



SVP-22-072

10 CFR 50.73

December 30, 2022

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

Quad Cities Nuclear Power Station, Unit 2
Renewed Facility Operating License No. DPR-30
NRC Docket No. 50-265

Subject: Licensee Event Report 265/2022-003-00 "Manual Scram Due to Feedwater Regulator Valve Failure Increasing Reactor Water Level"

Enclosed is Licensee Event Report 265/2022-003-00 "Manual Scram Due to Feedwater Regulator Valve Failure Increasing Reactor Water Level," for Quad Cities Nuclear Power Station, Unit 2.

This report is being submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A) for an event or condition that resulted in manual or automatic actuation of the reactor protection system including a reactor scram.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this report, please contact Mark Humphrey at (309) 227-2800.

Respectfully,

A handwritten signature in black ink, appearing to read "Brian Wake", written over a horizontal line.

Brian Wake
Site Vice President
Quad Cities Nuclear Power Station

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Quad Cities Nuclear Power Station



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
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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 Infocoll.Resource@nrc.gov, and the OMB reviewer at: OMB Office of Information and Regulatory Affairs, (3150-0104), Attn: Desk all: 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. Page
Quad Cities Nuclear Power Station Unit 2	05000 - 265	1 OF 4

4. Title
Manual Scram Due to Feedwater Regulator Valve Failure Increasing Reactor Water Level

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
11	04	2022	2022	- 003 -	00	12	30	2022	n/a	05000
									Facility Name	Docket Number
									n/a	05000

9. Operating Mode	10. Power Level
1 - Power Operation	100%

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 checked="" 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)	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)	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)	10 CFR Part 50	<input 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)	
<input type="checkbox"/> OTHER (Specify here, in abstract, or NRC 366A).				

12. Licensee Contact for this LER

Licensee Contact	Phone Number (Include area code)
Rachel Luebbe	309-227-2813

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	FSV	P070	Y					

14. Supplemental Report Expected

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

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

On November 4, 2022, Unit 2 was at 100% power with no surveillance activities in progress that contributed to the event. At 1359 hours the 2B Feedwater Regulating Valve (FRV) failed in the open position and locked up, causing an increase in reactor vessel water level. Attempts at manual control of the feedwater system to decrease level were not successful. At 1400, a manual scram was inserted in accordance with operating procedures. All control rods inserted, and the scram was uncomplicated.

The cause of this event is foreign material partially or completely blocking hydraulic oil flow internal to a servo valve in the 2B FRV that caused it to move rapidly to the fully open position. This caused Unit 2 reactor vessel water level to rapidly rise until it reached the established scram criteria of +44 inches, at which time a manual scram was inserted.

This report is being submitted in accordance with 10 CFR 50.73(a)(2)(iv)(A) for an event or condition that resulted in manual or automatic actuation of the reactor protection system including a reactor scram.

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

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1. FACILITY NAME	2. DOCKET NUMBER	3. LER NUMBER		
		YEAR	SEQUENTIAL NUMBER	REV NO.
Quad Cities Nuclear Power Station Unit 2	05000- 265	2022	- 003	- 00

NARRATIVE**PLANT AND SYSTEM IDENTIFICATION**

General Electric – Boiling Water Reactor, 2957 Megawatts Thermal Rated Core Power

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

EVENT IDENTIFICATION

Manual Scram Due to Feedwater Regulator Valve Failure Increasing Reactor Water Level

CONDITION PRIOR TO EVENT

Unit: 2 Event Date: November 4, 2022 Event Time: 1400 CDT

Reactor Mode: 1 Mode Name: Power Operation Power Level: 100%

No structures, systems or components were inoperable at the start of this event that contributed to the event.

A. DESCRIPTION OF EVENT

On November 4, 2022, Unit 2 was operating at 100% power. There were no surveillances in progress that contributed to the event. At 1359 hours, main control room (MCR) alarms indicated the 2B Feedwater (FW) [JB] Regulating Valve (FRV) [FCV] failed in a manner that drove it to an open position and caused the valve to lock up. As a result, reactor vessel water level began to rise. The other FRV, 2A was in service and responded as designed and automatically closed to control reactor water level. With the 2A FRV fully closed, reactor water level continued to rise and when the level reached the established scram criteria of +44 inches, the Unit Supervisor directed a manual scram in accordance with station operating procedures.

