



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**

REGION IV
1600 E. LAMAR BLVD.
ARLINGTON, TX 76011-4511

June 2, 2017

Mr. Richard L. Anderson, Site Vice President
Arkansas Nuclear One
Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802-0967

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 2 – NRC POST-APPROVAL LICENSE
RENEWAL INSPECTION REPORT 05000368/2017009

Dear Mr. Anderson:

On April 20, 2017, U.S. Nuclear Regulatory Commission (NRC) inspectors completed a Post-Approval Site Inspection for License Renewal at Arkansas Nuclear One, Unit 2. The enclosed report documents the inspection results, which were discussed on April 20, 2017, with yourself and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations, and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based upon the results of this inspection, no findings of significance were identified.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at <http://www.nrc.gov/reading-rm/adams.html> and at the NRC Public Document Room in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

/RA Greg Pick Acting for/

Gregory E. Werner, Chief
Engineering Branch 2
Division of Reactor Safety

Docket: 50-368
License: NPF-6

Enclosure:
Inspection Report 05000368/2017009
w/Attachment: Supplemental Information

U.S. NUCLEAR REGULATORY COMMISSION

REGION IV

Docket: 05000368
License: NPF-6
Report: 05000368/2017009
Applicant: Entergy Operations Inc.
Facility: Arkansas Nuclear One, Unit 2
Location: Junction of Hwy. 64 West and Hwy. 333 South
Russellville, Arkansas
Dates: April 17 – 20, 2017
Inspectors: G. Pick, Senior Reactor Inspector
B. Correll, Reactor Inspector
Approved By: Gregory E. Werner, Chief
Engineering Branch 2
Division of Reactor Safety

Enclosure

SUMMARY

IR 05000368/2017009; 04/17/2017 – 04/20/2017; Arkansas Nuclear One, Unit 2, Post-Approval Site Inspection for License Renewal

The report covers an inspection conducted by regional inspectors in accordance with NRC Manual Chapters 2515 and NRC Inspection Procedure 71003.

The significance of inspection findings is indicated by their color (i.e., Green, Greater than Green, White, Yellow, or Red), determined using Inspection Manual Chapter 0609, "Significance Determination Process," dated April 29, 2015. Their cross-cutting aspects are determined using Inspection Manual Chapter 0310, "Aspects within the Cross-Cutting Areas," dated December 4, 2014. Violations of NRC requirements are dispositioned in accordance with the NRC Enforcement Policy. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," dated July 2016.

A. NRC-Identified Findings and Self-Revealing Findings

None

B. Licensee-Identified Violations

None

REPORT DETAILS

4. OTHER ACTIVITIES (OA)

4OA5 Other - Post-Approval Site Inspection for License Renewal (Phase 1) – IP 71003

The inspectors evaluated the material condition of the facility in the spring 2017 while the plant was shut down for Refueling Outage 2R25. The inspectors selected this period because it allowed an opportunity to evaluate inaccessible areas prior to entry into the period of extended operation. The period of extended operation is the additional 20 years beyond the original 40-year licensed term and begins after midnight on July 17, 2018. The specific areas walked down during the inspection are listed in Section 01.b.5.

In addition, the inspectors performed this inspection to evaluate whether the licensee: (1) completed the necessary actions to comply with the license condition and commitments that are a part of the renewed operating license; (2) implemented the aging management programs as described in the updated final safety analysis report; and (3) implemented programs that agreed with those approved in the safety-evaluation report and described in the updated final safety analysis report. Specific activities evaluated during this inspection are described in the following paragraphs.

.01 Review of Aging Management Programs

a. Inspection Scope

The inspectors evaluated whether the licensee implemented the aging management programs described in NUREG-1828, "Safety Evaluation Report (SER) Related to the License Renewal of Arkansas Nuclear One, Unit 2." The inspectors verified that the licensee implemented procedures, documented inspection results, initiated corrective action documents, and provided training to implementing personnel.

The inspectors reviewed supporting documents including implementing procedures, work orders, inspection reports, engineering evaluations, and condition reports; conducted interviews with licensee staff; and visually inspected structures, systems, and components including those not accessible during power operation to verify that the licensee completed the necessary actions to comply with the license conditions stipulated in the renewed facility operating license.

The inspectors listed specific documents reviewed in the attachment.

b. Findings and Observations

.1 B.1.2 Bolting and Torqueing Activities (17908)

The Bolting and Torqueing Activities aging management program is an existing plant-specific program that manages the loss of mechanical closure integrity for bolted connections and bolted closures in high temperature systems and in applications subject to significant vibration. The bolting and torqueing program applies to the pressure boundary components for in-scope license renewal systems and components.

