UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 EAST LAMAR BOULEVARD
ARLINGTON, TEXAS 76011-4511

April 11, 2020

Mr. John Dinelli, Site Vice President
Arkansas Nuclear One
Entergy Operations, Inc.
N-TSB-58
1448 S.R. 333
Russellville, AR 72802-0967

SUBJECT: ARKANSAS NUCLEAR ONE, UNIT 2 – NRC POST-APPROVAL LICENSE RENEWAL INSPECTION REPORT 05000368/2019016

Dear Mr. Dinelli:

On March 20, 2020, U.S. Nuclear Regulatory Commission (NRC) inspectors completed an in-office inspection for Arkansas Nuclear One, Unit 2. The enclosed report documents the inspection results, which were discussed with you and other members of your staff. The results of this inspection are documented in the enclosed report.

No findings or violations of more than minor significance were identified during this inspection.

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 Title 10 of the *Code of Federal Regulations* 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

Nicholas H. Taylor
Digitally signed by Nicholas H. Taylor
Date: 2020.04.13 10:11:13 -05'00'

Nicholas H. Taylor, Chief
Engineering Branch 2
Division of Reactor Safety

Docket No. 50-368
License No. NPF-6

Enclosure:
As stated

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ARKANSAS NUCLEAR ONE, UNIT 2 – NRC POST-APPROVAL LICENSE RENEWAL INSPECTION REPORT 05000368/2019016 – April 11, 2020

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U.S. NUCLEAR REGULATORY COMMISSION
Inspection Report

Docket Number:	05000368
License Number:	NPF-6
Report Number:	05000368/2019016
Enterprise Identifier	I-2019-016-0000
Licensee:	Entergy Operations, Inc.
Facility:	Arkansas Nuclear One, Unit 2
Location:	Russellville, AR
Inspection Dates:	December 1, 2019 through March 20, 2020
Inspectors:	I. Anchondo, Reactor Inspector G. Pick, Senior Reactor Inspector (Lead)
Approved By:	Nicholas H. Taylor, Chief Engineering Branch 2 Division of Reactor Safety

Enclosure

SUMMARY

IR 05000368/2019016; 12/01/2019 – 03/20/2020; Arkansas Nuclear One, Unit 2; In-Office Post-Approval Site Inspection for License Renewal

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting a license renewal commitment evaluation for Arkansas Nuclear One, Unit 2, in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to https://www.nrc.gov/reactors/operating/oversight.html for more information.

List of Findings and Violations

No findings or violations of more than minor significance were identified.

Additional Tracking Items

None.

4. OTHER ACTIVITIES (OA)

4OA5 Phase 3 Inspection Activities (IP 71003)

Phase 3 Inspection activities are performed after the licensee enters the period of extended operation. The period of extended operation is the additional 20 years beyond the original 40-year licensed term. Arkansas Nuclear One, Unit 2, began the period of extended operation on July 18, 2018.

The inspectors performed this inspection to evaluate whether the licensee completed outstanding actions required to comply with the license renewal license condition and commitments and effectively implemented outstanding actions related to aging management programs.

The inspectors closed Commitments 39, 41, and 42 during this inspection.

a. Inspection Scope

During this in-office inspection, the inspectors evaluated the licensee actions related to commitments not closed during the Phase 2 license renewal inspection (Inspection Report 05000368/2018010 (**ML18221A507**)).

The inspectors reviewed program documents, design calculations, inspection results, engineering reports, and corrective action documents. The inspectors interviewed licensee personnel, including the program owners, and design engineers during several teleconferences to discuss the technical resolution related to the commitments. In addition, headquarters personnel assisted in the technical review of these commitments.

b. Observations

1. Implement the Environmentally Assisted Fatigue Option (Section 4.3.3.1) (17940) – Commitment 39

This program managed aging effects related to environmentally assisted fatigue. Prior to entering the period of extended operation, the safety evaluation report required the licensee to address the effects of environmentally assisted fatigue for several fatigue-sensitive locations, which included:

- Reactor vessel shell and lower head
- Reactor vessel inlet and outlet nozzles
- Surge line
- Charging nozzle
- Safety injection nozzle
- Shutdown cooling system Class 1 piping

During the previous inspection, the inspectors determined that the licensee had elected to perform the inspection option as allowed by their safety analysis report, Section 4.3.3.1. The licensee identified two locations that would be inspected in accordance with American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME) , Section XI, Appendix L, “Operating Plant Fatigue Assessment,” and

submitted the fatigue assessment results to the NRC for review. The licensee had preliminarily calculated that the cumulative usage factor for the other monitored locations remained less than one (1.0) and did not require inspection. Since the calculations were not available for review at the time of this inspection, this commitment remained open.

