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2CAN122101

10 CFR 50.73

December 1, 2021

ATTN: Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Entergy - Licensee Event Report 50-368/2021-002-00, Material Defect in Primary Coolant System that Cannot be Found Acceptable Under American Society of Mechanical Engineers Section XI

Arkansas Nuclear One – Unit 2
NRC Docket No. 50-368
Renewed Facility Operating License No. NPF-6

Entergy Operations, Inc. (Entergy) submits the enclosed Licensee Event Report (LER) 50-368/2021-002-00 for Arkansas Nuclear One, Unit 2. This event is reportable in accordance with 10 CFR 50.73(a)(2)(ii)(A) as any event or condition that resulted in the condition of the nuclear power plant, including its principal safety barriers, being seriously degraded. The LER describes a Reactor Pressure Vessel Closure Head Penetration Nozzle in-service test indication resulting in a material defect in the primary coolant system that could not be found acceptable under ASME Section XI.

This letter contains no new regulatory commitments.

Should you have any questions concerning this issue, please contact Riley D. Keele Jr., Manager, Regulatory Assurance, at 479-858-7826.

Respectfully,

ORIGINAL SIGNED BY RILEY D. KEELE, JR.

Riley D. Keele, Jr.
RDK/mkh

Enclosure: Licensee Event Report 50-368/2021-002-00

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cc: NRC Region IV Regional Administrator
NRC Senior Resident Inspector – Arkansas Nuclear One
NRC Project Manager – Arkansas Nuclear One

Enclosure to

2CAN122101

Licensee Event Report 50-368/2021-002-00

(08-2020)



LICENSEE EVENT REPORT (LER)

(See Page 3 for required number of digits/characters for each block)

(See NUREG-1022, R.3 for instruction and guidance for completing this form <http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1022/r3/>)

Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Library, and Information Collections Branch (T-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollections.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk ail: oir_submission@omb.eop.gov. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

1. Facility Name Arkansas Nuclear One, Unit 2		2. Docket Number 05000 0368	3. Page 1 OF 3
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4. Title
Material Defect in Primary Coolant System that Cannot be Found Acceptable Under American Society of Mechanical Engineers Section XI

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Revision No.	Month	Day	Year	Facility Name	Docket Number
10	04	2021	2021	002	00	12	01	2021	N/A	05000 N/A
									Facility Name	Docket Number
									N/A	05000 N/A

9. Operating Mode 6	10. Power Level 0
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11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)

<input type="checkbox"/> 10 CFR Part 20	<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 10 CFR Part 73
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.69(g)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 10 CFR Part 21	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(1)(i)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 21.2(c)	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(i)
<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 10 CFR Part 50	<input checked="" type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 73.77(a)(2)(ii)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)	
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)	

OTHER (Specify here, in abstract, or NRC 366A).

12. Licensee Contact for this LER	
Licensee Contact Riley D. Keele / Manager, Regulatory Assurance	Phone Number (Include area code) (479) 858-7826

13. Complete One Line for each Component Failure Described in this Report									
Cause	System	Component	Manufacturer	Reportable to IRIS	Cause	System	Component	Manufacturer	Reportable to IRIS
B	AB	RPV	C490	Y					

14. Supplemental Report Expected		15. Expected Submission Date		
<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date)	Month	Day	Year

16. Abstract (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)

On October 3, 2021, Arkansas Nuclear One, Unit 2 was shut down in Mode 6 for a scheduled refueling outage. The reactor vessel closure head (RVCH) was being examined in accordance with the Inservice Inspection Program. Ultrasonic (UT) examination identified an indication that was not acceptable under American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel code requirements. The RVCH Control Element Drive Mechanism (CEDM) Nozzle 46 was found to contain a surface-connected flaw. On October 4, 2021, it was determined that the indication did not meet the acceptable limits as defined in ASME Code Case N-729-6.

A half-nozzle repair was completed on November 20, 2021 to correct the identified condition on CEDM Nozzle 46. This event is reportable in accordance with 10 CFR 50.73(a)(2)(ii)(A) as any event or condition that resulted in the condition of the nuclear power plant, including its principal safety barriers, being seriously degraded.



