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RLB-91-153

June 6, 1991

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Reference: Quad Cities Nuclear Power Station
Docket Number 50-254, DPR-29, Unit One

Enclosed is Licensee Event Report (LER) 91-012 Revision 00, for Quad Cities Nuclear Power Station.

This report is submitted in accordance with the requirements of the Code of Federal Regulations, Title 10, Part 50.73(a)(2)(IV)(D). The licensee shall report any event or condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident.

Respectfully,

COMMONWEALTH EDISON COMPANY
QUAD CITIES NUCLEAR POWER STATION


R. L. Bax
Station Manager

RLB/TB/vmw

Enclosure

cc: R. Stols
T. Taylor
INPO Records Center
NRC Region III

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LICENSEE EVENT REPORT (LER)

Form Rev 2.0

Facility Name (1) Quad Cities Unit One
 Title (4) HPCI Inoperable Due To Failed Bushing In Stop Valve
 Docket Number (2) 0150000254
 Page (3) 1 of 6

Event Date (5)			LER Number (6)			Report Date (7)			Other Facilities Involved (8)		
Month	Day	Year	Year	Sequential Number	Revision Number	Month	Day	Year	Facility Names	Docket Number(s)	
01	07	91	91	0112	010	01	06	91	Quad Cities Unit 2	0150000265	
OPERATING MODE (9)			THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)								
POWER LEVEL (10)			20.402(b)			20.405(c)			50.73(a)(2)(iv)		
0193			20.405(a)(1)(i)			50.36(c)(1)			X 50.73(a)(2)(v)		
			20.405(a)(1)(ii)			50.36(c)(2)			50.73(a)(2)(vii)		
			20.405(a)(1)(iii)			50.73(a)(2)(i)			50.73(a)(2)(viii)(A)		
			20.405(a)(1)(iv)			50.73(a)(2)(ii)			50.73(a)(2)(viii)(B)		
			20.405(a)(1)(v)			50.73(a)(2)(iii)			50.73(a)(2)(x)		
									73.71(b)		
									73.71(c)		
									Other (Specify in Abstract below and in Text)		

LICENSEE CONTACT FOR THIS LER (12)

Name Nick Radloff, Technical Staff Ext. 2942
 TELEPHONE NUMBER
 AREA CODE 309 654-1241

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
X	B	J	S	C	V	A	15	B	15

SUPPLEMENTAL REPORT EXPECTED (14)

Expected Submission Date (15) _____
 [Yes (If yes, complete EXPECTED SUBMISSION DATE)] X [NO]

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

ABSTRACT:

At 1015 hours on May 7, 1991, Unit One was in the RUN mode at 93 percent rated core thermal power. Unit One High Pressure Coolant Injection (HPCI) system was declared inoperable to perform QCOS 2300-13, HPCI System Manual Initiation Test. During this test the HPCI turbine stop valve failed to stroke fully open.

Upon investigating the problem, it was identified that the long bushing in the stuffing box of the stop valve had slid down the valve stem and the bushing pin had sheared. Unit Two HPCI stop valve was checked to verify that the same problem did not exist. It was discovered that the long bushing was also partially out of the stuffing box with no bushing pin in the bushing. Unit Two HPCI was declared inoperable as of 1000 hours, May 8, 1991.

The failure of both HPCI systems was due to inadequate vendor instructions which resulted in the stuffing boxes not being peened. Unit One HPCI system was successfully repaired, tested, and declared operable on May 17, 1991, at 1745 hours. Unit Two HPCI was repaired and declared operable on May 19, 1991, at 1320 hours.

This event was being reported in accordance with 10CFR50.73(a)(2)(v)(D).

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PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2511 Mwt rated core thermal power.

EVENT IDENTIFICATION:

HPCI Inoperable Due To Failed Bushing In Stop Valve.

A. CONDITIONS PRIOR TO EVENT:

Unit: One
Reactor Mode: 4

Event Date: May 7, 1991
Mode Name: RUN

Event Time: 1015
Power Level: 93%

This report was initiated by Deviation Report D-4-01-91-080 and D-4-02-91-046.

RUN Mode (4) - In this position the reactor system pressure is at or above 825 psig, and the reactor protection system is energized, with APRM protection and RBM interlocks in service (excluding the 15% high flux scram).

B. DESCRIPTION OF EVENT:

At 1015 hours on May 7, 1991, Unit One was in the RUN mode at 93 percent rated core thermal power. At this time, the High Pressure Coolant Injection (HPCI) [BJ] System was declared inoperable and HPCI Outage Report, QCOS 2300-2 was initiated. This was done to perform HPCI System Manual Initiation Test. QCOS 2300-13.

