managed during the period of extended operation.

17. Electrical Component Inspection Program

a. Scope

The Electrical Component Inspection Program has not yet been developed. The team reviewed the proposed Electrical Component Inspection Program by reviewing the license renewal application, applicable engineering reports, and the NRC's SER. In addition, the team interviewed the applicant's program engineer.

b. Observations

The proposed Electrical Component Inspection Program will manage the aging effects of passive electrical components through a combination of system testing and new activities described below.

- An inspection program will be developed to monitor the condition of electrical cables, splices, and connectors located in areas that may be conducive to accelerated aging.

- The inspection program will also measure insulation resistance, which should detect damage from being immersed in water. In addition, the applicant will monitor the presence of water in the exterior cable vaults to evaluate the degree to which the applicable cables are exposed to ground water.

- An inspection program will be developed to inspect and monitor the condition of electrical splices.

- A procedure will be developed to inspect and clean connectors that are terminating impedance-sensitive circuits.

Aside from cables exposed to ground water, discussed above, the applicant determined that no additional aging effects for inaccessible cables or connectors were found in comparison to accessible cables or connectors. Thus, accessible cables and connectors can be thought of as representative of inaccessible cables and connectors. However, the effects of aging could progress differently in the accessible compared to inaccessible cables, such as those contained in fire wraps. To address this possible difference, the applicant plans to perform evaluations to ensure that accessible cables are truly representative of inaccessible cables. When an unacceptable condition is identified for an

accessible cable or connector, the applicant will evaluate whether the same condition is applicable to inaccessible cables and determine if additional actions need to be taken. The NRC staff, in it's SER, agreed.

The inspection team did not identify any additional concerns not already addressed by the NRC's SER.

c. Conclusions

The team concluded that the Electrical Component Inspection Program, if implemented as described in the license renewal application and the NRC's SER, will manage the effects of aging for which it is credited.

18. Alternate AC Diesel Generator Testing and Inspections

a. Scope

The team reviewed the existing Alternate AC Diesel Generator Testing and Inspections Program by interviewing the program engineer, reviewing applicable engineering reports, and reviewing the results of surveillances and inspections.

b. Observations

The Alternate AC Diesel Generator Testing and Inspection Program is a combination of existing proceduralized surveillance activities to ensure the effects of aging are managed before the loss of intended functions occurs. The program includes the diesel generator and its components, as well as the fuel oil heat exchanger. The intended function within the scope of license renewal is to maintain pressure boundary integrity. Heat function is also a function in the scope of license renewal for the heat exchangers. The aging effects addressed by the program are listed below:

- Loss of material or loss of mechanical closure integrity for the starting air subsystem components;
- Loss of material or loss of mechanical closure integrity for the intake combustion air subsystem components;
- Loss of material, fouling, and mechanical closure integrity for the intake air aftercooler;
- Loss of material for carbon steel components, cracking of the stainless steel components, or loss of mechanical closure integrity for the exhaust subsystem components;
- Loss of mechanical closure integrity for the lube oil subsystem components;

- Fouling, loss of material from wear, and loss of mechanical closure integrity for the lube oil cooler;

- Loss of material and loss of mechanical closure integrity for the cooling water subsystem components; and

- Fouling and a loss of material for the radiator, loss of material from wetted portions of the exhaust fan housings, and fouling of the fuel oil heat exchanger.

The existing programs that the applicant credits in their license renewal application for managing the effects of aging are listed below. Further discussion of these programs are provided elsewhere in Section III.D of this report.

- Alternate AC Diesel Generator Testing and Inspections

- Maintenance Rule Program

- Auxiliary Systems Chemistry Monitoring Program

- Oil Analysis Program

The team reviewed the following documents and results of maintenance activities:

- Engineering Report 93-R-1016-18, “Aging Management Review of the Alternate AC Generator System,” Revision 1

- Maintenance Action Item 36688, completed on November 26, 2000, using Procedure 2104.037, “Alternate AC Diesel Generator Operations,” to perform an 18-month test of the diesel generator and its components

- Maintenance Action Item 22665, completed on June 14, 2000, which is the 18-month mechanical preventive repetitive maintenance and inspection activity for the alternate ac diesel generator

Based on review of the above, the team found that the maintenance testing of the alternate ac diesel generator was being performed in accordance with plant procedures.

c. Conclusions

The team concluded that the Alternate AC Diesel Generator Testing and Inspections, as described in the license renewal application and as accepted by the NRC’s SER, provide reasonable assurance that the aging effects of the alternate ac diesel generator will be managed during the period of extended operation.

19. Emergency Diesel Generator Testing and Inspections

a. Scope

The team reviewed the existing Emergency Diesel Generator Testing and Inspections Program by interviewing the program engineer, reviewing applicable engineering reports, emergency diesel generator system drawings, and the results of surveillances and inspections.

b. Observations

The Emergency Diesel Generator Testing and Inspection Program is a combination of proceduralized surveillance activities. The program includes the emergency diesel generator assembly and its associated support components, including the fuel oil system. The aging effects addressed by the program are:

- Loss of material for the carbon steel components in the starting air system;
- Loss of material for the unpainted carbon steel internal surfaces and the outer portions of the intake that could be wetted by rain;
- Loss of material and fouling for the intake air aftercoolers;
- Loss of material for the exhaust components;
- Loss of material and fouling for the lube oil coolers;
- Loss of material and cracking for the cooling water system;
- Loss of material and fouling for the cooling water heat exchangers; and
- Loss of closure integrity for the engine skid mounted and connector components.

The existing programs that the applicant is crediting for managing the effects of aging are listed below. Further discussion of these programs are provided elsewhere in Section III.D of this report.

- Emergency Diesel Generator Testing and Inspections
- Maintenance Rule Program
- Auxiliary Systems Chemistry Monitoring Program
- Oil Analysis Program

The team reviewed the following documents and results of maintenance activities:

- Engineering Report 93-R-1016-18, “Aging Management Review of the Emergency Diesel Generator System,” Revision 1

- Maintenance Action Item 36955, completed on October 17, 2000, which utilized Procedure 1104.036, “Emergency Diesel Generator Operation,” to perform a monthly test of Diesel Generator 1

Based on review of the above, the team found that the maintenance testing of the emergency diesel generator was being performed in accordance with plant procedures.

c. Conclusions

The team concluded that the Emergency Diesel Generator Testing and Inspections, as described in the license renewal application and as accepted by the NRC’s SER, provide reasonable assurance that the aging effects of the emergency diesel generators will be managed during the period of extended operation.

20. Battery Quarterly Surveillance

a. Scope

The team reviewed the existing Battery Quarterly Surveillance Program by interviewing the program engineer, visually inspecting the racks of the station batteries, and reviewing the NRC’s SER, applicable engineering reports, and results of surveillances and inspections.

b. Observations

The Battery Quarterly Surveillance Program is an existing program which ensures the structural integrity of the emergency battery racks.

The team reviewed the following documents and results of maintenance activities:

- Engineering Report 93-R1015-03, “Aging Management Review of the Auxiliary Building,” Revision 1

- Maintenance Action Initiation 25682, completed on December 21, 2000

- Procedure 1307.063, “Unit 1 D06 and D07 Battery Surveillance,” to verify integrity of the battery racks.

In addition, the team inspected the racks for both batteries and observed that their condition was adequate.

c. Conclusions

The team concluded that the Battery Quarterly Surveillance provides reasonable assurance that the aging effects of the station batteries will be managed during the period of extended operation, as described in the license renewal application and as accepted by the NRC's SER.

21. Fire Barrier Inspections

a. Scope

The team reviewed the existing Fire Barrier Inspection Program by interviewing the program engineer, visually inspecting a sampling of accessible fire barriers, and reviewing the NRC's SER, applicable engineering reports, and the results of surveillances and inspections.

b. Observations

The Fire Barrier Inspection Program is a series of proceduralized inspections that include visual inspection of fire doors, fire hatches, fire wraps, and penetration fire stops to manage loss of material. In addition, the program requires visual inspection of fire wraps and penetration fire stops to manage change in material properties. The team reviewed the following documents:

- Engineering Report 93-R-1015-03, "Aging Management Review of the Auxiliary Building," Revision 1
- Engineering Report 93-R-1015-07, "Aging Management Review of Bulk Commodities," Revision 1
- Procedure 1405.016, "Unit 1 Penetration Fire Barrier Visual Inspection," completed October 4, 2000
- Maintenance Action Item 22579, "Perform Unit One 1-Hour Cable Fire Wrap Inspection," completed June 1, 2000.