The scram was inserted at 1400 hours. All control rods were inserted, and the scram was uncomplicated.

The NRC was notified via ENS Report 56210 at 1710 EDT on November 4, 2022.

Following replacement of the 2B FRV servo valve [FSV], Unit 2 returned to power operations on November 6, 2022.

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NARRATIVE**B. CAUSE OF EVENT**

The cause of the FRV failure was foreign material partially or completely blocking the movement of a spool internal to the servo valve [FSV] associated with the 2B FRV assembly. Foreign material either blocked a hydraulic control channel in the servo or impeded the free movement of the spool which ports hydraulic fluid to the 2B FRV actuator. Malfunction of the spool caused the FRV to move rapidly from the half open to fully open position, leading to the rise in reactor water level. The foreign material introduction occurred during servo valve manufacture and/or assembly. The servo had been replaced during a down power on October 23, 2022.

A contributing cause of the scram is the inability of the 2A FRV to successfully mitigate the reactor water level transient that occurred when the 2B FRV failed in the open position. The 2B FRV is unique in its construction, in that it is larger in size and has a longer valve stroke than any of the other FRVs installed at the site. The station failed to recognize or adequately mitigate the inherent risk of this design configuration. As a result, the 2B FRV failure in the open position was an unrecognized single-point vulnerability that was un-mitigated.

C. SAFETY ANALYSISSystem Design

The feedwater control system is designed to regulate feedwater flow to the reactor vessel such that the reactor vessel water level is maintained at an operator controlled setpoint. Flow rates are controlled using hydraulically controlled flow regulating valves. Feedwater to the reactor is controlled by throttling the feedwater regulating valves. Two full-flow feedwater regulating valves are provided for power operation. One low flow regulating valve is used for lower power operation and is normally set to automatically maintain reactor water level. Both full-flow feedwater regulating valves are hydraulically operated.

Safety Impact

The safety significance of this event is minimal. The operators performed actions in accordance with applicable procedures and training. During the transient, the manual scram was inserted at +44 inches reactor water level increasing in accordance with station procedures. All control rods inserted to bring the reactor to a safe shutdown condition. Adequate make up to the vessel always remained available from the feedwater system as well as Emergency Core Cooling Systems sources. The event was within the analysis of UFSAR Chapter 15.

This event is not a Safety System Functional Failure per NEI 99-02, Revision 7.

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		2022	- 003	- 00

NARRATIVE**D. CORRECTIVE ACTIONS**

Immediate:

1. Replace the 2B FRV Servo. (Complete)
2. Performed hydraulic oil sample analysis. (Complete)

Follow up:

1. Evaluate and implement solenoid manufacturer corrective actions and install new components if appropriate.
2. Evaluate and implement operator actions based on new FRV failure mode and lessons learned.
3. Evaluate extent of condition for all servo valves obtained from this manufacturer.

E. PREVIOUS OCCURENCES

The station events database, LERs and INPO Industry Reporting Information System (IRIS) were reviewed for similar events at Quad Cities Nuclear Power Station in the last three years. This event was caused by foreign material in a hydraulically operated valve. There was one previous event at the station of a FRV lockup caused by a foreign material, which occurred on July 4, 2022. During the search three other FRV lockup events were discovered in the past three years, however these events were attributed to different causes and therefore not included.

LER (265/2022-002-00) Manual Scram Due to Feedwater Regulator Valve Failure Decreasing Reactor Water Level – This event was a scram caused by foreign material in the servo valve of the other (2A) FRV. The failure mode of the FRV during the July 4, 2022 event was failing closed, where this event it was failing open. The foreign material from the 7/4/22 event was due poor hydraulic fluid quality, where this event was due foreign material introduced during the servo manufacturing process. Corrective actions associated with the July 4, 2022 event was still in progress when the November 4, 2022 event occurred on the same unit.

F. COMPONENT FAILURE DATA

Servo

Manufacturer: Parker

Supplier: Black Limited Advanced Controls/Blac

Nomenclature: Servo Valve

Model/Part Number: DES 1071, 10-S-80/50/7.2