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RA-22-0139

April 21, 2022

10 CFR 50.73

Attn: Document Control Desk  
U. S. Nuclear Regulatory Commission  
11555 Rockville Pike  
Rockville, MD 20852-2746

Duke Energy Carolinas, LLC  
Oconee Nuclear Station Unit 2  
Docket Number: 50-270  
Renewed Operating Licenses: DPR-49

**Subject:** Licensee Event Report 270/2022-003, Revision 00 – Manual Reactor Trip due to Main Feedwater Control Valve Positioner Malfunction

Licensee Event Report 270/2022-003, Revision 00, is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

There are no regulatory commitments associated with this LER.

There are no unresolved corrective actions necessary to restore compliance with NRC requirements.

If there are questions, or further information is needed, contact Laura Boyce, Regulatory Affairs, at (864) 873-6774.

Sincerely,

A handwritten signature in black ink, appearing to read "Steven M. Snider", written over a horizontal line.

Steven M. Snider  
Vice President  
Oconee Nuclear Station

Enclosure: Licensee Event Report 270/2022-003 Rev.00

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April 21, 2022  
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cc (w/Enclosure):

Ms. Laura Dudes, Administrator, Region II  
U.S. Nuclear Regulatory Commission  
Marquis One Tower  
245 Peachtree Center Ave., NE, Suite 1200  
Atlanta, GA 30303-1257

Mr. Shawn Williams, Project Manager  
U.S. Nuclear Regulatory Commission  
11555 Rockville Pike  
Mail Stop O-08B1A  
Rockville, MD 20852-2738

Mr. Jared Nadel  
NRC Senior Resident Inspector  
Oconee Nuclear Station



## LICENSEE EVENT REPORT (LER)

(See Page 2 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 Information Services Branch (T-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollects.Resource@nrc.gov](mailto:Infocollects.Resource@nrc.gov), and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk air: [oir\\_submission@omb.eop.gov](mailto: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

Oconee Nuclear Station Unit 2

## 2. Docket Number

0500000270

## 3. Page

1 OF 4

## 4. Title

Manual Reactor Trip due to Main Feedwater Control Valve Positioner Malfunction

## 5. Event Date

Month	Day	Year
02	21	2022

## 6. LER Number

Year	Sequential Number	Rev No.
2022	003	00

## 7. Report Date

Month	Day	Year
4	21	2022

## 8. Other Facilities Involved

Facility Name	Docket Number
NA	05000
Facility Name	Docket Number
NA	05000

## 9. Operating Mode

1

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

<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(ii)(B)	<input type="checkbox"/> 50.73(a)(2)(viii)(B)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.73(a)(2)(iii)	<input type="checkbox"/> 50.73(a)(2)(ix)(A)
<input type="checkbox"/> 20.2203(a)(2)(i)	<input type="checkbox"/> 50.36(c)(1)(i)(A)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 50.36(c)(1)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<input type="checkbox"/> 73.71(a)(4)
<input type="checkbox"/> 20.2203(a)(2)(iii)	<input type="checkbox"/> 50.36(c)(2)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.71(a)(5)
<input type="checkbox"/> 20.2203(a)(2)(iv)	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(1)
<input type="checkbox"/> 20.2203(a)(2)(v)	<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(ii)
<input type="checkbox"/> 20.2203(a)(2)(vi)	<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(vii)	<input type="checkbox"/> 73.77(a)(2)(iii)
	<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> Other (Specify in Abstract below or in NRC Form 366A)	

## 10. Power Level

68

## 12. Licensee Contact for this LER

Licensee Contact

Laura Boyce, Senior Nuclear Engineer, Oconee Regulatory Affairs

Telephone Number (Include Area Code)

(864) 873-6774

## 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
D	SJ	75	B455	Y	N/A				

## 14. Supplemental Report Expected

☐ Yes (If yes, complete 15. Expected Submission Date) ☒ No

## 15. Expected Submission Date

Month	Day	Year

Abstract (Limit to 1400 spaces, i.e., approximately 14 single-spaced typewritten lines)

