LICENSEE EVENT REPORT (LER) Form Rev. 2.0

Facility Name (1)	Docket Number (2)	Page (3)
Quad Cities Unit Two	0 5 0 0 0 2 6 5	1 of 0 6

Title (4)

High Pressure Coolant Injection Inoperable Due to Inadequate Venting.

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 5 0 0 0
1 0	0 9	9 6	9 6	-- 0 0 2	-- 0 0		1 1	0 5	9 6		0 5 0 0 0

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10CFR (Check one or more of the following) (11)					
POWER LEVEL (10)	1 0 0	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 in Abstract below and in Text)
		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)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
	AREA CODE
Charles Peterson, Regulatory Affairs Manager, ext. 3602	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	MANUFACTURER	REPORTABLE TO NPRDS		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)		Expected Submission Date (15)	Month	Day	Year
	YES (If yes, complete EXPECTED SUBMISSION DATE)	X NO			

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

ABSTRACT

On October 9,1996 at 1000 hours the Unit Two High Pressure Coolant Injection (HPCI) System was declared inoperable when the pump discharge piping failed to vent during performance of QCOS 2300-09, "HPCI Monthly Vent Verification" procedure. An Emergency Notification System call was made at 1248 hours on October 9, 1996 and an investigation was initiated.

The root cause was an improper fill and vent of HPCI injection piping after maintenance was performed on the system during August 1996. This improper fill and vent trapped air in the HPCI pump discharge piping downstream of the system isolation valve (MO-2301-8) preventing proper system venting.

Corrective actions included purging the air from the system and correcting the HPCI system line-up procedure to ensure filling and venting of all system piping. It was verified that the Unit 1 HPCI piping was properly filled and vented.

The consequences of this event on the health and safety of the public are considered minimal because the amount of air trapped in the system piping would not have prevented the HPCI system from performing its design function.

PLANT AND SYSTEM IDENTIFICATION:

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

EVENT IDENTIFICATION: High Pressure Coolant Injection Inoperable Due to Inadequate Venting.

A. CONDITIONS PRIOR TO EVENT:

Unit: Two Event Date: October 9, 1996 Event Time: 1000

Reactor Mode: 1 Mode Name: POWER OPERATION Power Level: 100%

This report was initiated by Licensee Event Report LER265\96-002.

Power Operation (1) - Mode switch in the RUN position with average reactor coolant temperature at any temperature.

B. EVENT DESCRIPTION

On October 9, 1996 at 1000 hours the Unit Two (U-2) High Pressure Coolant Injection (HPCI)[BJ] System was declared inoperable when no water flow was observed from the pump discharge piping high point vent during performance of QCOS 2300-09, "HPCI Monthly Vent Verification" procedure. This indicated that the system piping up to the system isolation valve was not full of water as required by Technical Specification (Tech Spec)4.5.A.1.a.1. At the time of the event, a static head of water was being supplied to the HPCI system by the Contaminated Condensate Storage Tanks (CCST) [KM] which were filled to a level 1 foot 8 inches above the highest point of the HPCI discharge piping. Over the next nine hours, system venting was attempted several times in differing configurations and it could not be verified that the discharge piping was full. At approximately 1900 hours on October 9, 1996, the HPCI Cooling Water Pump was run for one minute with its discharge lined up through the HPCI vent piping. After this fill and vent of the system piping, it was verified that all piping was full and the failure to vent event could not be recreated.

The HPCI pump suction was then switched to the suppression pool [NH], the Keep Fill system [BM] was valved in and the HPCI system was vented to verify the piping was full. The U-2 HPCI system was then declared operable at 2120 hours on October 9, 1996. The system was declared operable even though the root cause of this event had not been determined because of the positive fill being provided by the keep fill system and the daily verification of this fill.

During troubleshooting to determine the root cause of this event, a planned Limiting Condition for Operation (LCO) on the HPCI system was entered on October 12, 1996 at 0300 hours when the pump suction was switched back to the CCST. The failure to vent could not be recreated during this troubleshooting and the system was again declared operable at 1820 hours on October 13, 1996. The HPCI pump suction at this time was from the CCST and because the root cause had still not been determined, an increased frequency (daily) of venting the system was undertaken. This verified the system piping remained full up to the system isolation valve as required by the Tech Specs.