QCOS 2300-13 tests the ability of the HPCI system to respond to an initiation signal for a quick startup. During this test, the breakers are deenergized for Motor Operated (MO) HPCI Injection valve, 1-2301-8, Test Return Throttle valve, 1-2301-10, and Test Return Bypass valve, 1-2301-15. This made the system inoperable.

While performing the test, the Nuclear Station Operator (NSO) depressed the HPCI Manual Initiation button and timed the system response to full flow. During this step, the NSO noticed that the HPCI Turbine Stop Valve (BJ) [SCV] light indication did not display the full open signal. Further, the Motor Speed Changer (MSC) remained at its Low Speed Stop (LSS). The stop valve light indication should have displayed a full open signal and the MSC should have moved to its High Speed Stop (HSS). At this point, the NSO manually tripped the turbine.

Technical Staff (TS) and Operations personnel investigated the problem. The NSO stroked the HPCI stop valve again, and TS and an operator observed locally that the valve did not stroke full open. This prevented the MSC from moving off the LSS. Mechanical Maintenance (MM) was notified of the problem.

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At 1205 hours on May 7, 1991, the NRC was notified of the event via the Emergency Notification System (ENS) in order to comply with the requirements of 10CFR50.72(b)(2)(iii)(D).

MM investigated the problem and noticed the long bushing, normally located inside the stuffing box of the stop valve, had slid down the valve stem. After it had been determined the pin between the bushing and stuffing box had been sheared off, the other unit's (Unit Two) HPCI stop valve was checked to verify that the bushing was in the stuffing box. MM discovered the long bushing was partially withdrawn from the stuffing box with the pin for the long bushing missing. Unit Two HPCI was declared inoperable as of 1000 hours, May 8, 1991, and QCOS 2300-2, HPCI Outage Report was initiated.

At 1237 hours on May 8, 1991, the NRC was notified of the event via the ENS in order to comply with the requirements of 10CFR50.72(b)(2)(iii)(D).

At 2205 hours on May 9, 1991, Unit One HPCI stop valve was repaired by replacing the stuffing box assembly. The stop valve was stroked successfully. MM continued disassembly on the Unit Two stop valve while Operating began to prepare for testing of Unit One HPCI.

Technical Staff (TS), Operating, and MM personnel inspected the old stuffing box removed from Unit One. They found the inside diameter of the stuffing box galled. Also, the spacer bushing had bound up in the center of the stuffing box. This bound bushing stopped the valve stem coupling and prevented the valve from fully opening.

On May 10, 1991 at 1700 hours the NSO performed QCOS 2300-13 on the Unit One HPCI system. When the NSO tripped HPCI in order to prepare for QCOS 2300-1, Periodic HPCI Pump Operability Test, TS personnel reported that the pin in the long bushing and stuffing box had sheared again, and that the long bushing had dropped partially down from the stuffing box.

With the assistance of a General Electric turbine representative, MM concentrated on reassembly of the Unit Two stop valve. The Vendor Equipment Technical Information (VETI) manual did not give detailed information for the required dimensional tolerances of the long bushing and valve stem. In order to verify proper alignment MM contacted the vendor (Atwood & Morrill Co. Inc.) to obtain these tolerance limits. After comparing the dimensional measurements of the long bushing and valve stem with the vendor recommendations MM found that the valve stem had runout problems that exceeded the vendor's allowable tolerance limits. This resulted in the valve stem being replaced as well as the stuffing box and bushing.

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At 1350 hours on May 12, 1991, the NSO performed QCOS 2300-5 for Unit Two. Prior to running the surveillance, the stop valve was stroked successfully with and without steam applied to the valve. When the turbine was tripped at the end of the surveillance, the pin again sheared and the long bushing dropped partially down from the stuffing box.

At this point, both Unit One and Unit Two stop valves were disassembled. A thorough examination of all the dimensional tolerances for the stuffing boxes and valve stem assemblies for both units were taken and discussed with the vendor along with other possible causes of failure. The vendor approved the tolerance measurements taken and recommended that the stuffing box be peened for both units to hold the long bushing in place. The vendor further recommended extra careful work practices be taken in aligning the stuffing box and stem upon reassembly of the valve.

Technical Staff and MM contacted Dresden Station about the problem and discovered that their stop valve stuffing boxes were peened. The vendor's drawings were checked and no reference to a peening process for the installation of the stuffing box assembly was located.