The team inspected randomly-selected areas of the plant and noted that fire barriers inspected appeared to be in good condition and functional.

c. Conclusions

The team concluded that the Fire Barrier Inspections provide reasonable assurance that the aging effects of the fire barriers will be managed during the period of extended operation, as described in the license renewal application and as accepted by the NRC's SER.

22. Primary Chemistry Monitoring Program

a. Scope

The team reviewed the license renewal application, the NRC's SER, plant procedures, and records of past chemistry level data and discussed the program with responsible applicant personnel.

b. Observations

This was an existing program that was identified for managing corrosion in systems containing primary system reactor coolant water. The program, described in Appendix B, Section 4.6.1, of the license renewal application, involves sampling and analysis of the fluids, limiting the levels of certain impurities, and use of chemical additives to preclude corrosive environments. The purpose of the Primary Chemistry Monitoring Program is to maximize long-term availability of primary systems by minimizing system corrosion, fuel corrosion, and radiation field buildup. The Primary Chemistry Monitoring Program provides assurance that elevated levels of contaminates and oxygen do not exist in the systems covered by the program. This prevents or minimizes the occurrence of cracking and other aging effects.

The ANO-1 Primary Chemistry Monitoring Program consists of sampling criteria, frequencies, locations, and allowable values with specific guidance for actions to be taken with parameters exceeding allowable values. The frequency of sampling is daily, weekly, monthly, quarterly or as required, based on plant operating conditions. This frequency has been established based on Technical Specification requirements, EPRI guidelines, and ANO-specific experience.

The team reviewed the description of this inspection program provided in the license renewal application and discussed the program with responsible applicant personnel. The team reviewed further details of the attributes of the program described in plant Procedure 1000.106, Primary Chemistry Monitoring Program, Change 005-00-0. Subsequently, the team verified implementation of the program through a review of trended chemistry levels recorded in the applicant's electronic database for July through December 2000. Data reviewed included Borated Water Storage Tank, Reactor Coolant System, and Spent Fuel Pool chemistry results. The team found that all the data reviewed showed the chemical concentration parameters well within specifications.

c. Conclusions

The team found that the Chemistry Control Program was implemented consistent with the license renewal application and as accepted in the NRC's SER.

23. Secondary Chemistry Monitoring

a. Scope

The team reviewed the license renewal application, the NRC's SER, applicant responses to NRC requests for additional information, plant procedures, secondary chemistry monitoring and trending history, and maintenance records for a system within the scope of license renewal. The team also discussed the program with responsible applicant personnel.

b. Observations

The Secondary Chemistry Monitoring program as described in Appendix B to the license renewal application is credited for managing cracking, loss of material, loss of mechanical closure integrity, and fouling in components that are within the scope of license renewal. The Secondary Chemistry Monitoring activities include sampling and analysis of the main feedwater, condensate, and steam generator systems, as well as many of the safety-related non-Class 1 systems that use the condensate storage tanks as sources of makeup water.

The secondary chemistry monitoring program is controlled by ANO Procedure/Work Plan 1052.007. The inspection team reviewed this procedure and found that it is used to identify normal sampling frequencies for each secondary chemistry system and to identify a normal operating range for the chemical parameters being monitored on each system. This procedure, as stated within, is used to maximize the availability and operating life of the major components monitored by the secondary chemistry monitoring program.

The inspection team also reviewed Procedure/Work Plan 1000.042, "Steam Generator Water Chemistry Monitoring - Unit 1." The purpose of this procedure is to identify secondary water chemistry monitoring activities to maximize the availability and operating life of major components such as the steam generators and the turbine. Review of this procedure and discussions with the applicant's chemistry department personnel verified that the applicant is implementing the program consistent with industry (Electric Power Research Institute) standards and guidelines, as well as incorporating plant experience.

The team interviewed plant chemistry personnel and reviewed secondary chemistry monitoring and trending history. The team found that the applicant maintained trends and reviewed these trends on a periodic basis.

To evaluate the effectiveness of the program, the team requested the maintenance history for the previous 5 years for the main feedwater system to identify if any cracking, loss of material, loss of mechanical closure integrity, or fouling had occurred. This maintenance history revealed only one incident of fouling in a flow sensing device in the feedwater system; no additional aging concerns were identified as part of this review. The team found that a single

occurrence of fouling in the feedwater system over a 5-year period is good indication that the program is effective at managing the aging effects of concern.

c. Conclusions

The Secondary Chemistry Monitoring program is a long-standing program that appears to be well established and properly implemented. The program and acceptance criteria are implemented consistent with industry standards and guidelines, and trending results are periodically reviewed and evaluated. The team concluded that this program provides reasonable assurance that the aging effects for which it is credited will be managed during the period of extended operation, as described in the license renewal application and as accepted by the NRC's SER.

24. Auxiliary Systems Chemistry Monitoring

a. Inspection Scope

The team reviewed the license renewal application, plant procedures, test results, and the NRC's SER to verify that the Auxiliary Systems Chemistry Monitoring program was being implemented consistent with the information presented in the application and the SER. The team also discussed the Auxiliary Systems Chemistry Monitoring program with knowledgeable applicant staff.

b. Observations

Appendix B, of the applicant's license renewal application states that the purpose of Auxiliary Systems Chemistry Monitoring is to maximize the availability and operating life of the components used for the closed cooling water loops. The applicant credits Auxiliary Systems Chemistry Monitoring with minimizing the loss of material due to corrosion, cracking, fouling, and loss of mechanical closure integrity aging effects.

Auxiliary Systems Chemistry Monitoring is an existing program, implemented by the applicant's Procedure 1052.027, "Auxiliary Systems Water Chemistry Monitoring," Revision 3. The team reviewed the requirements contained in the procedure and discussed the implementation of these requirements with the applicant's responsible personnel. The team found that Procedure 1052.027 required sampling and testing the closed cooling water loops water chemistry at specified frequencies. The water in the applicable closed loop cooling water systems is sampled and the control parameters (i.e., pH, iron, copper, biological activity, etc.) are monitored and trended. Based on these trends, corrective action is taken when a control parameter is outside of the acceptable range. The team reviewed the test results and trends from the water samples taken within the past few months from the closed loop cooling water systems included in the scope of license renewal. The team found that the water chemistry control

parameters from these water samples were maintained within the acceptable range and that appropriate corrective action was taken when control parameters were found outside the acceptable range.

c. Conclusions

The team concluded that the Auxiliary Systems Chemistry Monitoring Program sampling and testing activities were being conducted as prescribed by plant procedures, the applicant's license renewal application, and the NRC's SER.

25. Inservice Inspection of Classes 1, 2, and 3 Piping (ASME Section XI, Subsections IWB, IWC, IWD, and Augmented)

a. Scope

The team reviewed the license renewal application, the NRC's SER, plant procedures, engineering reports, and the results from past inservice inspections of the main feedwater, emergency feedwater, and SW systems. The team also interviewed knowledgeable applicant personnel.

b. Observation

The applicant's aging management programs for Classes 1, 2, and 3 piping included the inservice testing requirements of ASME Section XI, Subsections IWB, IWC, IWD, and Augmented inspections.

ASME Section XI, Subsection IWB: In Appendix B to the license renewal application, Subsection IWB inservice inspections are credited with identifying and correcting degradation in Class 1 pressure retaining components and their integral attachments. Subsection IWB inspections are credited with managing cracking, loss of mechanical closure integrity at bolted connections, and loss of material. To do this volumetric, surface, and visual examinations are performed. Volumetric examinations include radiographic, ultrasonic and/or eddy current testing. Surface examinations include magnetic particle or dye penetrant testing. Visual examinations consist of: (1) assessing the surface condition of the part being examined; (2) identifying evidence of leakage from pressure retaining components; and (3) and determining the general mechanical and structural condition of component and supports. The team found that ASME Section XI, Subsection IWB inservice inspections, as described in the license renewal application and as accepted by the NRC's SER, are adequate for managing aging effects on Class 1 piping.