**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

(See NUREG-1022, R.3 for instruction and guidance for completing this form
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Estimated burden per response to comply with this mandatory collection request: 80 hours. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the FOIA, Library, and Information Collections Branch (T-6 A10M), U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to Infocollects.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; e-mail: oir_submission@omb.eop.gov. The NRC may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the document requesting or requiring the collection displays a currently valid OMB control number.

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Arkansas Nuclear One, Unit 2	05000- 0368	2021	002	00

NARRATIVE

PLANT STATUS

Arkansas Nuclear One, Unit 2 (ANO-2) was shut down for a refueling outage and in Mode 6. There were no other structures, systems, or components that were inoperable at the time that contributed to the event.

EVENT DESCRIPTION

On October 3, 2021, ANO-2 reactor vessel closure head (RVCH) [RPV] was being examined in accordance with the Inservice Inspection Program. The performance of an ultrasonic (UT) examination identified an indication that was not acceptable under American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel code requirements. The RVCH Control Element Drive Mechanism (CEDM) Nozzle 46 was found to contain a surface-connected flaw. On October 4, 2021, it was determined that the indication did not meet the acceptable limits as defined in ASME Code Case N-729-6.

Nozzle 46 had an indication identified that breached the threshold of measured growth which would classify it as potential Primary Water Stress Corrosion Cracking (PWSCC). Supplemental examinations were performed on the indication which identified PWSCC as the flaw mechanism.

The UT and bare metal visual (BMV) examinations of Nozzle 46 did not identify any evidence of a leak path through the RVCH above the CEDM J-groove weld or boron deposits on the RVCH outer diameter surface. This demonstrated that the indication had not progressed to the J-groove weld triple point which would have resulted in Reactor Coolant System (RCS) [AB] leakage onto the RVCH.

This condition was reported to the NRC in accordance with 10 CFR 50.72(b)(3)(ii)(A) for degradation of a principal safety barrier. (EN-55506)

This event is being reported under 10 CFR 50.73(a)(2)(ii)(A) which requires submittal of a Licensee Event Report within 60 days after the discovery for any event or condition that resulted in the condition of the nuclear power plant, including its principal safety barriers, being seriously degraded.

SAFETY ASSESSMENT

There were no consequences to the safety of the general public, nuclear safety, industrial safety, or radiological safety. The safety significance of the flaw's presence during operation was low. The flaw did not go through the wall of the nozzle so there was no leakage of RCS water onto the RVCH. The size of the flaw was small, so substantial margin existed until reaching a critical (e.g., unstable) crack size. The ANO-2 RVCH Inspection Program is in accordance with the requirements of ASME Code Case 729-6, as modified by the additional limitations set forth in 10 CFR 50.55a(g)(6)(ii)(D). This provides assurance against any credible PWSCC degradation event that would challenge nuclear safety.



**LICENSEE EVENT REPORT (LER)
CONTINUATION SHEET**

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Arkansas Nuclear One, Unit 2	05000-0368	2021	002	00

NARRATIVE

Materials Reliability Program RVCH Penetration Safety Assessment for U.S. Pressurized Water Reactor Plants (MRP 110) was performed by the industry, and it was demonstrated that there is significant margin against nozzle ejection due to circumferential cracking because of the time required for a circumferential crack to grow to the critical size, which is typically at least 330 degrees. Likewise, the safety assessment also demonstrated that periodic BMV examination of the top surface of the RVCH performed at appropriate intervals (each refueling outage for ANO-2) provides assurance against significant wastage of the low-alloy steel head material, even given the assumption of a leaking nozzle.

EVENT CAUSE(S)

The ANO-2 RVCH penetrations are constructed of Inconel Alloy 600 material which is susceptible to PWSCC, resulting in a flaw in RVCH Nozzle 46.

CORRECTIVE ACTIONS

Half-nozzle repair was performed to correct the identified condition on CEDM Nozzle 46. The half-nozzle repair involved machining away the lower section of the nozzle which contained the flaws, then welding the remaining portion of the nozzle to the RVCH to form the new pressure boundary. The new weld also attached a replacement lower nozzle that provided a means for re-attaching the guide cone.

Examinations documented in ANO2-RR-21-002 Request for Additional Information response (ML21312A017) required by ASME Code Case N-729-6 have been performed satisfactorily on Nozzle 46.

PREVIOUS SIMILAR EVENTS

None.