The team reviewed the implementing procedures, program documents, license renewal documents, safety analysis report, and the safety evaluation report. The team interviewed maintenance supervisors and program owners to assess the program implementation. The team verified that the licensee identified the in-scope components that required bolting and torquing controls.

Based on review of the actions implemented related to the Bolting and Torquing Activities aging management program, the team concluded the licensee implemented actions to effectively manage the effects of aging leading up to the period of extended operation. The team concluded that the licensee met Commitment 17908 prior to the period of extended operation.

.2 B.1.3 Boric Acid Corrosion Prevention Program (17909)

The Boric Acid Corrosion Prevention Program aging management program managed the effects of aging caused by loss of material, loss of mechanical closure integrity, and corrosion of connector surfaces. This program applied to structures, systems, and components containing, or exposed to, borated water, including the external surfaces of piping, valves, tanks, and bolting made of carbon steel or other locations where boric acid may drip. This program relied on implementing the recommendations of Generic Letter 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR plants," dated March 17, 1988. This program is reviewed during outages as part of the NRC baseline inspection program.

The team determined that a baseline inspection review of this program concluded after the start of our onsite review. Consequently, the team credited the completion of that onsite inspection after talking to the inspector and the licensee. The team reviewed implementing procedures, program documents, license renewal documents, safety analysis report, and the safety evaluation report. The baseline inspection assessed reports that track and resolve locations of boric acid leaks and verified that the licensee had performed adequate assessment of boric acid leaks. The program is implemented by tracking and trending the location of leaks identified by visual inspection.

Based on review of the actions implemented related to the Boric Acid Corrosion Prevention Program aging management program, the team concluded the licensee implemented actions to effectively manage the effects of aging during the period of extended operation. The team concluded that the licensee met Commitment 17909 prior to the period of extended operation.

.3 B.1.8 Environmental Qualification of Electric Components Program (EQ Program) (17914)

The EQ Program aging management program manages component thermal, radiation, and cyclical aging of electrical equipment important to safety as required by 10 CFR 50.49. The EQ Program manages aging effects through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, environmentally qualified components without a qualified life extending into the renewed license term are to be refurbished, replaced, or have their qualification extended prior to reaching aging limits.

The team reviewed calculations, evaluations, license renewal documents, safety evaluation report, EQ Program implementing procedures, equipment database entries, and historical and scheduled work order documents. The team interviewed the program owner and visually inspected a sample of components located inside the containment building to verify no adverse equipment conditions exists.

Based on review of the procedures and records, discussions with licensee personnel, and walk-down inspections of selected components, the team concluded that the Equipment Qualification of Electric Components Program would manage the aging effects through the period of extended operation. The team concluded that the licensee met Commitment 17914 prior to the period of extended operation.

.4 B.1.30.3 Primary and Secondary Water Chemistry Control Program (17939)

The Primary and Secondary Water Chemistry Control Program aging management program managed the effects of aging caused by fouling, cracking, and loss of material. The program controlled primary water chemistry for the reactor coolant system including primary side of the steam generators and the emergency core cooling systems, spent fuel pool system, and the chemical and volume control system. The program controlled secondary water chemistry in the main feedwater system, emergency feedwater system, main steam system, condensate storage system, and steam generators.

The team reviewed the safety analysis report, program basis documents, calculations, trend analysis documents, implementing procedures, license renewal application, safety evaluation report, and license renewal documents. The team interviewed chemistry personnel, reviewed completed inspections and chemistry trend data, and reviewed corrective action documents. The team verified that the licensee followed the guidelines in EPRI Report TR-105714, "Pressurized Water Reactor Primary Water Chemistry Guidelines," Revision 6, and in EPRI Report TR-102134, "Pressurized Water Reactor Secondary Water Chemistry Guidelines," Revision 7.

The team verified that Procedure OP-1000.106, "Primary Chemistry Monitoring Program," Revision 10, established sampling parameters and frequencies based on EPRI guidelines and plant specific experience for primary chemistry. Similarly, Procedure 1000.043, "Steam Generator Water Chemistry Monitoring, Unit II," Revision 28 established secondary water chemistry monitoring for parameters and frequencies for secondary water chemistry. Procedure EN-DC-317, "Entergy Steam Generator Administrative Procedure," Revision 6, provided the guidance related to establishing a steam generator program consistent with the guidelines established in NEI 97-06, "Nuclear Energy Institute Steam Generator Program Guidelines." The procedures included detailed descriptions of primary and secondary water chemistry parameters to be monitored, sampling frequencies, and chemistry limits. The team confirmed that the licensee maintained their chemistry parameters well within the limits established to prevent degradation of the components.

