



**Commonwealth Edison**

Quad Cities Nuclear Power Station  
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RLB-90-173

July 2, 1990

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

Reference: Quad Cities Nuclear Power Station  
Docket Number 50-265, DPR-30, Unit Two

Enclosed is Licensee Event Report (LER) 90-008, 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)(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.

Respectfully,

COMMONWEALTH EDISON COMPANY  
QUAD CITIES NUCLEAR POWER STATION

*R. L. Bax* for RLB  
R. L. Bax  
Station Manager

RLB/MJB/jlg

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 Two  
 Title (4) Failure of the Automatic Function of the HPCI Flow Controller due to Unknown Causes.

Docket Number (2) 0 | 5 | 0 | 0 | 0 | 2 | 6 | 5  
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Failure of the Automatic Function of the HPCI Flow Controller due to Unknown Causes.

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)
0   6	0   2	9   0	9   0	0   0   8	0   0	0   7	0   2	9   0		0   5   0   0   0   1

OPERATING MODE (9) 4

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)

20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
20.405(a)(1)(i)	50.36(c)(1)	X 50.73(a)(2)(v)	73.71(c)
20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	Other (Specify
20.405(a)(1)(iii)	50.73(a)(2)(i)	50.73(a)(2)(viii)(A)	in Abstract
20.405(a)(1)(iv)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(B)	below and in
20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(x)	Text)

## LICENSEE CONTACT FOR THIS LER (12)

Name K. J. Hill, Technical Staff Engineer Ext. 2150

TELEPHONE NUMBER 3 | 0 | 9 | 6 | 5 | 4 | - | 2 | 2 | 4 | 1

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

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS
X	B   J	F   I   C	Y   0   0   6	Y					

## 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 1723 hours on June 2, 1990, Unit Two was in the RUN mode at 100 percent power. The High Pressure Coolant Injection (HPCI) Pump Flow Indicating Controller (FIC), 2-2340-1, was found in the manual mode and the red FAIL lamp on the FIC was lit. HPCI was declared inoperable and an outage report was initiated.

The cause of the failure could not be determined. The power supply fuse was removed and reinstalled, then the FIC returned to normal.

Operating personnel began operability testing of HPCI, but stopped at 2105 hours due to a steam leak at the flanged connection of the Turbine Stop Valve-Below Seat Drain Orifice, 2-2301-98.

The gasket was replaced at the flange connection. At 0510 hours on June 3, 1990, the HPCI operability test was successfully completed.

NRC notification of the event via the Emergency Notification System (ENS) phone was completed at 2118 hours on June 2, 1990, to comply with the requirements of 10CFR50.72(b)(2)(iii).



LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

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Quad Cities Unit Two	0   5   0   0   0   2   6   5	9   0	-	0   0   8	-	0   0		0   2	OF	0   5
TEXT Energy Industry Identification System (EIIS) codes are identified in the text as [XX]										

PLANT AND SYSTEM IDENTIFICATION:

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

EVENT IDENTIFICATION: Failure of the Automatic Function of the HPCI Flow Controller Due to Unknown Causes.

A. CONDITIONS PRIOR TO EVENT:

Unit: Two Event Date: June 2, 1990 Event Time: 1723  
Reactor Mode: 4 Mode Name: RUN Power Level: 100%

This report was initiated by Deviation Report D-4-2-90-031

RUN Mode (4) Run - 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 1723 hours on June 2, 1990, Unit Two was operating in the RUN mode at 100 percent or rated core thermal power. The Unit Two Nuclear Station Operator (NSO) found the Unit Two High Pressure Coolant Injection (HPCI) [BJ] Pump [P] Flow Indicating Controller (FIC) [FIC], 2-2340-1, in the manual mode at 100 percent demand. The red FAIL lamp [IL] on the controller was lit indicating a failure of the automatic control function.

The NSO attempted to return the FIC to automatic control, but each time after releasing the automatic control selector pushbutton, the FIC returned to the manual mode. The NSO decreased the manual demand signal of the FIC from 100 percent and observed the HPCI turbine Motor Gear Unit (MGU) to move from the High Speed Stop (HSS). This verified proper operation of the turbine governor [65] and signal converter [CNV].

Discussions ensued between the Assistant Superintendent of Operations (ASO), Shift Engineer (SE) and Production Superintendent about the ability of the system to function at 100 percent reactor power and in manual. It was decided to take the conservative action and declare the system inoperable.

The HPCI system was declared inoperable due to failure of the automatic mode of the flow controller. HPCI Subsystem Outage Report, QOS 2300-01, was initiated and NRC notification of the event via the Emergency Notification System (ENS) phone was completed at 2118 hours on June 2, 1990, to comply with the requirements of 10CFR50.72(b)(2)(iii). Operating initiated required testing of redundant systems. All systems were tested and verified operable except for the Automatic Pressure Relief (APR) [SB] subsystem. The APR subsystem was being prepared for the required testing when HPCI was declared operable. The APR subsystem had previously been proven operable on May 7, 1990.

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At 1830 hours on June 2, 1990, Instrument Maintenance (IM) personnel began troubleshooting the controller failure. By 2030 hours, the FIC was again operating normally, however, the IMs could find no cause for the failure.

The IMs had removed the fuse [FU] at the back of the FIC to de-energize it to allow connection of a calibration unit. After re-installing the fuse, the fail lamp was unlit and the setpoint returned to 5600 gpm. IM personnel checked the program parameters but found no problems. The FIC had apparently reset once it was de-energized and now was operating correctly.