ASME Section XI, Subsection IWC: In Appendix B to the license renewal application, Subsection IWC inservice inspections are credited with identifying and correcting degradation in Class 2 pressure retaining components and their integral attachments. These inspections are credited with managing cracking, loss of mechanical closure integrity, and loss of material. To do this volumetric, surface, and visual examinations are performed. Volumetric examinations

include radiographic, ultrasonic, and/or eddy current testing. Surface examinations include magnetic particle or dye penetrant testing. Visual examinations consist of (1) assessing the surface condition of the part being examined; (2) identifying evidence of leakage from pressure retaining components; and (3) determining the general mechanical and structural condition of components and supports. Aging effects of selected components in the following systems are managed by Subsection IWC: core flood, reactor building spray, main feedwater, main steam, spent fuel, service water, high pressure injection, makeup and purification, low pressure injection, decay heat, emergency feedwater, chilled water, condensate storage, and reactor coolant. The team found that ASME Section XI, Subsection IWC inservice inspections, as described in the license renewal application and as accepted by the NRC's SER, are adequate for managing aging effects on Class 2 piping.

ASME Section XI, Subsection IWD: In Appendix B to the license renewal application, Subsection IWD inservice inspections are credited with identifying and correcting degradation in Class 3 pressure retaining components and their integral attachments. Subsection IWD inspections are credited with managing cracking, loss of mechanical closure integrity, and loss of material. As described in the license renewal application, these effects of aging are managed by a visual examination to identify evidence of leakage from pressure retaining components. The team disagreed that this visual examination alone would be sufficient to detect loss of material in piping systems. In discussions with technical staff from NRR and with applicant staff, the team found that the Appendix B was intended to provide a detailed discussion of the individual aging management programs and was not meant to convey that any single program, alone, could manage all the aging effects listed therein. For each system, structure, or commodity group (SSC), these programs could be credited for managing certain effects of aging either alone or in conjunction with other aging management programs. The aging management reviews of each SSC provides a discussion of which programs or combination of programs will manage the aging effects in that SSC. The team found that ASME Section XI, Subsection IWD, inspections were always credited [in the application] in combination with some other program to manage the effects of aging in Class 3 piping. As a result, the team was satisfied with this explanation.

The team found that the applicant did not include nine SW lines in their list of piping included in the scope of their ASME Section XI, Subsection IWD, inservice inspection program. This list is used to establish inspection sampling to meet ASME Section XI requirements. The team learned that the applicant had previously identified these discrepancies in Condition Reports CR-ANO-1-2000-0265 and CR-ANO-1-2000-0466, which the team reviewed. The applicant determined that, because they were conservative in selecting their inspection samples, the minimum requirements of the ASME Section XI had still been satisfied. The team found that the applicant appropriately evaluated and corrected this discrepancy.

With the exception of the discrepancies noted above that the applicant has entered into their corrective action program, the team found that ASME Section XI, Subsection IWD inservice inspections, as described in the license renewal application and as accepted by the NRC's SER, are adequate for managing aging effects on Class 3 piping.

ASME Section XI, Augmented Inspections: In Appendix B to the license renewal application, Augmented inservice inspections are credited with identifying and correcting degradation of components outside the jurisdiction of ASME Section XI, such as non-Class 2 piping welds in high energy lines and the borated water storage tank header piping. These inspections are credited for managing the aging effects of loss of material and cracking. In Appendix B to the license renewal application, the applicant proposed the following additional augmented inservice inspections for license renewal purposes, which will be implemented prior to the extended period of operation.

- Inspections of the weld of piping wetted by reactor sump water
- Supplemental inspection of the certain stainless steel piping in the main steam system
- One-time inspection of certain containment penetrations and the decay heat pump room drain valves to ensure seismic qualification is maintained and to manage loss of material and cracking
- Special inspections of certain containment penetrations to manage cracking

The team found that Engineering Report 93-R-1011-01 described the following three ASME Section XI augmented inspections added to the program for licence renewal which were not included in Appendix B of the license renewal application: (1) visual inspection of the reactor coolant pump; (2) inspection of the sodium hydroxide system; and (3) a supplemental inspection of stainless steel tubing in the chilled water system. The applicant revised the FSAR supplement to include these additional augmented inspections in a letter to the NRC from J. D. Vandergrift of Entergy Operations, Inc., dated March 14, 2001.

With the exception of the discrepancy described above that the applicant has agreed to correct, the team found that ASME Section XI, Subsection IWD inservice inspections, as described in the license renewal application and as accepted by the NRC's SER, are adequate for managing aging effects on Class 3 piping.

c. Conclusions

With the exceptions discussed above, the team concluded that the ASME Section XI, Subsections IWB, IWC, IWD and augmented inservice inspections, as described in the license renewal application and as accepted by the NRC's

SER, will be adequate for managing the aging effects for which they are credited. The applicant has corrected or agreed to correct the identified discrepancies.

26. Inservice Inspection of Piping and Component Supports (ASME Section XI, Subsection IWF)

a. Inspection Scope

The team reviewed the applicant's ASME Section XI, Inservice Inspection Program, results of past IWF inspections, plant procedures to verify that the program was implemented consistent with the information presented in the applicant's license renewal application and the NRC's SER issued January 10, 2001. The team also discussed the IWF inservice inspection program with knowledgeable applicant personnel.

b. Observations

Appendix B of the applicant's license renewal application describes the ASME Section XI, Subsection IWF inservice inspections and states that the purpose of these inspections is to identify and correct degradation of ASME Section XI, Class 1, 2, 3, or MC component supports in accordance with 10 CFR 50.55a. The applicant states that the aging effects managed as part of the Subsection IWF inservice inspections include cracking, loss of material, and change in material properties. The team found that the applicant was implementing the ASME Section XI, Inservice Inspection Program, Subsection IWF inspections credited for license renewal under the 1992 Code Edition, consistent with 10 CFR 50.55a and the ANO-1 Technical Specifications.

c. Conclusions

The team concluded that the ASME Section XI, Subsection IWF inservice inspections, as described in the license renewal application and as accepted by the NRC's SER, will be adequate for managing the aging effects for which they are credited.

27. Inservice Inspection of Metal Containments (ASME, Section XI, Subsection IWE)

a. Scope

The team reviewed the license renewal application, the NRC's SER, ANO-1 Third Interval Inservice Inspection Plan, and plant procedures. The team also interviewed knowledgeable applicant personnel.

b. Observations

Inspection of metal containment and the metallic liner of concrete containment are specified in ASME Section XI, Subsection IWE, "Requirements for Class MC

and Metallic Liners of Class CC Components of Light-Water Cooled Plants." Appendix B of the license renewal application states that Subsection IWE will identify and correct degradation of: (1) Class MC pressure retaining components and their integral attachments and (2) metallic shell and penetration liners of Class CC pressure retaining components and their integral attachments. Subsection IWE is credited with managing the aging effects of loss of material of steel surfaces in the ANO-1 reactor building liner plate.

The first Subsection IWE inservice inspection of the ANO-1 reactor building liner plant is scheduled for the next refueling outage in March of 2001. The team reviewed Procedure/Work Plan 5120.513 which provides instructions for individuals qualified and certified to perform visual examinations (VT-1, VT-2, and VT-3) for the inservice inspection activities at ANO-1. The team found that the procedure appeared to be adequate for performing the first Subsection IWE inspection of the ANO-1 reactor building liner.

c. Conclusions

The team concluded that the ASME Section XI, Subsection IWE inservice inspections, as described in the license renewal application and the NRC's SER, will manage the effects of aging for which it is credited.

