



Edward R. Pigott  
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Serial No: RA-23-0123  
May 31, 2023

10 CFR 50.73

U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555  
ATTENTION: Document Control Desk

Subject: Duke Energy Carolinas, LLC  
McGuire Nuclear Station, Unit 2  
Docket No. 05000370  
Renewed License No. NPF-17  
Licensee Event Report 2023-001-00  
Nuclear Condition Report Number 02467460

Pursuant to 10 CFR 50.73 Section (a)(2)(iv)(A), attached is Unit 2 Licensee Event Report (LER) 2023-001-00, regarding manual actuation of the Auxiliary Feedwater Motor Driven Pumps in response to potential equipment failure.

This event is considered to have no significance with respect to the health and safety of the public. There are no regulatory commitments contained in this LER.

If questions arise regarding this LER, please contact Jeff Sanders at 980-875-4680.

Sincerely,

A handwritten signature in black ink that reads 'Edward R. Pigott'.

Edward R. Pigott  
Duke Energy  
McGuire Nuclear Station  
Site Vice President

Attachment

U.S. Nuclear Regulatory Commission  
RA-23-0123  
Page 2

cc: Laura A. Dudes  
Administrator Region II  
U.S. Nuclear Regulatory Commission  
Marquis One Plaza  
245 Peachtree Center Avenue  
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J. Klos  
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Chris Safouri  
NRC Senior Resident Inspector  
McGuire 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 FOIA, Library, and Information Collections Branch (T-6 A10M), U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by email to [Infocollections.Resource@nrc.gov](mailto:Infocollections.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; email: [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.

<b>1. Facility Name</b> McGuire Nuclear Station, Unit 2	<input checked="" type="checkbox"/> <b>050</b> <input type="checkbox"/> <b>052</b>	<b>2. Docket Number</b> 05000370	<b>3. Page</b> 1 OF 5
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**4. Title**  
Manual Actuation of the Unit 2 Motor Driven Auxiliary Feedwater Pumps

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	<input type="checkbox"/> 050	Docket Number
04	02	2023	2023	- 001 -	00	06	01	2023	Facility Name	<input type="checkbox"/> 052	Docket Number

**9. Operating Mode** 3      **10. Power Level** 0%

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

<b>10 CFR Part 20</b>	<input type="checkbox"/> 20.2203(a)(2)(vi)	<b>10 CFR Part 50</b>	<input type="checkbox"/> 50.73(a)(2)(ii)(A)	<input type="checkbox"/> 50.73(a)(2)(viii)(A)	<input type="checkbox"/> 73.1200(a)
<input type="checkbox"/> 20.2201(b)	<input type="checkbox"/> 20.2203(a)(3)(i)	<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"/> 73.1200(b)
<input type="checkbox"/> 20.2201(d)	<input type="checkbox"/> 20.2203(a)(3)(ii)	<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)	<input type="checkbox"/> 73.1200(c)
<input type="checkbox"/> 20.2203(a)(1)	<input type="checkbox"/> 20.2203(a)(4)	<input type="checkbox"/> 50.36(c)(2)	<input checked="" type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)	<input type="checkbox"/> 73.1200(d)
<input type="checkbox"/> 20.2203(a)(2)(i)	<b>10 CFR Part 21</b>	<input type="checkbox"/> 50.46(a)(3)(ii)	<input type="checkbox"/> 50.73(a)(2)(v)(A)	<b>10 CFR Part 73</b>	<input type="checkbox"/> 73.1200(e)
<input type="checkbox"/> 20.2203(a)(2)(ii)	<input type="checkbox"/> 21.2(c)	<input type="checkbox"/> 50.69(g)	<input type="checkbox"/> 50.73(a)(2)(v)(B)	<input type="checkbox"/> 73.77(a)(1)	<input type="checkbox"/> 73.1200(f)
<input type="checkbox"/> 20.2203(a)(2)(iii)		<input type="checkbox"/> 50.73(a)(2)(i)(A)	<input type="checkbox"/> 50.73(a)(2)(v)(C)	<input type="checkbox"/> 73.77(a)(2)(i)	<input type="checkbox"/> 73.1200(g)
<input type="checkbox"/> 20.2203(a)(2)(iv)		<input type="checkbox"/> 50.73(a)(2)(i)(B)	<input type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(ii)	<input type="checkbox"/> 73.1200(h)
<input type="checkbox"/> 20.2203(a)(2)(v)		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> 50.73(a)(2)(vii)		

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

**12. Licensee Contact for this LER**

<b>Licensee Contact</b> Jeffrey D. Sanders, Senior Engineer	<b>Phone Number (Include area code)</b> 980-875-4680
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**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>14. Supplemental Report Expected</b>	<b>15. Expected Submission Date</b>	Month	Day	Year
<input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date)				