An investigation team was formed on October 14, 1996 to determine the root cause. This investigation team used a "failure analysis method" to consider all possible root causes. These possible causes were then eliminated one by one through a combination of observations, testing and calculations until the one root cause was determined. The team completed their investigation on October 24, 1996. Daily venting of the HPCI discharge piping was discontinued at that time.

C. APPARENT CAUSE OF THE EVENT

The apparent cause of this event was a failure to properly vent the HPCI injection piping downstream of the system isolation valve (2-2301-8) after maintenance in August 1996 on the system injection check valve (2-2301-7). Refer to Figure 1 for a layout of the HPCI discharge piping high point.

Because QCOP 2300-1 "HPCI Preparation for Stand-by Operation" procedure did not provide steps for filling the section of discharge piping downstream of the system isolation valve, a Discreet Component Operation (DCO) was written to fill and vent this piping. The piping was filled and vented by running the HPCI cooling water pump with the discharge of the pump lined up to the "B" Feedwater Header. The cooling water pump was run until water vented on the "B" Feedwater Header.

Since these vents are located below the high point of the HPCI discharge piping, the discharge piping was not completely filled. This improper venting left air in the piping downstream of the system isolation valve.

The system isolation valve, 2-2301-8, is opened on a quarterly frequency. The first time that it was opened after this improper venting was on October 8, 1996 per QCOS 2300-6, "Quarterly HPCI System Power Operated Valve Test." When the system isolation valve was opened, the air trapped in the piping migrated to the upstream side of the 2-2301-8 system isolation valve since the upstream piping section was at a lower pressure than the downstream side. Subsequently, on October 9, 1996 when QCOS 2300-09 was attempted, this trapped air prevented the system from venting properly even though there was a static head of water above the high point of the discharge piping.

The U-2 HPCI vent piping is hard piped to a six foot loop seal located about forty feet below the HPCI high point piping. With this vent piping full of the air that was trapped in the HPCI discharge piping, six feet of static head could not be developed at the loop seal and water flow could not be established. When the HPCI discharge piping was completely evacuated of air during the cooling water pump run at about 1900 hours on October 9, 1996, continuous water flow was established through the vent piping. This scenario was verified through conversations with hydraulic systems experts at General Electric Company.

D. SAFETY ANALYSIS OF THE EVENT

The consequences of this event are considered minimal. The amount of air trapped in the HPCI injection piping downstream of the system isolation valve was less than one cubic foot. This estimate is based on the fact that it takes only 0.27 cubic feet to completely fill the HPCI vent piping and the system was successfully vented after a short, one minute, cooling water pump run on October 9, 1996. With only one cubic foot of air trapped in the system, based on engineering judgement, a significant water hammer event would not have occurred had the HPCI system injected. Therefore, system piping integrity would have been maintained and the system was functional despite the trapped air and failure to vent.

Additionally, the Automatic Depressurization System (ADS)[RV] and the Low Pressure Coolant Injection (LPCI)[BO] systems were operable during this event and would also have provided protection for the fuel in the event of a Loss of Coolant Accident.

E. CORRECTIVE ACTIONS

The corrective actions completed are:

1. The U-2 HPCI discharge piping has been verified to be full of water to the system isolation valve (MO2-2301-8).

2. QCOS 2300-9, was completed following performance of QCOS 2300-6, thereby verifying no additional trapped air present in the HPCI piping downstream of the system isolation valve.

3. It was verified that a similar problem did not exist on Unit 1 by ensuring that QCOS 2300-9, had been successfully completed following the performance of QCOS 2300-6.

4. The root cause team report has been distributed to the Operating Department to ensure they understand the cause of this event.

5. An engineering letter has been written to the Operating Department instructing them on the proper vent location for system venting. Additionally, this letter included instructions on how to ensure that piping is completely filled if there is not a high point vent available.

