



Public Service Electric and Gas Company P.O. Box 236 Hancocks Bridge, New Jersey 08038-0236

Nuclear Business Unit

October 9, 1995

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

Dear Sir:

HOPE CREEK GENERATING STATION  
DOCKET NO. 50-354  
UNIT 1  
LICENSEE EVENT REPORT 95-020-00

This Licensee Event Report entitled "Automatic Actuation of the High Pressure Coolant Injection System's Suction Path Swapover Engineered Safety Feature" is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv). This event is a recurrence of an event that occurred on July 3, 1995. We are currently conducting a thorough, in depth root cause analysis in order to determine the root cause of this event and take corrective actions to prevent recurrence in the future. A supplement to this Licensee Event Report will be provided to you by November 30, 1995.

Sincerely,

Mark E. Reddemann  
General Manager -  
Hope Creek Operations

SORC Mtg. 95-095

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**LICENSEE EVENT REPORT (LER)**

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ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0091, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

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TITLE (4)  
**Automatic Actuation of the High Pressure Coolant Injection System's Suction Path Swapover Engineered Safety Feature**

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 NAME	DOCKET NUMBER
09	08	95	95	-- 020	-- 00	10	09	95		05000
										05000

OPERATING MODE (9)	1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)								
POWER LEVEL (10)	100	20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)(B)	50.73(a)(2)(viii)					
		20.2203(a)(1)	20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(x)					
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71					
		20.2203(a)(2)(ii)	20.2203(a)(4)	x 50.73(a)(2)(iv)	OTHER					
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A					
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)						

LICENSEE CONTACT FOR THIS LER (12)

NAME <b>J. Zambuto</b>	TELEPHONE NUMBER (include Area Code) <b>(609) 339-3011</b>
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COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS

SUPPLEMENTAL REPORT EXPECTED (14)

<input checked="" type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE).	<input type="checkbox"/> NO	EXPECTED SUBMISSION DATE (15)	MONTH <b>11</b>	DAY <b>30</b>	YEAR <b>95</b>
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ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On September 8, 1995, at 1515 hours, an automatic actuation of the Engineered Safety Feature (ESF) associated with the High Pressure Coolant Injection (HPCI) System's suction path occurred during full power operation. HPCI is designed to initially inject water into the Reactor Pressure Vessel from the Condensate Storage Tank (CST). When the water level in the CST falls below a predetermined level or the Suppression Chamber (Torus) water level is high, the pump suction is automatically transferred to the Torus. Initial Torus water level was 76.8 inches on Safety Parameter Display System (SPDS) prior to the event. Various activities which affect sensed Torus water level were being conducted prior to the event. All equipment responded properly to the sensed Torus high water level signal. The NBU is currently conducting a thorough, in depth root cause analysis in order to determine the root cause of the event and take corrective actions to prevent recurrence. Areas being investigated include but are not limited to the allowable Torus level band, instrumentation, degraded equipment conditions, procedures, and simulator fidelity. A supplement will provide the root cause, contributing factors, and associated corrective actions to prevent recurrence.

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PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor (BWR/4)  
High Pressure Coolant Injection System: BJ, EIIS Identifier: BJ

IDENTIFICATION OF OCCURRENCE

TITLE (4): Automatic Actuation of the High Pressure Coolant Injection System's Suction Path Swapover Engineered Safety Feature

Event Occurrence: September 8, 1995  
Event Time: 1515 hours EST  
Discovery Date: September 8, 1995

CONDITIONS PRIOR TO OCCURRENCE

Plant in OPERATIONAL CONDITION 1 (Power Operation)  
Reactor Power 100% of rated, 1079 MWe

DESCRIPTION OF OCCURRENCE

On September 8, 1995 at 1515 hours, during normal full power operations, the Hope Creek Generating Station (HCGS) experienced an automatic actuation of an Engineered Safety Feature (ESF) when the pump suction path swapover on the HCPI system portion of the Emergency Core Cooling System (ECCS) occurred due to high Torus water level. All equipment associated with the ESF actuation functioned properly and the operator response to the event was in accordance with plant procedures and the requirements of HCGS's Technical Specifications. This occurrence is reportable as a Licensee Event Report under 10CFR50.73(a)(2)(iv) as "any event or condition that resulted in a manual or automatic actuation of any Engineered Safety Feature."

A Corrective Action Program Action Request 950908501 (Type: CR) was initiated on September 8, 1995 to determine the root cause and establish corrective actions for this event. In addition, the Nuclear Regulatory Commission (NRC) was notified in accordance with 10CFR50.72(b)(2)(ii), since an unplanned automatic ESF actuation is reportable as a notification to the NRC Operations Center within four hours of identification of such an event. Operations performed this notification at 1714 hours.

