



SVP-20-036

10 CFR 50.73

May 19, 2020

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 265/2020-001-00 "Loss of Both Divisions of Residual Heat Removal Low Pressure Coolant Injection Due to Swing Bus Failure to Transfer"

Enclosed is Licensee Event Report 265/2020-001-00 "Loss of Both Divisions of Residual Heat Removal Low Pressure Coolant Injection Due to Swing Bus Failure to Transfer," for Quad Cities Nuclear Power Station, Unit 2.

This report is submitted in accordance with 10 CFR 50.73(a)(2)(v)(D) for any event or condition that could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident.

There are no regulatory commitments contained in this letter.

Should you have any questions concerning this report, please contact Sherrie Grant at (309) 227-4833.

Respectfully,

A handwritten signature in black ink, appearing to read "K. Ohr", written over a white background.

Kenneth S. Ohr
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 2 for required number of digits/characters for each block)

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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 Information Services 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 Officer for the Nuclear Regulatory Commission, 725 17th Street NW, Washington, DC 20503; e-mail: 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 Quad Cities Nuclear Power Station, Unit 2	2. Docket Number 05000265	3. Page 1 OF 4
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4. Title
Loss of Both Divisions of Residual Heat Removal Low Pressure Coolant Injection Due to Swing Bus Failure to Transfer

5. Event Date			6. LER Number			7. Report Date			8. Other Facilities Involved	
Month	Day	Year	Year	Sequential Number	Rev No.	Month	Day	Year	Facility Name	Docket Number
03	20	2020	2020	- 001	- 00	05	19	2020	n/a	05000
									Facility Name	Docket Number
									n/a	05000

9. Operating Mode		11. This Report is Submitted Pursuant to the Requirements of 10 CFR §: (Check all that apply)			
1	<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 type="checkbox"/> 50.73(a)(2)(iv)(A)	<input type="checkbox"/> 50.73(a)(2)(x)	
10. Power Level		<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)
100	<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 checked="" type="checkbox"/> 50.73(a)(2)(v)(D)	<input type="checkbox"/> 73.77(a)(2)(i)	
	<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)(ii)	
		<input type="checkbox"/> 50.73(a)(2)(i)(C)	<input type="checkbox"/> Other (Specify in Abstract below or in NRC Form 366A)		

12. Licensee Contact for this LER

Licensee Contact Richard Swart – Regulatory Assurance	Telephone 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 ICES	Cause	System	Component	Manufacturer	Reportable to ICES
B	BO	RLY	A109	Y	n/a				

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

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

On March 20, 2020, at 1025 hours CDT at Quad Cities Nuclear Power Station (QCNPS) Unit 2, a Motor Control Center (MCC) failed to transfer between buses during the performance of the Auto-Transfer Logic Operability Surveillance. This resulted in declaring both loops of the Residual Heat Removal (RHR) Low-Pressure Coolant Injection (LPCI) safety system function inoperable, due to preventing LPCI Motor Operated Valves (MOVs) from opening from the LPCI Loop Select Logic.

The apparent cause of the event was a manufacturing error in the LPCI swing bus time delay relay. The barrel spring, which aids in closing the normally closed contacts, was not properly positioned, allowing inconsistent contact closure.

This is being reported in accordance with 10 CFR 50.73(a)(2)(v)(D), which requires the reporting of any event or condition that could have prevented the fulfillment of the safety function of systems needed to mitigate the consequences of an accident.



**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	2020	- 001	- 00

NARRATIVE

PLANT AND SYSTEM IDENTIFICATION

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

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

EVENT IDENTIFICATION

Loss of Both Divisions of Residual Heat Removal Low Pressure Coolant Injection Due to Swing Bus Failure to Transfer

A. CONDITION PRIOR TO EVENT

Unit: 2 Event Date: March 20, 2020 Event Time: 1025 hours CDT
 Reactor Mode: 1 Mode Name: Power Operation Power Level: 100%

There were no other structures, systems or components (SSC) inoperable during this event time period that could have contributed to this event.

B. DESCRIPTION OF EVENT

On March 20, 2020, at 1025 hours, during performance of the Residual Heat Removal (RHR) Low Pressure Coolant Injection (LPCI)[BO] swing bus [BU] surveillance, the Motor Control Center (MCC)[MCC] 28/29-5 did not auto-transfer feed from Bus 29 to Bus 28. At the time of the event, LPCI was already inoperable under Technical Specification (TS) 3.5.1 Condition E for two LPCI systems inoperable. However, the failure to auto-transfer would have prevented LPCI Loop Select Logic from opening motor operated valves (MOV) 2-1001-29A/B, resulting in the loss of the LPCI safety function. Following the failure to transfer, power was restored to MCC 28/29-5 by Operations.

Operations and Electrical Maintenance (EMs) began troubleshooting following restoration of power. They identified that the Bus 29 feed breaker to MCC 28/29-5 did not trip as expected. Upon this discovery they began taking voltage and resistance checks along the trip circuitry associated with the feed breaker. The initial results indicated that during the surveillance, installation of a jumper per surveillance instructions resulted in the contactor at MCC 28/29-5 D2 opening but the associated feed breaker did not open. This indicated that the most likely causes of failure were either the auxiliary contact 2-3 on the M-contactor for the feed from Bus 29 or the LPCI Swing Bus Time Delay Relay.

