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2CAN022102

February 8, 2021

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

Subject: Licensee Event Report 50-368/2020-001-00, Loss of Feedwater Control System Power for Train 'A' Feedwater that Resulted in Plant Trip

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

Pursuant to the reporting requirements of 10 CFR 50.73, attached is the subject Licensee Event Report concerning the Loss of Feedwater Control System Power for Train “A” Feedwater that Resulted in Plant Trip for Arkansas Nuclear One, Unit 2 which occurred on December 10, 2020.

There are no new commitments contained in this submittal. Should you have any questions concerning this issue, please contact Riley D. Keele Jr., Manager, Regulatory Assurance, at 479-858-7826.

Respectfully,

John Dinelli Digitally signed by John Dinelli
Date: 2021.02.08 10:04:08 -06'00'

John C. Dinelli
JCD/mar

Attachment: Licensee Event Report 50-368/2020-001-00

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

Attachment 1 to
2CAN022102

Licensee Event Report 50-368/2020-001-00

NRC FORM 366 (08-2020) U.S. NUCLEAR REGULATORY COMMISSION

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/)

APPROVED BY OMB: NO. 3150-0104 EXPIRES: 08/31/2023

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 ail: oira_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. Page
Arkansas Nuclear One Unit 2	05000 368	1 OF 4

4. Title
Loss of Feedwater Control System Power for Train 'A' Feedwater that Resulted in Plant Trip

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
12	10	2020	2020	- 001 -	00	02	08	2021	N/A	05000 N/A
									Facility Name	Docket Number
									N/A	05000 N/A

9. Operating Mode	10. Power Level
1	100

11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: *(Check all that apply)*

10 CFR Part 20	☐ 20.2203(a)(2)(vi)	☐ 50.36(c)(2)	☑ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(A)	**10 CFR Part 73**
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.69(g)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(4)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(i)	**10 CFR Part 21**	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	☐ 73.77(a)(1)(i)
☐ 20.2203(a)(2)(ii)	☐ 21.2(c)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)	☐ 73.77(a)(2)(i)
☐ 20.2203(a)(2)(iii)	**10 CFR Part 50**	☐ 50.73(a)(2)(ii)(A)	☐ 50.73(a)(2)(viii)(A)	☐ 73.77(a)(2)(ii)
☐ 20.2203(a)(2)(iv)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)	
☐ 20.2203(a)(2)(v)	☐ 50.36(c)(1)(ii)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)	

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

12. Licensee Contact for this LER

Licensee Contact	Phone Number (Include area code)
Riley D. Keele / Manager, Regulatory Assurance	(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	JB	UJX	TDW120	Yes						

14. Supplemental Report Expected		15. Expected Submission Date	Month	Day	Year
☑ No	☐ Yes (If yes, complete 15. Expected Submission Date)				

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

On December 10, 2020, at 1608 CST, while in MODE 1 at 100 percent power, Arkansas Nuclear One, Unit 2 (ANO-2) experienced an automatic reactor scram due to low steam generator water level in the 'A' Steam Generator (SG). The low SG water level was caused by loss of power to the 'A' Feedwater Control System (FWCS) due to power supply failures in the 'A' FWCS cabinet. This resulted in main feedwater flow demand to the 'A' Main Feedwater Pump (MFP) and associated feedwater regulating valves to fail to minimum. Emergency Feedwater (EFW) actuated automatically due to low water level in the 'A' SG. The failure of the 'A' FWCS power supplies affected post-trip response of the 'B' FWCS, which resulted in water level in the 'B' SG rising to a level requiring manual trip of the 'B' MFP. EFW responded as designed to feed both steam generators automatically. The plant was stabilized in MODE 3.

The other safety systems responded as designed. Electrical power was supplied from offsite power and maintained unit electrical loads as designed. The 'B' MFP remained available using approved plant procedures.

There were no consequences to the general safety of the public, nuclear safety, industrial safety, or radiological safety. No radiological releases have occurred due to this event.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

(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/)

1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Arkansas Nuclear One Unit 2	05000-368	2020	- 001	- 00

NARRATIVE

1. Event Description:

On December 10, 2020, at 1608 CST, while in MODE 1 at 100 percent power, Arkansas Nuclear One, Unit 2 (ANO-2) experienced an automatic reactor scram [JC] due to low steam generator water level in the 'A' Steam Generator (SG). The low SG water level was caused by loss of power to the 'A' Feedwater Control System (FWCS) due to power supply failures in the 'A' FWCS cabinet. This resulted in main feedwater flow demand to the 'A' Main Feedwater Pump (MFP) and associated feedwater regulating valves to fail to minimum. Emergency Feedwater (EFW) [BA] actuated automatically due to low water level in the 'A' SG. The failure of the 'A' FWCS power supplies affected post-trip response of the 'B' FWCS, which resulted in water level in the 'B' SG rising to a level requiring manual trip of the 'B' MFP. EFW responded as designed to feed both steam generators automatically. The plant was stabilized in MODE 3.