Based on review of the actions implemented that related to the Primary and Secondary Water Chemistry Control Program aging management program, the team concluded the licensee implemented actions to effectively manage the effects of aging during the period of extended operation. The team concluded that the licensee met Commitment 17939 prior to the period of extended operation.

.5 Review of Structures, Systems, and Components

The inspectors performed the walk downs of inaccessible areas looking for signs of aging, such as corrosion on piping and supports, corrosion of cable trays, water intrusion, cracking, and spalling of concrete.

Specific areas walked down and components evaluated during this inspection included:

- Containment building steam generator D-rings
- Containment building general areas
- Containment building sumps
- Reactor coolant pump oil collection system
- Letdown heat exchanger room
- Make-up tank room
- Cooling tower basin and cooling tower fill elevation

During the walk downs, the inspectors identified aging effects that did not affect the function of the structures, systems, or components. These indications included surface corrosion on some supports and bolting, surface cracks with evidence of calcium oxide on concrete walls, and boric acid on walls from previous leaks.

40A6 Meetings, Including Exit

The inspectors presented the inspection results to Mr. R. Anderson, Site Vice President, and other members of the licensee staff during an exit meeting conducted on April 20, 2017. The licensee acknowledged the NRC inspection observations. The inspectors retained no proprietary information and verified that no proprietary information was documented in this report.

SUPPLEMENTAL INFORMATION

PERSONNEL CONTACTED

Licensee Personnel

R. Anderson, Site Vice President
J. Angel, Mechanical Maintenance Supervisor
D. Bauman, License Renewal Contractor
B. Davis, Director, Engineering
C. Davis, Site Material Handling & FME Coordinator
T. Evans, General Manager Plant Operations
D. Fromberger, Licensing Engineer
E. Gresh, License Renewal Project Manager
L. Howard, License Renewal Contractor
C. Johnson, Civil Engineer Design
M. McInerney, License Renewal Contractor
N. Mosher, Licensing Specialist
B. Patrick, Senior Maintenance Manager
S. Pyle, Regulatory Assurance Manager
J. Stanton, Mechanical Maintenance Supervisor
B. Steinman, EQ Program Owner

NRC Personnel

B. Tindell, Senior Resident Inspector
J. Drake, Senior Reactor Inspector

COMMITMENTS REVIEWED

The following commitments were closed during this inspection:

B.1.2 (17908), B.1.3 (17909), B.1.8 (17914), and B.1.30.3 (17939)

DOCUMENTS REVIEWED

General

Condition Reports (CR-ANO-2-)

2017-02043* 2017-02051* 2017-02052*

*Condition Reports generated during the inspection

License Renewal

<u>Number</u>	<u>Title</u>	<u>Revision/Date</u>
NUREG-1801, Volume 2	Generic Aging Lessons Learned (GALL) Report	September 2005
NUREG-1828	Safety Evaluation Report Related to the License Renewal of Arkansas Nuclear One, Unit 2	April 2001

License Renewal

<u>Number</u>	<u>Title</u>	<u>Revision/Date</u>
USAR Chapter 16	Aging Management Programs and Activities	24
2CAN100302	License Renewal Application	October 14, 2003
2CAN010401	License Renewal Application Clarifications	January 22, 2004

Aging Management Programs

Bolting and Torqueing Activities

Condition Reports (CR-ANO-2-)

2017-02093* 2017-02090

*Condition Reports generated during the inspection

License Renewal

<u>Numbers</u>	<u>Title</u>	<u>Revision/Date</u>
A2-EP-2002-002	AN0-2 License Renewal Project Evaluation of Aging Management Programs, Section 4.1 – Bolting and Torqueing Activities	2
CALC-ANO2-ME-15-00004	Review of the Bolting and Torqueing Activities Aging Management Program for License Renewal Implementation	0
2CAN040401	Request for Additional Information Responses for License Renewal Application TAC No. MB8402 Arkansas Nuclear One – Unit 2	April 6, 2004
2CAN060404	Request for Additional Information Responses for License Renewal Application TAC No. MB8402 Arkansas Nuclear One – Unit 2	June 21, 2004