On February 21, 2022, Oconee Nuclear Station (ONS) Unit 2 was in Mode 1 increasing reactor power following startup from a forced outage. At 22:05 Eastern Standard Time (EST) with Unit 2 at 68 percent power, a Main Feedwater (FDW) control valve positioner malfunctioned, resulting in inadequate FDW flow to the 2A Steam Generator (SG). As a result, the Integrated Control System (ICS) initiated an automatic runback. At 22:07 EST, with ICS runback on Unit 2 continuing and reactor power at 39 percent and decreasing, operators initiated a manual reactor trip due to lowering water level in the 2A SG. Immediately following the manual reactor trip, the 2A and 2B motor driven Emergency Feedwater (MDEFW) pumps automatically started as designed when the "low steam generator level" signal was received for the 2A SG. The reactor trip was not complex, with all systems responding normally post-trip. Operators responded and stabilized the plant. Decay heat was removed by discharging steam to the main condenser using the turbine bypass valves. Units 1 and 3 were not affected. Unit 2 was restarted on February 27, 2022 following repairs.

This event was reported to the NRC on February 22, 2022, in Event Notification (EN) number 55750, as a 4-hour notification under 10 CFR 50.72(b)(2)(iv)(B) – Reactor Protective System (RPS) Actuation – Critical (Manual Reactor Trip). An update to the EN was provided to also report an 8-hour non-emergency notification of a valid actuation of the Emergency Feedwater (EFW) system in accordance with 10 CFR 50.72(b)(3)(iv)(A). The event is also reportable under 10 CFR 50.73(a)(2)(iv)(A) as an RPS actuation and as an EFW system actuation.



## 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/>)

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 Information Services Branch (T-6 A10M), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by e-mail to [Infocollects.Resource@nrc.gov](mailto: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](mailto: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. LER NUMBER		
Oconee Nuclear Station Unit 2	0500000270	YEAR	SEQUENTIAL NUMBER	REV NO.
		2022	003	00

### NARRATIVE

Energy Industry Identification System (EIIIS) codes are identified in the text as [XX].

### BACKGROUND

The Main Feedwater (FDW) system [SJ] receives water from the Condensate System [SD], increases the water's pressure using the turbine driven feedwater pumps [P], increases the water's temperature using the high-pressure feedwater heaters, and controls the FDW flow supplied to the steam generators (SG) using the FDW main and startup control valves. The FDW pumps and control valves are controlled by the Integrated Control System (ICS) [JA]. The FDW startup control valves (2FDW-35 for the 2A SG and 2FDW-44 for the 2B SG) control the FDW flow to the associated SG up to approximately 15 percent reactor power. When the FDW startup control valves are near full demand, ICS will begin opening the FDW main control valves (2FDW-32 for the 2A SG and 2FDW-41 for the 2B SG) to control FDW flow to the associated SG above approximately 15 percent reactor power.

The Emergency Feedwater (EFW) system [BA] automatically supplies feedwater to the SG to remove decay heat from the Reactor Coolant System (RCS) [AB] upon the loss of FDW. The EFW system consists of two motor driven EFW (MDEFW) pumps [P] and one turbine driven EFW (TDEFW) pump [P], any one of which can provide the required heat removal capability. The three EFW pumps are started automatically upon a loss of both FDW pumps or a signal from the Anticipated Transient Without Scram (ATWS) Mitigation System Actuation Circuitry (AMSAC). The two MDEFW pumps are also started automatically upon a "low steam generator level" signal [JB].

### EVENT DESCRIPTION

On February 21, 2022, Unit 2 was in Mode 1 increasing reactor power following startup from a forced outage. At 22:05 EST with Unit 2 at 68 percent power, the valve positioner for 2FDW-32 malfunctioned, resulting in inadequate FDW flow to the 2A SG. As a result, ICS entered feedwater tracking mode and initiated an automatic runback. At 22:07 EST, with ICS runback on Unit 2 continuing and reactor power at 39 percent and decreasing, operators initiated a manual reactor trip due to lowering water level in the 2A SG. Immediately following the manual reactor trip, the 2A and 2B MDEFW pumps automatically started as designed when the "low steam generator level" signal was received for the 2A SG. The trip was not complex, with all systems responding normally post-trip. Operators responded and stabilized the plant. Decay heat was removed by discharging steam to the main condenser [SG] using the turbine bypass valves [JI]. The FDW system supplied adequate feedwater flow to both SG by through the FDW startup control valves 2FDW-35 and 2FDW-44 (as designed) and operators secured the MDEFW pumps in accordance with normal post-trip procedure actions.