Additional corrective actions to be completed are:

1. Revise QCOP 2300-1, to ensure that the piping downstream of the system isolation valve is filled and vented after maintenance (that drains the piping). This will be completed by December 15, 1996. (NTS# 2651809600201, OP)

2. Revise QCOS 2300-9, to include adequate acceptance criteria to detect the HPCI discharge piping is not completely full. This will be completed by December 15, 1996. (NTS# 2651809600202, OP)

3. Revise QCOS 2300-6, to require that the Vent Verification procedure be performed immediately after the valve surveillance. During the investigation into this event, it was determined that there is a period of time during the valve surveillance that the CCST supply water is valved out to the HPCI pump suction. Therefore, to ensure that the piping has remained full, it is necessary to perform the vent verification immediately after. This will be completed by December 15, 1996. (NTS# 2651809600203, OP)

4. Evaluate the Reactor Core Isolation Cooling System and Safe Shutdown Make-up Pump piping configuration and procedures to determine if similar conditions exist. This will be completed by December 1, 1996. (NTS# 2651809600204, SED)

5. Revise procedures as necessary following NTS# 2651809600204. This will be completed by March 1, 1997. (NTS# 2651809600205, OP).

6. Perfom a calculation to determine the minimum volume of trapped air in the HPCI system discharge piping which would cause an unacceptable water hammer. This will be completed by December 15, 1996. (NTS# 2651809600206, SED)

7. Submit a supplemental LER after the calculation in NTS# 2651809600205 is complete, if it is determined that the amount of trapped air present in the HPCI piping during this event would have caused an unacceptable water hammer. This will be completed by January 15, 1997. (NTS# 2651809600207, SED)

8. This event will be covered during mods and lessons learned training for licensed and non-licensed operators. This will be completed by May 1, 1997. (NTS# 2651809600208, TRN).

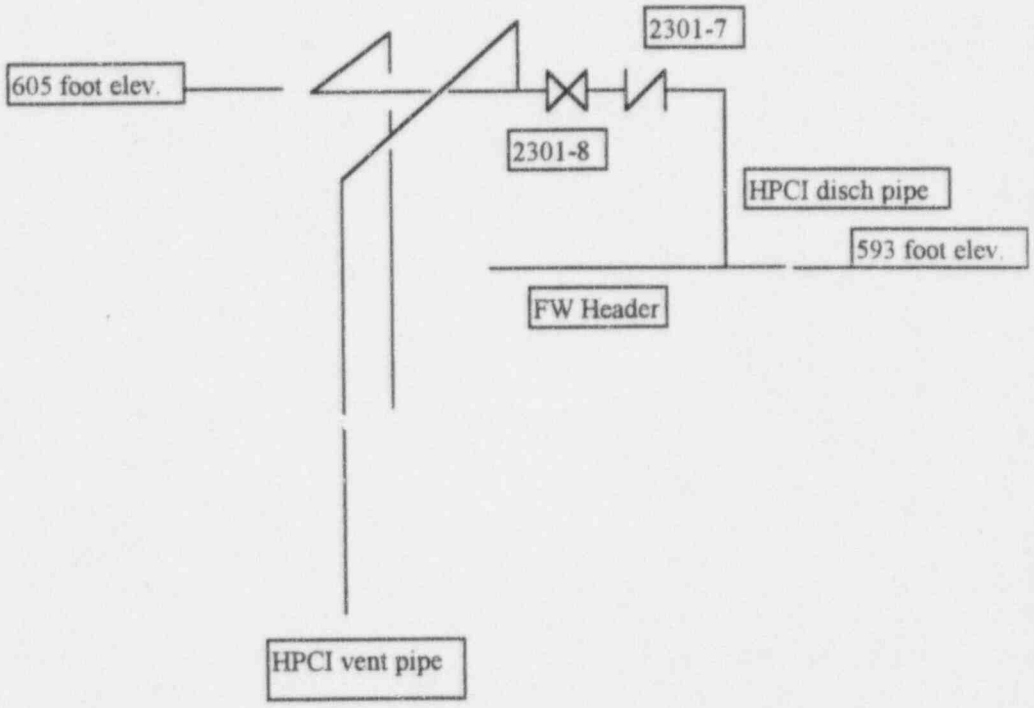
F. PREVIOUS EVENTS

Problem Identification Form #95-2301 identifies a similar event which occurred in August of 1995 on U-2 while the reactor was shutdown. The piping was filled prior to reactor start-up by running the HPCI cooling water pump. This is the only similar event identified during the root cause investigation. No other LERs, within the last two years, have been identified.

G. COMPONENT FAILURE DATA

There was no equipment failure associated with this event.

Figure 1


2301-7
605 foot elev.
2301-8
HPCI disch pipe
593 foot elev.
FW Header
HPCI vent pipe