Miscellaneous

<u>Number</u>	<u>Title</u>	<u>Date</u>
NUREG-1339	Resolution of Generic Safety Issue: Bolting Degradation or Failure in Nuclear Power Plants	September 1991

Procedure

<u>Number</u>	<u>Title</u>	<u>Revision</u>
EN-MA-145	Maintenance Standard for Torque Applications	8

Work Orders

00336053-01	50249280-01	52571938-01
52571993-01	52573394-01	52673739-01
52674949-01		

Boric Acid Control Program

Condition Report (CR-ANO-2-)

2017-02032*

*Condition Report generated during the inspection

License Renewal

<u>Number</u>	<u>Title</u>	<u>Revision/Date</u>
A2-EP-2002-002	ANO-2 License Renewal Project Evaluation of Aging Management Programs, Section 4.2 – Boric Acid Corrosion Prevention Program	2
CALC-ANO2-ME-15-00005	Review of the Boric Acid Corrosion Prevention Aging Management Program for License Renewal Implementation	1
2CAN040405	Request for Additional Information Responses for License Renewal Application TAC No. MB8402 Arkansas Nuclear One – Unit 2	July 22, 2004

Miscellaneous

<u>Number</u>	<u>Title</u>	<u>Revision</u>
SEP-BAC-ANO-001	Boric Acid Corrosion Control Program Inspection and Identification of Boric Acid Leaks for ANO-1 AND ANO-2	2

Procedure

<u>Number</u>	<u>Title</u>	<u>Revision</u>
EN-DC-119	Boric Acid Corrosion Control Program (BACCP)	11

Environmental Qualification

License Renewal

<u>Number</u>	<u>Title</u>	<u>Revision</u>
A2-EP-2002-002	ANO-2 License Renewal Project Evaluation of Aging Management Programs, Section 4.5 – Environmental Qualification (EQ) of Electric Components Program”	2
CALC-ANO2-EE-00001	Review of the Environmental Qualification (EQ) of Electric Components Program for License Renewal Implementation	0
SER Section 4.4	Environmental Qualification of Electrical Equipment	

Miscellaneous

<u>Title</u>	<u>Revision</u>
NES-11A, Environmental Qualification Report Assessment, V44-001 “Motorized Valve Actuator”	4
NES-11B, System Component Evaluation Worksheet, 2A082 “Motor Valve Operator with Limit Switch”	9
NES-11C, EQ Data Record Summary Sheet, 2A082 “Motor Valve Operator with Limit Switch”	4
NES-11C, EQ Data Record Summary Sheet, 2A006 “2PT-1041-2 Pressure Transmitter”	2
TD G050.0170 “Installation, Operation and Maintenance Manual for GEMS Magnetic Liquid Level Indicator”	0
TD G050.0140 “GEMS Continuous Liquid Level Indicating Components and Systems”	0
NES-11C, EQ Data Record Summary Sheet, 2A146 “2LE-5646A-2, 2LE-5646B-2 Level Sensor”	2
NES-11C, EQ Data Record Summary Sheet, 2A145 “2LE-5645A-2, 2LE-5645B-2 Level Sensor”	2
NES-11, Environmental Qualification (EQ) Design Documentation	10

Procedure

<u>Number</u>	<u>Title</u>	<u>Revision</u>
EN-DC-164	Environmental Qualification (EQ) Program	4

Preventive Maintenance

PMQR 50010009-01 PMQR 50013903-01 PMQR 50013903-02

Primary and Secondary Water Chemistry Control Program

License Renewal

<u>Numbers</u>	<u>Title</u>	<u>Revision</u>
A2-EP-2002-002	ANO-2 License Renewal Project Evaluation of Aging Management Programs, Section 4.18.1 “Primary and Secondary Water Chemistry Control Program”	2
CALC ANO2-ME-15-00028	Review of the Primary and Secondary Water Chemistry Control Program Aging Management Program for License Renewal Implementation	0

Miscellaneous

<u>Title</u>	<u>Revision</u>
Chemistry Primary Water Strategic Plan	9
Unit Two Secondary Chemistry Optimization Program	14

Procedures

<u>Number</u>	<u>Title</u>	<u>Revision</u>
1000.043	Steam Generator Water Chemistry Monitoring, Unit II	25
1000.106	Primary Chemistry Monitoring Program	12
1052.007	Secondary Chemistry Monitoring	41
1052.023	Conduct of Chemistry	20

R. Anderson

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