**16. Abstract** (Limit to 1326 spaces, i.e., approximately 13 single-spaced typewritten lines)

On April 2, 2023, at 0341, Operations entered the Senior Reactor Operator Decision Making Process after receiving a report that called into question the functionality of the operating 2B Main Feedwater (MFW) Pump Recirculation Valve, 2CF-81. At the time, Unit 2 was in Mode 3, the 2B MFW pump was feeding the steam generators, and the 2A MFW Pump Recirculation Valve 2CF-76 was nonfunctional. At 0352 hours, Operations manually started the Auxiliary Feedwater (AFW) Motor Driven Pumps to feed the steam generators to allow corrective maintenance on the MFW System. The AFW Motor Driven Pumps started as designed. Flow to the steam generators was not adversely impacted during this sequence.

Subsequent investigation determined that the 2A and 2B MFW recirculation piping experienced abnormal vibration when flow was introduced through valves 2CF-76 and 2CF-81, making the valves susceptible to failure. The recirculation piping had recently been modified to replace the carbon steel elbow piping immediately downstream of the valves with a stainless steel target tee configuration. To mitigate the issue, the target tee was replaced with the original carbon steel elbow arrangement. This event had no impact on the health and safety of the public.



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

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1. FACILITY NAME  McGuire Nuclear Station, Unit 2	<input checked="" type="checkbox"/> 050	2. DOCKET NUMBER  05000370	3. LER NUMBER		
	<input type="checkbox"/> 052		YEAR  23	SEQUENTIAL NUMBER  - 001	REV NO.  - 00

**NARRATIVE**

**BACKGROUND**

The following information is provided to assist readers in understanding the event described in this LER. Applicable Energy Industry Identification [EII] system and component codes are enclosed within brackets.

Feedwater System [SJ]:

The Main Feedwater System (MFW) takes treated Condensate System water, heats it further to improve the plant's thermal cycle efficiency, and delivers it at the required flow rate, pressure, and temperature to the steam generators (SGs). The MFW is designed to maintain proper vessel water levels with respect to reactor power output and turbine steam requirements.

Auxiliary Feedwater System [BA]:

The Auxiliary Feedwater System (AFW) automatically supplies feedwater to the SGs to remove decay heat from the Reactor Coolant System (RCS) upon the loss of normal feedwater supply. The AFW mitigates the consequences of any event with loss of normal feedwater. The design basis of the AFW is to supply water to the SGs to remove decay heat and other residual heat by delivering at least the minimum required flow rate to the SGs.

The AFW is designed to start automatically for any event requiring emergency feedwater. The AFW Motor Driven Pumps will automatically provide feedwater when initiated on any of the following conditions:

1. Trip of both main feedwater pumps
2. AMSAC Actuation (AMSAC - Anticipated Transient Without Scram (ATWS) Mitigation System Activation Circuitry)
3. Two out of four (2/4) low-low level alarms in any one SG
4. Initiation of a safety injection signal
5. Loss of power to the 4160V essential bus (Blackout)

The AFW Turbine Driven Pump will automatically provide feedwater when initiated on any of the following conditions:

1. Two out of four (2/4) low-low level alarms in any two SGs
2. Loss of power to the 4160V essential bus (Blackout)
3. 1/1 detector from Standby Shutdown Facility (SSF) SG Wide Range Low-Low Level on 2/4 SGs (72%)



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**NARRATIVE**

**EVENT DESCRIPTION**

On April 1, 2023, McGuire Unit 2 was preparing to exit the 2023 spring refueling outage by entering Mode 3 and subsequently heating the Reactor Coolant System to full temperature and pressure. During the refueling outage and prior to plant heat up, an Engineering Change (EC 419577) was implemented to (1) replace the piping downstream of the MFW Pump Recirculation Valves 2CF-76 and 2CF-81 with stainless steel material, (2) replace the elbow immediately downstream of valves 2CF-76 and 2CF-81 with a “target tee” configuration, and (3) upgrade the pressure and temperature ratings of piping between 2CF-76/81 and 2CF-77/82. Subsequently, during MFW pump startup activities after completion of the modification, the 2A and 2B MFW recirculation piping experienced abnormal vibration when flow was introduced through the recirculation valves.