During this inspection, the inspectors reviewed information related to assessing environmentally assisted fatigue for the affected components. The licensee had submitted the fatigue assessment inspection methodology and results by Letter 2CAN051801, "License Renewal Pressurizer Surge Line and Safety Injection Nozzle Inspection Arkansas Nuclear One, Unit 2," dated May 24, 2018 (**ML18144A970**). The licensee assessed that a postulated flaw would take more than 50 years to reach an unacceptable size; therefore, the planned 10-year inspection intervals provided appropriate condition monitoring. After review of the information in the letter, NRC issued a safety evaluation report on April 5, 2019 (**ML19074A028**), which concluded the licensee met their commitment and established an appropriate scope, method, and frequency of inspecting for environmentally assisted fatigue.

The inspectors reviewed the inspection results for the affected welds, which identified that the welds contained no flaws. The inspectors reviewed the detailed fatigue calculations referenced in Letter 2CAN051801. Overall, the inspectors determined that the licensee had performed the calculations using an appropriate methodology. The inspectors determined, after consulting with NRC headquarters, the licensee had not used factors in their calculation that reflected the changes to our current state of knowledge since they had originally performed their assessment. Following questioning, the licensee demonstrated that, even after adjusting the calculation based on our current state of knowledge, they provided adequate conservatism in their calculation. The licensee demonstrated that a postulated flaw would not result in failure in less than 30 years, but inspected the affected components every 10 years.

Other than the item described above, the inspectors identified no additional concerns with implementation of this commitment.

2. B.1.30 Chemistry Control Programs (17937, 17938, and 17939) – Commitment 41

These chemistry programs managed the effects of aging caused by fouling, cracking, and loss of material. The primary water chemistry program controlled 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 secondary water chemistry program controlled chemistry in the main feedwater system, emergency feedwater system, main steam system, condensate storage system, and steam generators.

Commitment 41 specified:

> "The chemistry procedure and engineering report will be revised to address loss of the passive layer if chemistry limits are out of specification for an extended period."

Although the inspectors had reviewed overall implementation of the primary and secondary water chemistry programs, the inspectors had not reviewed the details associated with the above commitment.

During this inspection, the inspectors reviewed the engineering report and the chemistry procedure and discussed the revisions with the program owner. The inspectors confirmed that the licensee established requirements to address loss of the passive layer whenever chemistry limits are found out of specification.

The inspectors identified no concerns with implementation of this commitment.

3. B.1.18 Periodic Surveillance and Preventive Maintenance Program (17925) – Commitment 42

This program managed aging effects related to change in material properties, cracking, heat exchanger fouling, loss of material, and loss of form. The license identified specific components included in this program because the other aging management programs did not monitor for the identified effects.

Commitment 42 specified:

> "The Periodic Surveillance and Preventive Maintenance Program will be revised to include an inspection of the alternate AC diesel generator starting air tank."

Although the inspectors had reviewed overall implementation of the periodic surveillance and preventive maintenance program, the inspectors had not reviewed the details associated with the above commitment.

During this inspection, the inspectors verified that the licensee established a periodic task to inspect that interior of the alternate AC diesel generator starting air tank. The inspectors confirmed that the licensee identified no adverse aging effects in the alternate AC diesel generator starting air tanks.

The inspectors identified no concerns with implementation of this commitment.

c. Conclusion

Based on review of the actions implemented, inspection results reviewed, and interviews with program owners, the inspectors determined that the licensee provided reasonable assurance and demonstrated that they had implemented actions to effectively manage the effects of aging for each respective program. The inspectors determined that the licensee met the commitments.

4OA6 Meetings, Including Exit

The inspector presented the inspection results on March 20, 2020, to Mr. J. Dinelli, Site Vice President, and other members of the licensee staff. The licensee acknowledged the NRC inspection observations. The inspector retained no proprietary information and verified that no proprietary information was documented in this report.