The other safety systems responded as designed. Electrical power was supplied from offsite power and maintained unit electrical loads as designed. The 'B' MFP remained available using approved plant procedures. The plant was stable in Mode 3 (Hot Standby) maintaining pressure and temperature by the EFW and secondary system steaming [KE] via the condenser [SG].

There were no other structures, systems, or components (SSCs) that were inoperable at the time contributing to the event.

The ANO-2 'A' FWCS cabinet experienced a complete power failure. This cabinet is powered from cabinet power supply [EE] 2C27A-PS1. It is designed to be redundant and contains 'A' and 'B' submodules that share the output loads. On a loss of one of the submodules, the other submodule is designed to continue to carry downstream loads.

The outputs of both cabinet power supply modules were de-energized, which resulted in a complete loss of demand signals to the 'A' train of feedwater control. This included the loss of both manual and automatic control for the 'A' MFP [SJ], the 'A' regulating valve, and the 'A' bypass regulating valve. In addition, the loss of 'A' panel power prevented other portions of the system from recognizing that the 'A' train was no longer functioning properly and interfered with the ability of the FWCS to detect the subsequent reactor trip and respond accordingly. Loss of power to the 'A' FWCS caused the 'B' FWCS not to respond to the reactor trip. As a result, it continued to feed as if the plant was still online, and control room operators were required to trip the 'B' MFP in order to prevent it from overfeeding the 'B' SG. The EFW system responded properly in automatic to control both SG levels at setpoint. The EFW system was secured at 1715 on December 10, 2020, after the Auxiliary Feedwater Pump was placed into service. The 'B' Condensate Recirculation Valve also did not open in response to the reactor trip (due to the trip signal being blocked by the de-energized 'A' FWCS cabinet), but operators opened it in manual to control condensate [SD] header pressure within limits.

This event was reported under 10 CFR 50.72(b)(2)(iv)(B), as any event or condition that results in actuation of the Reactor Protection System when the reactor is critical. It was also reported under 10 CFR 50.72(b)(3)(iv)(A) as a valid Emergency Feedwater System actuation. (EN 55028)

This report is made pursuant to 10 CFR 50.73(a)(2)(iv)(A), any event or condition that resulted in manual or automatic actuation of the Reactor Protection System and any event or condition that resulted in manual or automatic actuation of the Emergency Feedwater System.

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- 368	2020	- 001	- 00

NARRATIVE

2. Safety Assessment:

The reactor scram due to low steam generator water level in the 'A' Steam Generator did not result in actual consequences to safety of the general public, nuclear safety, industrial safety or radiological safety. EFW responded as designed in automatic to control SG levels at setpoint. The Auxiliary Feedwater Pump (non-safety) was placed into service and EFW returned to automatic standby approximately one hour following the plant trip. The safety significance of this event is determined to be low.

3. Event Cause(s):

The event was caused by a loss of power to the ANO-2 'A' FWCS. This was due to loss of 2C27A panel power which is supplied by cabinet power supply 2C27A-PS1. This power supply is designed to be redundant and contains 'A' and 'B' submodules that share the output loads. On a loss of one of the submodules the other submodule is designed to continue to carry downstream loads. During this event, an unknown initiator resulted in the loss of one of these submodules, and subsequently, the other submodule failed to carry the load after the initial failure. With both submodules failing to carry the load, there was a complete loss of power to the 2C27A panel, and a complete loss of demand signals for the 'A' channel of FWCS.

The most likely cause of a loss of both power supplies would be a momentary failure of a subcomponent of the filtering circuit. The filtering circuit is common to both submodules and was an unrecognized tie between the two redundant submodules. This tie created an unnecessary Single Point Vulnerability (SPV).

4. Corrective Actions:

The following actions have been completed:

• The 'B' submodule was replaced with an identical spare, the 'A' submodule was tested, and some internal components were replaced. Both submodules were verified to be working properly and have good outputs.

• The common 2C27A-PS1 filter capacitor outputs were functionally tested to confirm no observable defects in filtering capacity that would indicate a capacitor failure.

• Transfer tests were conducted to demonstrate that both power supplies could pick up system load when the other was cycled off. All equipment has been verified to be operating properly, and no deficiencies have been detected.

Following completion of an Apparent Cause Analysis (ACA), additional actions were determined to be appropriate and are included in the ANO Corrective Action Program. These include:

• Performing a modification to remove common components from the FWCS cabinet power supplies to eliminate SPVs.

• Removing and testing the filter network from 2C27A-PS1 to identify any degraded/faulty components.

LICENSEE EVENT REPORT (LER) CONTINUATION SHEET

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		YEAR	SEQUENTIAL NUMBER	REV NO.
Arkansas Nuclear One Unit 2	05000- 368	2020	- 001	- 00

NARRATIVE

5. Previous Similar Events:

None