On April 2, 2023, at 0341, Operations entered the Senior Reactor Operator Decision Making Process after receiving a report that called into question the functionality of the operating 2B MFW Pump Recirculation Valve, 2CF-81. At the time, Unit 2 was in Mode 3, the 2B MFW pump was feeding the steam generators, and the 2A MFW Pump Recirculation Valve 2CF-76 was nonfunctional. At 0352 hours, Operations manually started the Auxiliary Feedwater (AFW) Motor Driven Pumps to feed the steam generators to allow corrective maintenance on the MFW System. The AFW Motor Driven Pumps started as designed. Flow to the steam generators was not adversely impacted during this sequence.

Subsequent investigation determined that turbulent flow through the target tee caused abnormal vibration, making the recirculation valves susceptible to failure. As a means of mitigating the issue, the Engineering Change was revised to return the outlet configuration of 2CF-76 and 2CF-81 back to its original short radius elbow configuration of schedule 80 carbon steel. After completion of the Engineering Change revision, the MFW pumps were successfully restarted, vibration levels were consistent with normal operation, and the recirculation valves functioned as required. The 2A and 2B AFW Motor Driven Pumps were secured, and unit startup activities continued.

Sequence of Events (times are approximate)

- 04/01/23 12:16 – Unit 2 entered Mode 3
- 04/02/23 00:42 – The Unit 2 Reactor Coolant System reached full temperature and pressure.
- 04/02/23 00:56 – The 2A MFW pump was placed in service.
- 04/02/23 02:39 – The control room received annunciator alarm 2AD-8 A4 (MFW Pump Discharge Hi Pressure) due to 2CF-76 failing closed. The control room also received indications of Unit 2 Condensate flow lowering consistent with 2CF-76 closing and responded by opening 2CF-81 manual loader to mitigate the 2A MFW pump high discharge pressure.
- 04/02/23 03:22 – The 2B MFW pump was placed in service.
- 04/02/23 03:32 – The 2A MFW pump was removed from service by the control room.
- 04/02/23 03:41 –Senior Reactor Operator Decision Making process entered. The Decision was made to feed the steam generators with the AFW Motor Driven Pumps.
- 04/02/23 03:52 – The control room started the 2A and 2B AFW Motor Driven Pumps.



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**NARRATIVE**

- 04/02/23 04:03 – The 2B MFW pump was removed from service by the control room.
- 04/02/23 04:05 – The Unit 2 AFW Motor Driven Pumps are providing feed flow to all Unit 2 steam generators.
- 04/03/23 23:24 – The 2B MFW pump was placed back into service.
- 04/03/23 23:28 – The control room secured the 2A and 2B AFW Motor Driven Pumps.
- 04/04/23 21:10 – The 2A MFW pump was placed back into service.

**REPORTABILITY DETERMINATION**

Manual actuation of the AFW Motor Driven Pumps meets the threshold for an 8-hour report in accordance with § 50.72(b)(3)(iv)(A), “Any event or condition that results in valid actuation of any of the systems listed in paragraph (b)(3)(iv)(B) of this section, except when the actuation results from and is part of a pre-planned sequence during testing or reactor operation.” § 50.72(b)(3)(iv)(B) lists the AFW System as a system within the scope of § 50.72(b)(3)(iv)(A).

On April 2, 2023, at 1129, Operations reported the manual actuation of the AFW Motor Driven Pumps to the NRC Operations Center as a valid actuation in accordance with § 50.72(b)(3)(iv)(A). The Event Notification (EN) is documented as EN 56451.

This LER satisfies the corresponding written reporting criteria in 10 CFR 50.73(a)(2)(iv)(A), “Any event or condition that resulted in manual or automatic actuation of any of the systems listed in paragraph (a)(2)(iv)(B).”

**CAUSAL FACTORS**

A cause investigation determined that the risk of an adverse impact, due to an unvalidated design assumption on turbulent flow, was not recognized when modifying the MFW pump recirculation lines.

**CORRECTIVE ACTIONS**

The previously implemented Engineering Change was revised to return the plant to its former configuration by replacing the newly installed target tees with schedule 80 carbon steel short radius elbows. Engineering Change procedural guidance was also revised to require risk assessments for First-Of-A-Kind (FOAK) or First-In-A-While (FIAW) plant modifications.



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**NARRATIVE**

**SAFETY ANALYSIS**

Operations manually started the AFW Motor Driven Pumps prior to removing the 2B MFW pump from service. The AFW Motor Driven Pumps started as designed, and feed flow to the steam generators was not adversely impacted during this event. All plant systems responded as expected. Therefore, it is concluded that the impact on core damage risk was very small, and the event had no impact on public health and safety.

**ADDITIONAL INFORMATION**

A review of previous Licensee Event Reports was conducted to determine if this was a recurring event (i.e., similar event with the same cause or same failure mode). No previous similar events were identified within the past three years associated with manual actuation of the AFW System. Therefore, this is not considered a recurring event.