28. Inservice Inspection of Concrete Containments ASME Section XI, Subsection IWL)

a. Scope

The team reviewed the license renewal application, the NRC's SER, plant procedures, engineering requests, and condition reports. The team also interviewed knowledgeable applicant personnel.

b. Observations

The ANO-1 containment is a steel lined and post-tensioning concrete containment. Subsection IWL of ASME Section XI provides instructions for the inspection, documentation, and repair of reinforced concrete and post-tensioning systems of Class CC components. The ANO-1 concrete containment is not a Class CC containment; however, the applicant elected to perform inservice inspections in accordance with Subsection IWL. The aging effects that the applicant credits their Subsection IWL inservice inspections for managing are loss of material in tendon anchorage and cracking and change in material properties in concrete.

The team reviewed Procedure/Work Plan 5220.011 which provides instructions and documentation requirements to assess the continuing quality and structural performance of the containment post-tensioning system and the concrete containment. This includes inspecting the post-tensioning tendon system for evidence of water and general visual examination of the concrete surfaces.

The team reviewed records of the last Subsection IWL inservice inspection and found that many deficiencies had been identified by the applicant and reported in condition reports. The team reviewed several selected condition reports and the engineering evaluations of some of these identified deficiencies. The deficiencies reviewed by the team included the following:

- A difference in the amount of sheathing filler removed and the amount replaced (>10%).
- It was discovered that several rebars are exposed in the reactor building. An engineering evaluation determined this was due to human error and no repair to the concrete containment was required.
- A broken wire in one of the tendons
- A missing button head in one of the tendons
- A concrete crack greater than 0.01 inch (0.03 inch) adjacent to the bearing plate of a tendon
- Exposed reinforcing steel
- Wood embedded in exterior concrete surface
- Grease void >10% net duct volume and grease leaks on concrete surface

The team found that the applicant evaluated the deficiencies and either determined them to be acceptable or took appropriate corrective actions to correct the deficiency.

c. Conclusions

The team concluded that the ASME Section XI, Subsection IWL inservice inspections, as described in the license renewal application and the NRC's SER, will manage the effects of aging for which it is credited.

E. Open Items

During the license renewal scoping and screening inspection conducted December 11-15, 2000, the NRC identified inspection open items, which were documented in NRC Inspection Report 50-313/00-17; 50-368/00-17. These open items were either discrepancies that the applicant agreed to correct or were items that needed further NRC review to reach a conclusion. The team reviewed these open items during this inspection, and their resolutions are discussed below.

1. (Closed) Review of Draft Engineering Reports

   During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team reviewed several engineering reports in the process of being revised at the time of this inspection. The applicant committed to completing these draft revisions prior to the NRC's license renewal aging management inspection. This was documented as an open item in NRC Inspection Report 50-313/00-17; 50-368/00-17. The team reviewed the completed engineering reports and verified that any the changes made prior to final approval of the revision did not affect the conclusions documented in NRC Inspection Report 50-313/00-17; 50-368/00-17. This item is closed.

2. (Closed) Incorrect References in Table 2.2-1 of the License Renewal Application

   During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team identified an error in Table 2.2-1 of the applicant's license renewal application, in that the references listed were incorrect. The applicant agreed to issue a clarification letter to show the correct references. The team reviewed the applicant's clarification letter to the NRC dated January 31, 2001, and found that the applicant corrected the error in Table 2.2-1 of their license renewal application. This item is closed.

3. (Closed) Rubber Boot Omitted from License Renewal Scope

   During the NRC's scoping and screening inspection conducted December 11-15, 2000, in a walkdown of the emergency feedwater system, the team observed a rubber boot that was not identified as in being within the scope of license renewal. This rubber boot performs a function to demonstrate compliance with 10 CFR 50.48, "Fire Protection," therefore, should be in the scope of the license renewal in accordance with 10 CFR 54.4(a)3. The applicant agreed to revise Engineering Report 1015-07, "Aging Management Review of Bulk Commodities," to identify this rubber boot and any others that may be installed in the plant, as a commodity subject to aging management. The team reviewed Revision 2 of Engineering Report 93-R-1015-07 and verified that the rubber boot was included as a fire protection bulk commodity subject to aging management review. This item is closed.

4. (Closed) Inconsistency in Treatment of Steam Traps on License Renewal Scope

   During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team identified an inconsistency with how steam trap drains were treated with respect to license renewal scope, in that some were shown in the scope of license renewal and some were shown out of scope. Specifically the drain lines to Steam Traps 129 and 130 were shown inside the license renewal boundary; however, the drain lines to Steam Traps 77 and 79 were shown outside the license renewal boundary. The applicant determined that these drain lines should be screened out, because their pressure boundary failure would not prevent the accomplishment of a safety function, in accordance with 10 CFR

54.4 and 54.21, and agreed to revise the appropriate license renewal drawing. The team reviewed license renewal boundary Drawing LRA-M-204, Sheet 6, Revision 1, which was corrected to show the drain lines to Steam Traps 129 and 130 outside the boundary of license renewal. This item is closed.

5. (Closed) Service Water Line JBD-15-18" Omitted from License Renewal Scope

During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team found that the continuation of the SW line to the circulating water discharge flume, Line JBD-15-18", on Drawing M-209, Sheet 2, was not included in the applicant's scope of license renewal. The applicant agreed to correct the drawing discrepancy to accurately show the continuation of Line JBD-15-18" as within their license renewal boundary. The applicant issued a new license renewal boundary drawing, LRA-M-209, Sheet 2, Revision 0, to show the continuation of the SW line to the circulating water discharge flume, Line JBD-15-18" within the boundary of license renewal. The team reviewed this drawing and verified that Line JBD-15-18" was included in the boundary of license renewal. This item is closed.

6. (Closed) Discharge Flume Omitted from License Renewal Scope

During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team found that the circulating water discharge flume was incorrectly omitted from the license renewal scope and the applicant did not identify the flume as requiring an aging management review. The applicant agreed to include the flume in Engineering Report 93-R-1015-05, "Aging Management Review of the Emergency Cooling Pond and the Intake/Discharge Canals." The team reviewed Revision 2 to Engineering Report 93-R-1015-05 and verified that Note D was added to Table 4-1 to indicate that the concrete flume supports the intended function of the discharge canal and is subject to an aging management review. Loss of material was identified as an aging effect requiring management for the flume wall and the Maintenance Rule Program is credited for the managing of the flume's concrete. This item is closed.

7. (Closed) Unidentified Symbol on License Renewal Boundary Drawing LRA-M-210

During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team identified a symbol on license renewal boundary Drawing LRA-M-210, Sheet 1, which was not defined. The applicant agreed to revise the drawing to correct the symbol. The team reviewed Revision 1 of this drawing and verified that the symbol was corrected. This item is closed.

8. (Closed) Instrument Air Valves Omitted from Aging Management Review

During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team found that Instrument Air Valves IA-823 and IA-824, which have a passive closed safety function to provide containment isolation, were omitted

from the instrument air system aging management review documented in Engineering Report 93-R-1016-25. The applicant agreed and agreed to revise Engineering Report 93-R-1016-25 to include them. The team reviewed Engineering Report 93-R-1016-25 and verified that it included Instrument Air Valves IA-823 and IA-824. This item is closed.

9. (Closed) Sensing Line to Valve CV-6062 not Shown on License Renewal Boundary Drawing

During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team found that the chilled water system sensing line to Valve CV-6062 was incorrectly shown on license renewal boundary Drawing LRA-M-221 as being outside the license renewal boundary. The applicant agreed to correct this error in the next revision to the drawing. The team reviewed Drawing LRA-M-221, Revision 1, and verified that it correctly showed the sensing line to Valve CV-6062 included in the license renewal boundary. This item is closed.

10. (Closed) Failure to Revise License Renewal Engineering Report to Reflect the Removal of Lube Oil Valve 2PSV-7132 from the Plant

During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team found that lube oil Valve 2PSV-7132 was not shown on Drawing LRA-M-2241, Sheet 1, "AAC Generator System Lube Oil System;" however, it was included in Engineering Report 93-R-1016-18 as being within the scope of license renewal for the lube oil system. The applicant determined that the valve was a lube oil system relief valve that had been removed as part of a recent modification, but Engineering Report 93-R-1016-18 had not been revised. The applicant agreed to revise Engineering Report 93-R-1016-18 to reflect the recent modification. The team reviewed Engineering Report 93-R-1016-18, Revision 1, and verified that Valve 2PSV-7132 had been removed.