Operating personnel started HPCI Monthly and Quarterly Test, QOS 2300-1, to prove system operability, however, at 2105 hours the test was stopped due to a steam leak which developed from the flanged connection at the Turbine [TRB] Stop Valve [SHV] Below Seat Drain [DRN] Orifice [OR], 2-2301-98. Investigation by the Shift Foreman found the gasket material at the flange to be deteriorated. The Equipment Attendant initiated Nuclear Work Request Q85160 to replace the gasket.

At 0053 hours on June 3, 1990, the Unit Two HPCI system was taken out-of-service to allow Mechanical Maintenance (MM) personnel to repair the steam leak at the orifice plate.

By 0350 hours on June 3, 1990, all required testing of redundant systems except for APR had been completed and MM personnel completed the replacement of the gasket at the orifice plate. Operating personnel began returning the HPCI system to service.

At 0510 hours on June 3, 1990, QOS 2300-1 was successfully completed with no steam leaks at the orifice plate. The FIC operated without problem and was left in its normal standby conditions after the test.

At 0540 hours on June 3, 1990, Work Request Q85160 was completed and the SE terminated the outage report.

C. APPARENT CAUSE OF EVENT:

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

The controller alarm message stated there was a "User ROM" failure. The exact cause of the FIC Read Only Memory (ROM) failure is not known, but the reason it did not return to the automatic mode is due to its design. The FIC is designed with an internal monitoring system which shuts down the automatic mode upon detecting any error. Once this occurs, it will remain in the manual mode event if the condition clears.



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In discussions with the manufacturer, it was found that over the last one and one-half years, there have been two other similar incidents with this type controller. The exact cause of these failures could not be determined. However, it is suspected that a problem exists with the Erasable Programmable Read Only Memory (EPROM). Repairs to these controllers were completed by replacing and/or re-programming the EPROM.

The cause of the steam leak at the HPCI turbine stop valve below seat drain orifice plate is due to a failed gasket. Mechanical Maintenance personnel disassembled the orifice plate and found the gasket cracked and the flange surface slightly steam cut. The gasket was fabricated of a fibrous material. A study by Sargent and Lundy has recommended using a flexitalic gasket in this installation. A flexitalic gasket was used when reassembling this system.

#### D. SAFETY ANALYSIS OF EVENT:

The safety of the plant and personnel was not affected by this event. The HPCI system is designed to provide adequate core cooling for all main steam [SB] line break sizes less than those for which the Low Pressure Coolant Injection (LPCI) mode of the Residual Heat Removal (RHR) [BO] or Core Spray [BM] subsystems can adequately protect the core. In addition, the HPCI system provides a backup function to the Reactor Core Isolation Cooling (RCIC) [BN] system.

The relief valves [RV] of the Automatic Pressure Relief (APR) [SB] subsystem are a backup to the HPCI subsystem. They enable the Core Spray subsystem and LPCI mode of the RHR system to provide protection against the small pipe break in the event of HPCI failure by depressurizing the reactor vessel [RCT] rapidly enough to actuate the Core Spray subsystem and LPCI mode of the RHR system.

Technical Specification 3.5.C.2 allows continued reactor operation for seven days, if HPCI is found to be inoperable, provided all active components of the APR subsystems, the Core Spray subsystems, LPCI mode of the RHR system, and the RCIC system are operable.

The Operating Department initiated required testing of redundant systems upon declaring the HPCI system inoperable. This testing was discontinued upon declaring the HPCI system operable.

The failure of the automatic function of the FIC affected the ability of HPCI to automatically maintain 5600 gpm on an auto-initiation, but did not prevent the system from performing its safety function. With the FIC in manual and set at maximum demand, the turbine will start as normal and accelerate to full turbine speed. Pump flow will likely exceed 5600 gpm, however, the turbine will not reach the overspeed setpoint due to limitations designed into the turbine governor.

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Quad Cities Unit Two		0	5	1	0	0	2	6	5	9	0	-	0	0	8	-	0	1	0	0	5	QF	0	1	5

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The FIC failure could not have occurred more than one and a half hours before it was discovered by the NSO. Following the start of the shift at 1500 hours, the NSO, Shift Control Room Engineer (SCRE), and SE each made independent panel checks and found no problem with the FIC. The last of these checks was estimated to be at 1600 hours or about one and a half hours before the failure discovery.

It is believed the steam leak at the orifice plate would not have prevented turbine operation had an emergency situation arisen.

#### E. CORRECTIVE ACTIONS:

The immediate corrective action for the FIC failure consisted of declaring HPCI inoperable and initiating the system outage report. Instrument Maintenance personnel investigated the failure but could not determine the cause. The power supply fuse was removed and reinstalled, then the FIC returned to normal.

The immediate corrective action for the steam leak at the turbine stop valve below seat drain orifice plate consisted of shutting down the turbine to isolate the leak. Mechanical Maintenance personnel replaced the gaskets at the orifice plate and cleaned the mating surfaces. No leaks were found during system testing.

Nuclear Work Request Q85450 was initiated for Instrument Maintenance personnel to replace the HPCI FIC EPROM. This work was completed on June 24, 1990.

An investigation will be performed to review the possibility of installing alarms on the FICs (NTS 2652009003101).

A review of previous reports indicate that the steam leak at the orifice plate is an isolated event, therefore, no further action is deemed necessary at this time.

#### F. PREVIOUS EVENTS:

There have been no previous reports involving a failure of the FIC installed on either the HPCI or the RCIC systems, which are identical. There are no previous reports involving a steam leak at the turbine stop valve below seat or above seat drain orifice plate, which are of different size but similar design.

A search of the Nuclear Plant Reliability Data System (NPRDS) found no previous failures of the same model controllers involved in this event.

#### G. COMPONENT FAILURE DATA:

The HPCI FIC was manufactured by Yokogawa, series 80, model number SLPC-271.