Subsequent investigation determined the malfunction of 2FDW-32 was caused by foreign material contamination of the shuttle valve internal to the valve positioner [75]. The source of the foreign material contamination was from the original manufacture of the valve positioner shuttle valve. The valve positioner on 2FDW-32 was last replaced in a refueling outage in fall of 2021 as part of planned preventative maintenance.

Units 1 and 3 were not affected by this event. Unit 2 was restarted on February 27, 2022 following completion of repairs.

### Reportability

This event was reported to the NRC on February 22, 2022, in Event Notification (EN) number 55750, as a 4-hour notification under 10 CFR 50.72(b)(2)(iv)(B) – RPS Actuation – Critical (Manual Reactor Trip). An update to the EN was provided to also report an 8-hour non-emergency notification of a valid actuation of the EFW system in accordance with 10 CFR 50.72(b)(3)(iv)(A) – Specified System Actuation (EFW). The event is also reportable under 10 CFR 50.73(a)(2)(iv)(A) as an actuation of the RPS and as a valid EFW system actuation under 10 CFR 50.73(a)(2)(iv)(A).

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

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Oconee Nuclear Station Unit 2		0500000270		YEAR	SEQUENTIAL NUMBER	REV NO.
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**NARRATIVE CONTINUED****CAUSAL FACTORS**

The cause of feedwater control valve 2FDW-32 to fail to control FDW flow was foreign material contamination of the valve positioner shuttle valve from original manufacture.

**CORRECTIVE ACTIONS**

## Immediate:

1. Replaced 2FDW-32 valve positioner
2. Replaced valve positioner shuttle valves on 2FDW-35, 2FDW-41, and 2FDW-44

## Planned:

1. Work with valve positioner manufacturer to identify and correct manufacturing source of foreign material contamination
2. Revise procedures to include additional cleanliness and pre-installation tests of valve positioner shuttle valves
3. Replace valve positioners on Unit 3 FDW main and startup control valves (3FDW-32, 3FDW-35, 3FDW-41, and 3FDW-44) during Spring 2022 refueling outage
4. Replace valve positioners on Unit 1 FDW main and startup control valves (1FDW-32, 1FDW-35, 1FDW-41, and 1FDW-44) during Fall 2022 refueling outage

**SAFETY ANALYSIS**

The ONS Unit 2 manual trip on February 21, 2022, was uncomplicated and had no impact on public health and safety.

Following the malfunction of valve positioner for 2FDW-32 and the manual reactor trip, the 2A and 2B MDEFW pumps automatically started as designed to restore SG levels. Operators followed procedures to execute an orderly plant shutdown. FDW flow was aligned to the SG through the FDW startup control valves to remove decay heat by discharging steam to the main condenser.

Additional defense-in-depth to ensure safe shutdown was available from the Unit 2 EFW System, EFW via cross connects from Units 1 or 3, Protected Service Water (PSW) System, the Standby Shutdown Facility (SSF), and portable FLEX equipment. No Emergency Core Cooling System (ECCS) or other automatic safety system actuations occurred in response to this event.

A post-trip review found no procedural or human performance issues with the operator response to the event. There were no maintenance or other safety significant activities being conducted on any important plant systems or equipment at the time of the trip. Therefore, it is concluded that the impact on core damage risk was very low, and the event had no impact on public health and safety.



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CONTINUATION SHEET**

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Oconee Nuclear Station Unit 2	0500000270	YEAR  2022	SEQUENTIAL NUMBER  003	REV NO.  00

**NARRATIVE CONTINUED**

**ADDITIONAL INFORMATION**

A review of Duke Energy's Corrective Action Program did not identify any Oconee LERs or events in the last 3 years that involved the same underlying concerns or reasons as this event.

This event is considered INPO IRIS Reportable. There were no releases of radioactive materials, radiation exposures or personnel injuries associated with this event.