



Constellation

SVP-22-054

10 CFR 50.73

September 1, 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 265/2022-002-00 "Manual Scram Due To Feedwater Regulator Valve Failure Decreasing Reactor Water Level"

Enclosed is Licensee Event Report 265/2022-002-00 "Manual Scram Due To Feedwater Regulator Valve Failure Decreasing 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". The signature is fluid and cursive.

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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<b>1. Facility Name</b> Quad Cities Nuclear Power Station Unit 2	<b>2. Docket Number</b> 05000 - 265	<b>3. Page</b> 1 OF 4
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**4. Title**  
Manual Scram Due To Feedwater Regulator Valve Failure Decreasing 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
07	04	2022	2022	- 002 -	00	09	01	2022	n/a	05000
									Facility Name	Docket Number
									n/a	05000

<b>9. Operating Mode</b> 1 - Power Operation	<b>10. Power Level</b> 100%
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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 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)	

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

**12. Licensee Contact for this LER**

Licensee Contact Richard Swart	Phone Number (Include area code) 309-227-2810
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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
X	JB	FSV	P070	Y					

<b>14. Supplemental Report Expected</b> <input checked="" type="checkbox"/> No <input type="checkbox"/> Yes (If yes, complete 15. Expected Submission Date)	<b>15. Expected Submission Date</b> Month: _____ Day: _____ Year: _____
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**16. Abstract** (Limit to 1560 spaces, i.e., approximately 15 single-spaced typewritten lines)

On July 4, 2022, Unit 2 was at 100% power with no surveillance activities in progress that contributed to the event. At 0103 hours the 2A Feedwater Regulating Valve (FRV) failed in the closed position and locked up, causing a decrease in reactor vessel water level. Attempts at manual control of the feedwater system to increase level were not successful. At 0104, 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 2A FRV that caused it to move rapidly from the half open position to the full closed position. This caused Unit 2 reactor vessel water level to rapidly lower until it reached the established scram criteria of +11 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	- 002	- 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 Decreasing Reactor Water Level

**CONDITION PRIOR TO EVENT**

Unit: 2                      Event Date: July 4, 2022                      Event Time: 0104 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 July 4, 2022, Unit 2 was operating at 100% power. There were no surveillances in progress that contributed to the event. At 0103 hours, main control room (MCR) alarms indicated the 2A Feedwater (FW) [JB] Regulating Valve (FRV) [FCV] failed in a manner that drove it to a closed position and caused the valve to lock up. As a result, reactor vessel water level began to decrease. MCR Operators took manual control of the FW system in an effort to increase water level prior to reaching the scram threshold. The 2A FRV was locked up in the closed position.

The 2B FRV rapidly opened to maintain level, but the single FRV was incapable of passing sufficient flow to maintain vessel level at full reactor power. Manual control of the FRV was not successful at maintaining level. It is noted that there was a potential missed opportunity to perform an emergency power reduction which could have reduced reactor power, allowing the single FRV to maintain sufficient vessel level.

At 0104 hours, the decreasing water level reached the +11 inches threshold at which a manual scram was ordered. All control rods inserted, and the scram was not complicated.

The NRC was notified via ENS Report 55975 at 0557 EDT.

Following replacement of the 2A FRV, Unit 2 returned to power operations on July 6, 2022.



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Quad Cities Nuclear Power Station Unit 2	05000- 265	2022	- 002	- 00

**NARRATIVE**

**B. CAUSE OF EVENT**

The cause of the FRV failure was attributed to foreign material partially or completely blocking the hydraulic oil flow internal to a servo valve [FSV] associated with the 2A FRV assembly. This caused the FRV to move rapidly from the half open position to the full closed position, leading to the decrease in reactor water level. The foreign material introduction has been reduced to two potential sources: particulate in the hydraulic oil system (poor hydraulic fluid quality), and a parting line deformity in the servo's end seal ring.

An additional contributing cause of the scram is a failure of the control room operators to perform an emergency power reduction which could have reduced reactor power to a level within the capabilities of a single FRV. The failure mechanism encountered – in which a FRV failed in the closed position without first locking up based on position/demand deviation – was a previously unrecognized failure mechanism. Operators were unfamiliar with this failure mechanism and were unable to diagnose the fault and take appropriate action to mitigate the transient in the 30-seconds available before the Reactor Water Level transient became unrecoverable.

**C. SAFETY ANALYSIS**

System 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 14-inch full-flow feedwater regulating valves are provided for power operation. One 4-inch low-flow regulating valve is used for lower power operation, and is normally set to automatically maintain reactor water level. Both 14-inch 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 +11 inches decreasing in accordance with station procedures. All control rods inserted to bring the reactor to a safe shutdown condition. Adequate make up to the vessel remained available at all times from the feedwater system as well as Emergency Core Cooling Systems sources. The event was within the analysis of UFSAR Chapter 15. Standby Gas Treatment system initiated as expected but failed to achieve required flow rates, however secondary containment vacuum was maintained and there were no radiological leaks associated with the event; reference LER 05000-254/2022-003-00 for additional information.

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



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**NARRATIVE**

**D. CORRECTIVE ACTIONS**

Immediate:

1. Replace the 2A FRV Servo. (Complete)
2. Initiate additional hydraulic fluid filtering. (Complete)

Follow up:

1. Evaluate and implement servo manufacturer corrective actions and install new components at next refuel outages if appropriate.
2. Evaluate and implement hydraulic oil quality improvement actions including preventive maintenance frequency on oil filter replacement.
3. Revised Abnormal Operating Procedures to prioritize an Emergency Power Reduction before attempting to restore Reactor Water Level with manual control of the FRVs.

**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. No previous occurrences were identified.

**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