11. (Closed) Inconsistencies in the Treatment of the Reactor Building Leak Chase Channels and the Tendon Conduits in Engineering Report

During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team identified that Engineering Report 93-R-1015-01 does not treat the reactor building leak chase channels and the tendon conduits consistently, with respect to the scope of license renewal. The applicant agreed to revise the report to correct this discrepancy. The team reviewed Revision 2 to Engineering Report 93-R-1015-01 and verified that, in Sections 3.1.1.4 and 3.3, the leak chase channels and the tendon conduits are within the scope of license renewal. However, an aging management review is not required, because they do not perform any intended function. The team agreed. This item is closed.

12. (Closed) Inconsistencies Concerning the Preferred Source of Water for the SW System

During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team identified inconsistencies between the FSAR, the license renewal application and Engineering Report 93-R-1015-04 concerning the preferred source of water for the SW system. The applicant subsequently revised Engineering Report 93-R-1015-04 to clarify the preferred sources. This item is closed.

13. (Closed) Station Blackout and Reactor Protection System Cables not Identified as In-scope Components in the Turbine Building

During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team found that the applicant had omitted station blackout and reactor protection system cables from Engineering Report 93-R-1010-01 of in-scope components contained in the turbine building. The applicant subsequently revised this engineering report to specify the additional in-scope components. This item is closed.

14. (Closed) Flammastic Omitted from Table 3.6-8 of the License Renewal Application

During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team identified that flammastic (which is used in fire protection barriers and wraps), was incorrectly omitted from Table 3.6-8 of the applicant's license renewal application. The applicant agreed to correct the table by issuing a clarification letter to the NRC and to revise Engineering Report 93-R-1015-07, "Aging Management Review of Bulk Commodities," to include flammastic. On January 31, 2001, the applicant issued a clarification letter to address this and other issues. The team reviewed this clarification letter and verified that it provided additional information that addressed the omission in Table 3.6-8 of the license renewal application. In addition, the team reviewed Engineering Report 93-R-1015-07, "Aging Management Review of Bulk Commodities," Revision 2, and verified that the applicant added flammastic as a bulk commodity subject to an aging management review. This item is closed.

15. (Closed) Main Feedwater System Flow and Temperature Element Piping Omitted from the License Renewal Scope

During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team identified that the applicant had omitted nonsafety-related main feedwater system flow and temperature element piping and piping components from the license renewal scope. The flow and temperature instruments were needed for the anticipated transient without scram (ATWS) mitigating system actuation circuitry to initiate emergency feedwater upon a low feedwater flow condition. The team concluded that the ATWS mitigating system actuation circuitry related piping and piping components were

within the scope of license renewal and should be subject to an aging management review.

The applicant agreed that the flow and temperature instruments were within the scope of license renewal, but disagreed with the team's position related to the piping and piping components. The applicant stated that during an ATWS event, these instruments were intended to mitigate the effects of an operational transient such as a reduction in or loss of feedwater.

In accordance with 10 CFR Part 54, those systems, structures, and components relied upon to perform a function that demonstrates compliance with 10 CFR 50.62 (the ATWS rule) are within the scope of license renewal. The team reviewed the applicant's original ATWS submittal to the NRC and found that the flow and temperature instrumentation were relied upon to demonstrate compliance with 10 CFR 50.62, however the integrity of the piping to which the instruments were attached was not discussed.

The team concluded that the integrity of the piping supporting the ATWS instruments was not in the current licensing basis regarding 10 CFR 50.62. Part 50.54 limits the scope of license renewal to the current licensing basis, unless actual plant-specific operating experience suggests that additional components should be considered. The licensee stated that the piping supporting the ATWS instruments was being monitored in the flow accelerated corrosion monitoring program with favorable results. Therefore, the team concluded that failure of this nonsafety-related piping and piping components to which the ATWS instrumentation is attached is beyond the scope of license renewal for this plant. The team reviewed this conclusion with NRR staff, who concurred. This item is closed.

16. (Closed) Inconsistency in the Treatment of Main Feedwater Flow and Temperature Elements in Engineering Report

During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team found inconsistencies with respect to the treatment of the MFW flow and temperature instruments. In reviewing, Attachment 9, "Component Database Printout of Q and S Equipment," to Engineering Report 93-R-1010-01, "ANO-1 License Renewal Integrated Plant Assessment System and Structures Screening," the team noted that EFW flow elements FE-2627 and FE-2677, were not listed as either S or Q components. In addition, the team noted that EFW temperature elements TE-2629, TE-2630, TE-2679 and TE-2680 were listed as S components.

Since the temperature elements provide a correction to the flow indications and the flow and temperature instruments are located on the same EFW line, the team questioned the applicant regarding this apparent inconsistency. Furthermore, the report did not identify the flow elements as being within the scope of license renewal, but did identify the temperature elements as being in the scope.

During review of this issue, the applicant noted that flow elements were not required to be S or Q in part because they were purely mechanical devices (nozzles) and not within the scope of the ATWS submittal. The ATWS rule addressed control functions from the sensor output to the initiation device, so the flow elements were not included. The associated nonmechanical current to pneumatic converters, Pressure Differential Transmitters, PDT-2627 and PDT-2677 were in the scope of license renewal. However, the pressure differential transmitters screened out because they were active components.

The team sampled the following S-list components from the applicant's equipment database to verify that the applicant's scoping and screening of these systems and components were performed in accordance with their license renewal application and the NRC's SER.

- Auxiliary building floor drains, including floor drain isolation valves, for rooms containing safety-related equipment were included within the scope of license renewal, because they provide isolation between rooms. This isolation function is important in preventing a leak in one room from causing flooding in another room (and the potential loss of other safety-related equipment) that uses the same floor drain header. Therefore, these components are included within the scope of license renewal in accordance with 10 CFR 54.4(a)2.

- The reactor coolant pump (RCP) seal will operate without any supporting systems. Therefore, the RCP seal cooler supply and return lines were not included within the scope of license renewal, because they do not meet any of the criteria of 10 CFR 54.4(a) in support of the RCP seal. However, containment penetrations and the small portion of the RCP seal cooler supply and return line that passes through the containment are within the scope of license renewal for their role in containment isolation in accordance with 10 CFR 54.4(a)(1)(iii).

  That portion of the RCP seal injection system that is common to, and cannot be isolated from, the high pressure injection system is within the scope of license renewal for its role in the high pressure injection system pressure boundary in accordance with 10 CFR 54.4(a)1.

- The reactor coolant system (RCS) makeup tank was not within the scope of license renewal, because the applicant does not take credit for the RCS makeup tank during a design basis event. Therefore the RCS makeup tank is not included within the scope of license renewal, because it does not meet any of the criteria in 10 CFR 54.4(a)

- The sodium hydroxide chemical addition tank testing and recirculating lines are isolated during normal operation and accident conditions. Therefore, sodium hydroxide chemical addition tank testing and recirculating lines were not included as being within the scope of license

renewal, because they do not meet any of the scoping criteria in 10 CFR 54.4(a).

- The borated water storage tank and core flood tank drain line valves are in the scope of license renewal, because they contribute to the pressure boundary of these safety-related tanks and, therefore, are included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1)(iii).

The team concluded that the applicant had properly performed scoping and screening of the above sample of systems, structures, and components in accordance with their license renewal application and the NRC's SER. This item is closed.

17. (Closed) Intake Canal Bar Grates Omitted from License Renewal Scope

During the NRC's scoping and screening inspection conducted December 11-15, 2000, the team found that the intake canal bar grates were in the scope of license renewal, but were screened out, because they do not perform a license renewal intended function, and their failure would not prevent the performance of a safety function. This item remained open pending discussion with NRR staff and further team review of the effects that failure of the bar grates would have on the performance of a safety function.