SUPPLEMENTAL INFORMATION

COMMITMENTS

The inspectors reviewed chemistry control programs, in part, related to Commitments 17937, 17938, and 17939, and reviewed the periodic surveillance and preventive maintenance program, in part, related to Commitment 17925. As a result of the reviews, the inspectors closed Appendix A to NUREG-1828, "Safety Evaluation Report Related to the License Renewal of Arkansas Nuclear One, Unit 2," items 41 and 42 in this inspection report.

In addition, the inspectors closed Commitment 17940 and related Appendix A to NUREG-1828, item 39.

Commitments previously closed include:

NRC closed Commitments 17908, 17909, 17914, and 17939 in Inspection Report 05000368/2017009, which included NUREG-1828, Appendix A items 6 and 28.

NRC closed the following commitments in Inspection Report 05000368/2018010:

17905, 17910, 17911, 17912, 17913, 17915, 17916, 17917, 17918, 17919, 17920, 17921, 17922, 17923, 17924, 17925, 17926, 17927, 17928, 17929, 17930, 17931, 17932, 17933, 17934, 17935, 17936, 17937, 17938, 18175, 18207, and 20017.

During review of these commitments the inspectors confirmed that the licensee had met the conditions prescribed in NUREG-1828, Appendix A, Items 1, 2, 3, 4, 5, 7, 8, 9,10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, and 40.

DOCUMENTS REVIEWED

1. Implement the Environmentally Assisted Fatigue Option (Section 4.3.3.1) (17940) – Commitment 39

Condition Reports (CR-ANO-2-)

2020-00106*

*This condition report was issued as a result of this inspection.

Calculations

Number	Title	Revision/Date
CALC-17-E-0300-06	Arkansas Nuclear One – Unit 2 Pressurizer Surge Line 60-YR Fatigue Assessment	0
CALC-17-E-0300-08	Arkansas Nuclear One – Unit 2 Safety Injection Nozzle 60-YR Fatigue Assessment	0

Examinations

Number	Report Number	Date
2R23 16-011	2-ISI-UT-14-016, Component 16-011	05/21/2014
2R23 16-012	2-ISI-UT-14-015, Component 16-012	05/21/2014
2R23 21-001	2-ISI-VE-14-017, Component 21-001	05/30/2014
2R23 22-001	2-ISI-VE-14-015, Component 22-001	05/31/2014
2R23 23-001	2-ISI-VE-14-018, Component 23-001	05/30/2014
2R23 24-001	2-ISI-VE-14-016, Component 24-001	05/31/2014

Miscellaneous Documents

Number	Title	Revision/Date
	Basis for ASME Section XI Code Case for Flaw Tolerance Evaluation of CASS Piping	
	Arkansas Nuclear One, Unit 2 – Review of License Renewal Commitment Submittal Regarding Environmentally-Assisted Fatigue (EPID L-2018-LRO-0026)	04/05/2019
Case N-809	Reference Fatigue Crack Growth Rate Curves for Austenitic Stainless Steels in Pressurized Water Reactor Environments, Section XI, Division 1	06/23/2015
Case N-838	Flaw Tolerance Evaluation of Cast Austenitic Stainless Steel Piping, Section XI, Division 1	08/03/2015
Letter 2CAN051801	License Renewal Pressurizer Surge Line and Safety Injection Nozzle Inspection	05/24/2018
NUREG/CR-6260	Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components	02/1995
PVP2015-45191	Further Validation of the Technical Basis of Code Case N-838 for Flaw Tolerance Evaluation of CASS Piping	
PVP2017-66100	Technical Basis for Flaw Acceptance Criteria for Cast Austenitic Stainless Steel Piping	

2. B.1.30 Chemistry Control Programs (17937, 17938, and 17939) – Commitment 41

Condition Reports (CR-ANO-2-)

2017-04159 2018-00914 2018-03639 2019-02859

Miscellaneous Documents

Number	Title	Revision/Date
A2-EP-2002-002 2	ANO-2 License Renewal Project Evaluation of Aging Management Programs, Section 4.18.1 “Primary and Secondary Water Chemistry Control Program”	2
Letter 2CAN120403	License Renewal Application Draft Safety Evaluation Report Comments	12/09/2004
Procedure EN-CY-100	Conduct of Chemistry	8

3. B.1.18 Periodic Surveillance and Preventive Maintenance Program (17925) – Commitment 42

Miscellaneous Documents

Number	Title	Date
Letter 2CAN120403	License Renewal Application Draft Safety Evaluation Report Comments	12/09/2004

Work Orders

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