At 1304 hours on May 17, 1991, repairs on the Unit One stop valve were complete. The valve was successfully stroked twice prior to running the Quarterly HPCI Pump Operability Test, QCOS 2300-5. The NSO then performed the surveillance for Unit One without further problems.

At 1745 hours on May 17, 1991, the work packages were completed for the Unit One HPCI stop valve. The SE declared HPCI operable and terminated Unit One HPCI Outage Report, QCOS 2300-2.

MM completed the reassembly of the Unit Two stop valve and the NSO performed QCOS 2300-1, HPCI Periodic Pump Operability Test. At 2140 hours on May 18, 1991, HPCI was run successfully with the long bushing in the stuffing box remaining in place when the HPCI turbine was tripped.

The work package for the stop valve was closed out and at 1320 hours on May 19, 1991, the SE declared Unit Two HPCI operable and terminated Outage Report, QCOS 2300-2.

C. APPARENT CAUSE OF EVENT:

These events are being reported to comply with 10CFR50.73(a)(2)(v)(D): the licensee shall report any event or condition that alone could have prevented the fulfillment of the safety function of structures or systems that are needed to mitigate the consequences of an accident.

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The major cause of failure of the Unit One HPCI stop valve was due to inadequate vendor instructions. This resulted in the stuffing box being installed without being peened. A contributing factor to the bushing failures was due to the tight tolerances within the bushing and stuffing box assemblies. This is because the alignment of the stuffing box, bushings, and valve stem is critical. The slightest misalignment causes high frictional forces between the stem and long bushing, due to the quick closing action from the stop valve.

The installation of the stuffing box for both units was based on the Vendor Equipment Technical Information (VETI) manual and vendor drawings. This information did not detail the installation process thoroughly enough. This resulted in the stuffing box on both HPCI systems not being peened prior to installation and possible misalignment of the stuffing box and valve stem.

The stuffing box assembly in Unit One was installed during the recent refuel outage. This stuffing box was received at the station completely assembled from the manufacturer, with the stuffing box not peened.

D. SAFETY ANALYSIS OF EVENT:

The safety of the plant and personnel was not affected in this event. Per Technical Specification 3.5.C.2, if the HPCI subsystem is inoperable, reactor operation is allowed for fourteen days provided all active components of the Automatic Pressure Relief (APR) [SB] subsystems, the Core Spray (CS) [BM] subsystems, Low Pressure Coolant Injection (LPCI) mode of Residual Heat Removal (RHR) [BN] system are operable. These systems were operable throughout the event.

Unit One HPCI system was tested three days prior to this event and fully met Technical Specification 4.5.C.3 pump flow rate requirements. Unit Two HPCI stop valve was found missing a pin from the stuffing box, however, had previously met its Technical Specification requirements. Technical Specifications require HPCI to deliver a minimum of 5000 gpm against a corresponding reactor pressure greater than 1150 pounds per square inch gage (psig). As a precautionary measure Unit Two HPCI was declared inoperable after it was determined that it had the same type of problem as the Unit One HPCI.

E. CORRECTIVE ACTIONS:

The immediate corrective actions for the both HPCI systems consisted of declaring the HPCI inoperable and initiating the system outage report.

Both Unit One and Unit Two stuffing boxes, bushings, and pins were replaced. Also, the valve stem for Unit Two stop valve was replaced. MM repaired the valves, with the assistance from a GE turbine representative and the vendor, by peening the stuffing box and long bushing. Also, they verified tolerance measurements during the repair to ensure correct alignment within the stop valves.

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In order to prevent further occurrences, MM will revise the VETI manual which will accurately detail tolerance measurements and installation requirements for the stop valve. This will ensure proper alignment of the stem and stuffing box along with providing detailed installation information (NTS 2542009108001).

A search was conducted of the Nuclear Plant Reliability Data System (NPRDS) which identified the Dresden Station as the only other station that uses this component in a safety related system. A copy of this report and the additional information from the vendor will be sent to the Dresden Station Technical Staff Supervisor (NTS 2542009108002).

F. PREVIOUS EVENTS:

A (NPRDS) search found no previous events involving failures of HPCI turbine stop valves manufactured by Atwood & Morrill Co. Inc. that involves a bushing and pin failure.

G. COMPONENT FAILURE DATA:

The HPCI turbine stop valve is manufactured by Atwood & Morrill Co. Inc., model number 20747-H.