The team held discussions with NRR staff and performed additional review and found that the bar grates are in place to prevent floating debris from entering the circulating water bay to protect the circulating water pumps. Based on the following, the team determined that failure of the trash racks would not effect the operability of the SW systems.

- The SW bay is 15 feet below the surface.

- Low flow capacity of the SW pumps would not create a draft sufficient to draw in floating debris into the SW bay.

- The applicant's current licensing basis allows for complete loss of intake structure up to the SW bay with the emergency cooling pond providing sufficient cooling capacity under accident conditions.

The team concluded that the applicant appropriately screened out the intake canal bar grates from their license renewal scope. This item is closed.

IV. Exit Meeting Summary

The NRC discussed the results of this inspection on March 9, 2001, with members of the applicant's management and staff, in an exit meeting open for public observation at the ANO-1 site. The applicant acknowledged the findings presented and voiced no dissenting comments. Slides used by the NRC during the exit meeting are included in Attachment 3 to this report.

ATTACHMENT 1
SUPPLEMENTAL INFORMATION

PARTIAL LIST OF PERSONS CONTACTED

Applicant

R. Ahrabli, Structural Design Engineer
M. Cooper, Licensing Specialist
A. Cox, Supervisor, Design Engineering
J. Crabill, System Engineer
G. Ehren, System Engineer
R. Holman, Programs Engineer
I. Jacobson, Unit 1 System Engineer
B. Mitchell, Sr. Engineer, Plant Programs
N. Mosher, Licensing Specialist
T. Ott, Design Engineer, Electrical/Instrumentation and Control
D. Phillips, Supervisor, Unit 1 System Engineering
B. Robinson, Supervisor, Plant Programs
L. Shay, Engineering Programs Engineer
B. Short, System Engineer
S. Thomson, Contractor
G. Young, Manager, Business Development

NRC

R. Bywater, Senior Resident Inspector, Arkansas Nuclear One
Z. Fu, Materials Engineer, Office of Nuclear Reactor Regulation

LIST OF DOCUMENTS REVIEWED

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

DRAWINGS

Number	Title	Revision
FP-103	Fire Zones - Intermediate Floor Plan - EL 368'-0" and 372'-0"	23
FP-104	Fire Zone - Ground Floor Plan - EL 354'-0"	25
FP-105	Fire Zone - Plan Below Grade - EL 335'-0"	18

ELECTRICAL ONE LINE DRAWINGS

Number	Title	Revision
E-1	Station Single Line Diagram, Sheet 1	45
E-4	Single Line Meter & Relay Diagram 4160 Volt System, Main Supply, Sheet 1	26
E-5	Single Line Meter & Relay Diagram 4160 Volt System, Engineered Safeguards, Sheet 1	25
E-7	Single Line Meter & Relay Diagram 480 Volt Load Centers, Main Supply, Sheet 1	28
E-8	Single Line Meter & Relay Diagram 480 Volt Load Centers Engineered Safeguard & Main Supply, Sheet 1	22
E-17	Vital AC and 125V DC Single Line and Distribution, Sheet 1	40
E-17	Vital AC and 125V DC Single Line and Distribution, Sheet 1A	6

ENGINEERING REPORTS

Number	Description	Revision
93-R-1010-01	ANO-1 License Renewal Integrated Plant Assessment System and Structures Screening	0
93-R-1011-01	Review of the Programs Credited in the License Renewal Evaluations	0
93-R-1013-03	Demonstration of the Management of the Aging Effects for the ANO-1 RCS Piping	0
93-R-1014-01	Aging Effects for Structures and Structural Components	0
93-R-1015-01	Aging Management Review of the Reactor Building	2
93-R-1015-03	Aging Management Review of the Auxiliary Building	1
93-R-1015-04	Aging Management Review of the Intake Structure	2
93-R-1015-05	Aging Management Review of the Emergency Cooling Pond and the Intake/Discharge Canals	2
93-R-1015-06	Aging Management Review of Aboveground/Underground Yard Structures and Associated pipe Trenches	2
93-R-1015-07	Aging Management Review of Bulk Commodities	1 and 2

Number	Description	Revision
93-R-1016-01	Aging Management Review of the Spent Fuel System	1
93-R-1016-03	Aging Management Review of the Main Feedwater System	1
93-R-1016-06	Aging Management Review of the Service Water System	2
93-R-1016-07	Aging Management Review of the Emergency Diesel Generator System	1
93-R-1016-08	Aging Management Review of the Makeup and Purification/High Pressure Injection System	1
93-R-1016-10	Aging Management Review of the Decay Heat / Low Pressure Injection System	1
93-R-1016-11	Aging Management Review of the Auxiliary Building and Reactor Building Drains	2
93-R-1016-16	Aging Management Review of the Emergency Feedwater System	2
93-R-1016-18	Aging Management Review of the Alternate AC Generator System	1
93-R-1016-22	Aging Management Review of the Fuel Oil System	1
93-R-1016-23	Aging Management Review of the Containment Isolation Mechanical Components	1
93-R-1016-24	Aging Management Review of the Chilled Water System	1
94-R-1016-25	Aging Management Review of the Instrument Air Components	1
93-R-1017-01	Aging Management Review of the Passive Electrical Components	1
93-R-1017-02	ANO-1 License Renewal Screening of Ohmic Heating in Power Cables	1
93-R-1017-03	ANO-1 License Renewal Screening of Power Cables Potentially Subject to Wetting	1
93-R-1017-04	ANO-1 License Renewal Screening of Frequently Manipulated Cables & Terminations	1
93-R-1017-05	ANO-1 License Renewal Screening of Cables and Terminations Exposed to Potentially Hazardous Chemicals	1
93-R-1017-06	ANO-1 License Renewal Screening of Impedance Sensitive Circuits	1

Number	Description	Revision
93-R-1017-07	ANO-1 License Renewal Screening of Cables Exposed to High Radiation	1
93-R-1017-08	ANO-1 License Renewal Screening of Cables Outside Containment Exposed to Elevated Temperatures	1
93-R-1017-09	ANO-1 License Renewal Screening of Cables Inside Containment Exposed to Elevated Temperatures	1
93-R-1017-10	ANO-1 License Renewal Screening of Electrical Connections	1

PIPING & INSTRUMENT DIAGRAMS

Number	Title	Revision
LRA-M-204	Emergency Feedwater, Sheet 3	0
LRA-M-204	Emergency Feedwater Storage, Sheet 5	1
LRA-M-204	EFW Pump Turbine, Sheet 6	1
LRA-M-206	Steam Generator Secondary System, Sheet 1	1
LRA-M-206	MSIV Operator Controls, Sheet 2	1
LRA-M-209	Cir. Water, Service Water & Fire Water Intake Structure Equipment, Sheet 1	1
LRA-M-209	Cir. Water, Service Water & Fire Water Intake Structure Equipment, Sheet 2	0
LRA-M-210	Service Water, Sheet 1	1
LRA-M-217	Emergency Diesel Generators - Fuel Oil Storage, Sheet 1	0
LRA-M-217	Emergency Diesel Generator K-4A/K-4B - Starting Air System, Sheet 4	0
LRA-M-221	Emergency Chilled Water System, Sheet 2	1
LRA-M-232	Decay Heat Removal System, Sheet 1	2
LRA-M-236	Reactor Building Spray and Core Flooding System, Sheet 1	2
LRA-M-2241	AAC Generator System - Engine Cooling Water Subsystem, Sheet 1	0
LRA-M-2241	AAC Generator System - Air Intake & Exhaust Subsystem, Sheet 2	0

Number	Title	Revision
LRA-M-2241	AAC Generator System - Fuel Oil System, Sheet 3	0
LRA-M-2241	AAC Generator System - Starting Air & Service Air Subsystems, Sheet 4	0
LRA-M-2241	AAC Generator System - Lube Oil System, Sheet 5	0