Operations then performed another swap of MCC 28/29-5 from Bus 29 to Bus 28 to de-energize the Time Delay Relay [RLY] for testing. Resistance checks were performed for Contacts 1-5 for the Bus 28 feed closing circuit and Contacts 2-6 for the Bus 29 feed trip circuit. Contacts 1-5 were found closed with a reading of less than 1 ohm, and Contacts 2-6 were found open with a reading of 131 mega-ohms. The open reading for Contacts 2-6 indicates that they were likely hung-up, which explains why the auto-transfer didn't occur, since the Bus 29 feed breaker never received a trip signal. Following this finding, the Time Delay Relay was replaced, and the surveillance was



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NARRATIVE

reperformed successfully, supporting the high contact resistance or failure to close of Contacts 2-6 as the cause for the failure to auto-transfer. Detailed failure analysis of the relay revealed a manufacturing error that caused the barrel spring to be incorrectly positioned. The barrel spring aids in the closure of the normally closed contacts. This resulted in the inconsistent closure of Contacts 2-6 and the observed failure to auto-transfer.

Prior to installation of the relay in 2018, bench testing and calibration were performed with no issues noted. Following installation in 2018, post-maintenance testing demonstrated proper function. The March 20, 2020 event showed a failure of the Contacts 2-6 to close. During failure investigation of the relay, there was inconsistent performance of Contacts 2-6 during repeated tests. The barrel spring is an internal feature of the relay, not visible during external inspections. These are the reasons that the condition was not identified during receipt inspection or bench testing.

Part 21 reporting consideration will be discussed with the manufacturer.

C. CAUSE OF EVENT

The cause of the failure of MCC 28/29-5 to transfer from Bus 29 to Bus 28 was a manufacturing error resulting in failure to close of Contacts 2-6 in the LPCI Swing Bus Time Delay Relay.

D. SAFETY ANALYSIS

System Design

480VAC MCCs are designed to supply power for equipment vital to safe plant shutdown under accident conditions through Buses 28 and 29. Per Updated Final Safety Analysis Report (UFSAR) Section 8.3, the 480V MCC 28/29-5 is made up of two MCCs whose buses are connected with a copper link to form one continuous bus. The purpose of this common bus is to provide a dual source of power to the residual heat removal (RHR) and recirculation valves for operation in the low-pressure coolant injection (LPCI) mode. MCC 28/29-5 is normally supplied from Diesel Generator (DG) 2 through 4160V Bus 24-1 transformer TR-29 and Bus 29 during a LOOP with or without an accident signal. Should the DG 2 power source fail, the breaker and contactor feeding MCC_28/29-5 from Bus 29 will open automatically, the breaker and contactor feeding MCC 28/29-5 from Bus 28 will close automatically restoring power to these buses from DG $1/2\frac{1}{2}$ through Bus 23-1, transformer TR-28, and Bus 28. Design changes were implemented that supplement the previously described automatic transfer logic to initiate an automatic transfer based upon voltage and frequency abnormalities when the 480VAC swing MCC_28/29-5 is supplied from DG 2. This is accomplished with protective relay monitoring and generating a transfer signal based up on overvoltage, undervoltage, over frequency and underfrequency conditions.

Safety Impact

Per TS Bases 3.8.1, AC Distribution sources are required to be operable in Modes 1, 2, and 3 to ensure that acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of Anticipated Operational Occurrences (AOOs) or abnormal transients and adequate core cooling is provided and containment operability and other vital functions are maintained in the event of a postulated DBA. The failure of the time delay relay reduced the functionality of the low-pressure injection safety systems by preventing the ability of Bus 28/29-5 to auto transfer and cause LPCI to actuate.



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The loss of both loops of LPCI is a limiting single failure which is analyzed for recirculation line break LOCAs. UFSAR Section 8.3 includes discussion that the NRC accepts the design of the LPCI swing bus principally because the ECCS acceptance criteria can be met without any LPCI function. Therefore, the safety impact of the event is minimal.

Although the required LPCI function was not operable for a short period of time, this did not create any actual plant or safety consequences since Unit 2 was not in an accident or transient condition requiring use of LPCI during this period of time.

This event is a Maintenance Rule Functional Failure (MRFF) and a Safety System Functional Failure (SSFF).

E. CORRECTIVE ACTIONS

Immediate:

1. Operations restored power to Bus 28/29-5.
2. Maintenance replaced the degraded time delay relay.

Follow Up:

1. Work with relay manufacturer to consider Part 21 reportability.

F. PREVIOUS OCCURRENCES

A review of previous QCNPS events reveals a similar event in 2011 in which a different component in the bus transfer logic prevented the MCC from properly transferring from Bus 29 to Bus 28. This event took place during conditions other than the bus transfer surveillance. Although similar in results, this is not considered a station experience which would have directly contributed to preventing the current event.

1. LER 265/2011-001-00, Loss of Unit 2 Essential Service 480 VAC Bus, 03/10/2011. A worker falling from a ladder inadvertently tripped a bus by depressing a switch. The expected transfer of MCC 28/29-5 did not take place. The cause was found to be intermittent binding of a plunger on the main contactor for the MCC.

G. COMPONENT FAILURE DATA

Failed Equipment: RELAY, TDR; 1" 600# S/N 80349
 Component Manufacturer: Tyco Electronics (Agastat)
 Component Model Number: E7022AD003
 Component Part Number: N/A

This event will be reported to IRIS.