PROCEDURES

Procedure	Title	Change, Revision, or Date
1000.106	Primary Chemistry Monitoring	Change 005-00-0
1015.036	Containment Building Closeout, Attachment E, Unit 1 Sump Closeout	Change 006-03-0.
1025.029	Oil Analysis Program	Change 003-02-0
1032.037	Inspection and Evaluation of Boric Acid Leaks	Change 000-01-0
1104.029	Supplement 1, Service Water and Auxiliary Cooling Water System	November 5, 2000 December 11, 2000
1052.027	Auxiliary Systems Water Chemistry Monitoring	Revision 3
1203.012	Annunciator K12 Corrective Action	Change 031-03-0
1306.019	Annual Emergency Cooling Pond Sounding	September 16, 2000
1309.013	1R15 As-left Flow Data	October 5, 1999
1309.016	1R15 As-found Decay Heat Cooler Thermal Test	September 14, 1999
1309.018	1R15 EDG Cooler Thermal Test	August 16, 1999 August 14, 2000 August 28, 2000
1402.134	Inspection and Preventive Maintenance of the Unit One Polar Crane (L-002)	April 5, 1989
1411.002	Polar Crane Lubrication and Inspection	September 16, 1999
5000.005	Boric Acid Corrosion Prevention Program Administration	Change 001-00-0
5120.200	ISI Program Implementation	Revision 2

Procedure	Title	Change, Revision, or Date
5120.244	Unit 1 - Inservice Inspection (ISI) Period Pressure Tests	Change 005-02-0
5120.400	Unit One Integrated Leak Rate Test	April 14, 1992
5120.513	Inservice Inspection (ISI) Visual Examinations, VT-1, VT-2, VT-3	Change 001-00-0
5220.011	ANO 1&2 Containment Building Tendon Surveillance and Concrete Inspection	Change 000-02-0
HES-02	Containment Leak Rate Testing Program	Revision 6
HES-09	Inservice Inspection Program	Revision 2

MAINTENANCE ACTION ITEMS (MAIs)

MAI	Task	Description	Date
30047	2385	Maintenance Action Item - Polar Crane Assembly	September, 1999
8554	3835	Maintenance Action Item - Emergency Cooling Pond Sounding	September 16, 2000
24169	14761	Inspect High Pressure Injection Pump P-36A Lube Oil Cooler (E-39A)	May 5, 2000
22568	16174	Mechanically Clean and Inspect Auxiliary Building Electrical Rooms Emergency Chiller Condenser (E-176)	May 24, 2000
22579	1832	Perform Unit One 1-Hour Cable Fire Wrap Inspection IAW Procedure 1307.062	June 1, 2000
22665	19534	Perform 18 Month Mechanical Preventive Maintenance and Inspection Activities	June 14, 2000
27352	592	Perform Annual U1 Fire Door inspection	June 6, 2000
28727	2656	Perform 18M Electrical Penetration Inspect IAW Procedure 1405.016	October 4, 2000

36688	19220	Perform 18M Alternate AC Diesel Generator (2K9) IAW 2104.037	November 26, 2000
36955	9012	Perform Monthly DG #1 Test IAW Procedure 1104.036	October 17, 2000

UNIT 1 - INSERVICE INSPECTION (ISI) PRESSURE TEST REPORTS

Section	Date	Section	Date
1.8	June 15, 2000	1.9 U	November 2, 1999
1.9 A to C	June 15, 2000	1.9 V and W	October 28, 1999
1.9 D to G	October 25, 1999	1.10	November 2, 1999
1.9 H to K	October 29, 1999	1.11	August 25, 1999
1.9 L to R	November 1, 1999	2.5	November 1, 2000
1.9 S to	November 2, 1999	3.1	April 3, 1998
1.9 T	December 17, 1999	4.4	April 6, 2000

UNIT 1 - INSERVICE INSPECTION (ISI) NONDESTRUCTIVE TEST REPORTS

Section	Date	Section	Date
26-006	April 24, 1992	26-024	April 20, 1992
26-010	March 2, 1995	26-036	November 13, 1990
26-011	April 20, 1992	26-043	April 21, 1992

UNIT 1 - MONTHLY AND QUARTERLY TESTING OF EMERGENCY FEEDWATER PUMP 7A PER PROCEDURE 1106.006

Supplement	Dates	Dates
2	January 21, 2000	August 29, 2000
2	February 5, 2000	October 24, 2000
2	May 9, 2000	November 21, 2000

2	June 16, 2000	December 18, 2000
2	July 31, 2000	
12	January 10, 2000	November 10, 2000
12	March 12, 2000	November 26, 2000
12	April 11, 2000	November 27, 2000
12	July 4, 2000	December 17, 2000

UNIT 1 - MONTHLY/QUARTERLY TESTING OF EMERGENCY FEEDWATER PUMP 7B PER PROCEDURE 1106.006

Supplement	Dates	Dates
1	January 4, 2000	June 20, 2000
1	February 1, 2000	September 12, 2000
1	March 28, 2000	October 10, 2000
1	April 25, 2000	December 5, 2000
2	March 2, 2000	August 14, 2000
2	May 23, 2000	November 17, 2000
2	July 17, 2000	

CONDITION REPORTS

CR-ANO-C-1995-0220	CR-ANO-1-1998-0401	CR-ANO-1-2000-0189
CR-ANO-1-1998-0027	CR-ANO-1-1998-0404	CR-ANO-1-2000-0254
CR-ANO-1-1998-0044	CR-ANO-1-1998-0488	CR-ANO-1-2000-0352
CR-ANO-1-1998-0052	CR-ANO-1-1998-0548	CR-ANO-1-2000-0317
CR-ANO-1-1998-0091	CR-ANO-1-1998-0736	CR-ANO-1-2000-0439
CR-ANO-1-1998-0100	CR-ANO-1-1999-0001	CR-ANO-1-2000-0582
CR-ANO-1-1998-0160	CR-ANO-1-1999-0287	CR-ANO-1-2001-0030
CR-ANO-1-1998-0164	CR-ANO-1-1999-0386	CR-ANO-1-2001-0041

CR-ANO-1-1998-0305	CR-ANO-1-2000-0004	CR-ANO-C-2001-0050
CR-ANO-1-1998-0308	CR-ANO-1-2000-0104	
CR-ANO-1-1998-0388	CR-ANO-1-2000-0155	

MISCELLANEOUS DOCUMENTS

ANO Unit 1 Third Interval Inservice Inspection Plan, Revision 5, June 21, 2000

Preventive Maintenance Engineering Evaluation, PMEE 020, “Reactor Building Polar Cranes,” Revision 7

Preventive Maintenance Engineering Evaluation, PMEE 085, “Oil Analysis Program,” Revision 11

Containment Sump Inspection-Maintenance/Modification, QCI-S-1, Revision 7

Engineering Request ER 980080, “Engineering Evaluation on Deficiencies Discovered During ANO-1 25-Year Reactor Building Tendon Surveillance and Concrete Surface Examination,: Revision 1, February 18, 2000

Inservice Inspection Plan, Revision 31

Letter from J. Vandergrift, Director of Nuclear Safety Assurance, Entergy Operations, Inc., to the U.S. Nuclear Regulatory Commission, dated September 12, 2000

Letter from J. Vandergrift, Director of Nuclear Safety Assurance, Entergy Operations, Inc., to the U.S. Nuclear Regulatory Commission, dated January 31, 2001

Letter from J. Vandergrift, Director of Nuclear Safety Assurance, Entergy Operations, Inc., to the U.S. Nuclear Regulatory Commission, dated March 14, 2001.

Results of Reactor Building Sump Inspection, QCR-98-A40887-P, April 6, 1998

Records of sump closeouts completed 10/5/99 at the end of refueling 1R15 and 4/30/98 at the end of refueling 1R14

Preventive Maintenance Task 18414, “Perform Internal Visual Inspection of the Borated Water Storage Tank (T-3),” completed September 19, 1999, and April 10, 1998

Preventive Maintenance Task 18522, “Perform External Visual Inspection of (T-3) Borated Water Storage Tank,” inspections performed August 19, 1999, March 2, 1998, and May 20, 1996

Preventive Maintenance Task 17708, “Check Points in System for Foreign Material,” performed on October 23 and December 18, 2000.

Preventive Maintenance Task 25682, “Perform Weekly D06 and D07 Battery Surveillance IAW Procedure 1307.063,” performed on December 21, 2000

LIST OF ACRONYMS AND ABBREVIATIONS USED

AAC	alternate alternating current
ac	alternating current
ANO	Arkansas Nuclear One
ANO-1	Arkansas Nuclear One, Unit 1
ATWS	anticipated transients without SCRAM
BWST	borated water storage tank
dc	direct current
ECP	emergency cooling pond
EDG	emergency diesel generator
EFW	emergency feedwater
FSAR	Final Safety Analysis Report
ILRT	integrated leak rate test
MFW	Main Feedwater
NRC	Nuclear Regulatory Commission
NRR	NRC Office of Nuclear Reactor Regulations
PM	preventive maintenance
RCP	reactor coolant pump
RCS	reactor coolant system
SER	Safety Evaluation Report
SFP	spent fuel pool
SSC	System, Structure, Commodity Group
SW	service water
SWIP	Service Water Integrity Program
V	volt

ANO Unit 1
License Renewal
Aging Management
Review Inspection

Rebecca Nease
Inspection Team Leader

Inspection Team Members
Caudle Julian
Bill McNeill
Ray Mullikin
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Kathy Weaver

License Renewal Regulations

10 CFR Part 54 License Renewal Application

- 10 CFR 54.4 Defines the Scope of License Renewal
- 10 CFR 54.21 Describes the Structures, Systems and Components whose aging effects must be managed
  - Requires the aging effects to be identified
  - Requires a program that manages the effects of aging

10 CFR Part 51 Environmental Impacts

Renewal Application

- Integrated Plant Assessment
  - Identify structures and components in the Scope of License Renewal
  - Describe how scope / screening was performed
  - Demonstrate aging effects will be managed
  - Evaluate time-limited aging analyses and exemptions
- FSAR supplement
- Technical specification changes
- Environmental report supplement

License Renewal Scope

- Safety - related systems, structures and components needed during certain postulated events
- Non-Safety - related systems, structures and components whose failures could prevent the safety related systems, structures and components from performing their functions
- Systems, structures and components that are necessary to mitigate the following regulated events:
  - *Fire Protection (10 CFR 50.48)*
  - *Environmental Qualification (10 CFR 50.49)*
  - *Pressurized Thermal Shock (10 CFR 50.61)*
  - *Anticipated Transients without Scram (10 CFR 50.62)*
  - *Station Blackout (10 CFR 50.63)*

Inspection Activities

- Scoping / Screening Inspection
  - One-Week Team Inspection
    - December 11-15, 2000
    - Report issued February 2, 2001
- Aging Management Review Inspection
  - Two-Week Team Inspection
    - January 22-26, 2001
    - February 5-9, 2001
    - February 27-28, 2001
- Open Items Inspection (Optional)
    - Generated in inspections or as a result of HQ review
    - Date to be determined

Aging Management Inspection

- MC 2516, “Policy and Guidance for the License Renewal Inspection Programs”
- Inspection Procedure 71002, “License Renewal Inspection”
  - Supports the review process
  - Independently verifies through sampling that the Applicant has performed their license renewal aging management review IAW Part 54 and the methods described in their LR application
- Results of this inspection will be documented in Inspection Report 50-313/01-03

Inspection Scope

- Mechanical Systems (7)
- Electrical Systems
- Structures and Structural Components (4)
- Selected Aging Management Programs (30)
- Closure of Open Items from First License Renewal Inspection (17)

Inspection Scope

- Mechanical Systems
  - Emergency Feedwater
  - Main Feedwater
  - Service Water
  - Low Pressure Injection/Decay Heat Removal
  - High Pressure Injection/Make-up Purification
  - Instrument Air
  - Chilled Water

Inspection Scope

- Mechanical Systems (continued)
  - Aging Effects
    - Loss of Material
    - Loss of Integrity
    - Cracking
    - Fouling

Inspection Scope

- Mechanical Systems (continued)
  - Aging Management Programs
    - ASME Section XI, Subsections IWB, IWC, IWD, IWF, and Augmented
    - Service Water Integrity Program (SWIP)
    - Primary and Secondary Chemistry Control
    - Wall Thinning Inspection
    - Heat Exchanger Monitoring Program
    - Instrument Air Quality

Inspection Scope

- Electrical Systems
  - Plant Spaces Approach
    - Passive Electrical Components
    - Harsh Environments (heat, humidity)
  - Aging Effects
    - Reduced Insulation Resistance - Shorting
    - Embrittlement
    - Cracking
  - Aging Management Programs
    - Electrical Component Inspection

Inspection Scope

- Structures and Structural Components
  - Reactor Building
  - Intake Structure
  - Emergency Diesel Fuel Oil Storage Tank Vault
  - Bulk Commodities
    - Threaded Fasteners

Inspection Scope

- Structures and Structural Components (cont'd)
  - Aging Effects
    - Loss of Material Cracking/Separation
    - Change in Material Properties
  - Aging Management Programs
    - Maintenance Rule
    - ASME Section XI, Subsection IWF
    - Fire Protection Barrier Inspections

Inspection Results

- Bulk Commodities: Applicant's AMR for bulk commodities (ER 93-R-1015-07) takes credit for housekeeping activities to manage aging effects from a chemical spill.
  - Housekeeping is not considered an AMP, however a chemical spill is event-driven and not an aging effect.
  - Applicant revised the AMR.

Inspection Results

- Low Pressure Injection/Decay Heat Removal: The LRA identified that fouling can be managed by ASME Section XI IWC pressure testing, Heat Exchanger Monitoring (eddy current) and the SWIP.
  - The team identified that of these three, only SWIP can manage fouling.
  - Applicant corrected this in their annual update.

Inspection Results

- Low Pressure Injection/Decay Heat Removal: The LRA identified that loss of material can be managed by ASME Section XI IWC, Heat Exchanger Monitoring (eddy current), and Primary Chemistry Monitoring.
  - The team identified that of these three, only Primary Chemistry Monitoring prevents loss of material.
  - Applicant corrected this in their annual update.

Inspection Results

- Service Water System: Boundary drawings LRA-M-232 and 236 failed to show the SW cooling water lines to the Rx Bldg Spray Pump as being in scope.
  - The applicant revised these drawings to include these lines in the boundary.

Inspection Results

- Service Water System: The applicant's AMR for the SW system failed to include Class JBD piping.
  - The applicant revised the AMR to include Class JBD piping.

Inspection Results

- Service Water System: The applicant's AMR for the SW system appears to credit ASME Section XI IWD for managing loss of material, cracking, and closure integrity. However, IWD alone will not manage loss of material.
  - The applicant agreed to revise the AMR to clearly state that IWD together with SWIP will manage these aging effects.

Inspection Results

- ASME Section XI, Subsection IWD: The description of this program in the LRA states that IWD can manage the effects of cracking, loss of material, and closure integrity.
  - It is the team's position that IWD is not sufficient to detect loss of material.
  - This item remains open pending further discussion with the applicant and NRR staff.

Inspection Results

- ASME Section XI, Augumented Inspections: The LRA failed to list three augmented inspections that are credited in ER 93-R-1011-01: (1) visual insp of RCP; (2) augmented insp of sodium hydroxide system; and (3) insp of ChW system stainless steel tubing.
  - Applicant has committed to issuing a clarification to include these additional augmented inspections in the FSAR Supplement (App A of the LRA).

Inspection Results

- Service Water Integrity Program: The LRA includes RB coolers and sluice gates as part of SWIP, however, ER 93-R-1011-01 did not include these in the SWIP.
- LRA listed cleaning and flushing pump bearing coolers as SWIP activities, however, ER 93-R-1011-01 did not.
  - Applicant revised ER 93-R-1011-01 to be consistent with the LRA.

Inspection Results

- Boric Acid Corrosion Prevention: This existing program requires a walkdown of systems within the RB to detect the presence of leakage, documentation of results, and trending. Records of the walkdown performed during the last U1 outage could not be located and trending has not been established.
  - The applicant issued 2 CRs to document and correct these issues.