On September 8, 1995, the Residual Heat Removal (RHR) System was placed in Torus Cooling mode at 0247 hours to lower Torus water temperature. Torus water temperature was at 91 degrees F due in part to 3 weeping Safety Relief Valves (SRV). Torus water level was also higher than normal

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DESCRIPTION OF OCCURRENCE (Cont'd)

due in part to in leakage from the SRVs. Continual monitoring of Torus Level using: 1) the Safety Parameter Display System (SPDS) (which averages the two wide range level indications); and 2) the narrow range level indication was performed regularly during the shift.

Considering the recent July 3, 1995 HPCI Suction Swapover ESF actuation and the Torus water level conditions, operators discussed the potential need to lower Torus water level using the 'A' loop of Residual Heat Removal (RHR) as it was already in service in Torus Cooling Mode. The "RHR System Operation" procedure, HC.OP-SO.BC-0001, was referenced to determine whether an approved method existed for reducing Torus level using the 'A' RHR loop.

It was determined that procedural guidance did not exist to reduce level using the 'A' RHR loop. Methods to change the "RHR System Operation" procedure to allow use of the 'A' loop via the On The Spot Change (OTSC) process were discussed but dismissed by the operators. The reasons for dismissal were: 1) there is no automatic signal from the Primary Containment Isolation System for the 'A' loop of RHR, 2) the piping rating for the 'A' loop of RHR is 150 psi where as the 'B' loop of RHR is rated for 500 psi, and 3) a procedure existed to use 'B' RHR to letdown.

The possibility of using the 'B' RHR loop to reduce Torus level was also discussed. However, the operators believed that, in order to use the 'B' loop of RHR to reduce Torus level, an excessive number of component manipulations of safety systems were required. As a result, they discounted using the 'B' RHR loop. The operators were not aware of steps in the procedure which allowed using the 'B' loop of RHR to reduce level without these component manipulations.

Another method used at HCGS for controlling Torus water level is to use the Torus Water Clean-up Pump to pass Torus Water through the Fuel Pool Cooling and Clean-up System Filter Demineralizer and into the CST in accordance with procedure HC.OP-SO.EE-0001, entitled "Torus Water Cleanup System Operation." Operators understood that the system was impaired but called Radwaste to see if it could be used to reduce Torus water level. They were informed by Radwaste that the system remained unavailable for Torus level reduction, as was the case during the July 3, 1995 ESF actuation.

The need to reduce Torus water level was not seen as urgent. Relying on SPDS as primary indication, the operators believed that sufficient margin existed before reaching the trip setpoint. Consequently, they allowed Torus level reduction to be deferred to some point on the next shift when there were less activities scheduled.

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DESCRIPTION OF OCCURRENCE (Cont'd)

Drywell Nitrogen Makeup (inerting) was initiated at 1415. Drywell Nitrogen Makeup is required more frequently due to leakage of Nitrogen out of the Drywell through the open bypass valves around the moisture removal traps on the Primary Containment Instrument Gas Compressor. Nitrogen Makeup to the Drywell does cause a slight increase in Torus water level, until Nitrogen Makeup to the Torus equalizes the pressure between the Drywell and the Torus. The procedure for Drywell Nitrogen Makeup was not reviewed by the operators prior to the evolution.

Prior to the event, the SPDS indicated an average level of 76.8 inches. As mentioned previously, Torus water level reduction is required more frequently than typically is required due to in leakage. However, Torus level was being maintained within the Normal Torus Level Range of 75" to 78", as specified in the Operations Daily Surveillance Log.

At 1515 EST, the B1-C3 overhead alarm was received indicating Torus water level was high (i.e., had exceeded the trip setpoint of 78.5 inches) and the resultant ESF actuation occurred when the HPCI pump suction valve swapped from the CST to the Torus. The narrow range level indicator and recorder (LI/LR-4805) are the normal method to observe torus water level. The Torus water level narrow range indication was 77.8, while SPDS indicated 77.0. The trip units were not found in the tripped condition after the event, indicating that the high Torus water level was only momentary.

ANALYSIS OF OCCURRENCE

Per HCGS, Technical Specification (TS) 3.6.2.1, the allowed level, as indicated, for the Suppression Chamber is between 74.5 inches and 78.5 inches. Per TS Table 3.3.3-2, the HPCI Torus Level Trip Setpoint for the pump suction path ESF swapover is  $\leq 78.5$  inches with an Allowable Value of  $\leq 80.3$  inches.

Calibration checks were conducted on the instruments in both the wide range and the narrow range indication and actuation loops. The wide range instrumentation (i.e., transmitters, trip units, and indicators) was found to be within its calibration tolerances. The logic for the narrow range instrumentation is designed such that there are two channels (A and E), either of which can cause the HPCI suction swap on high Torus level. However, only the 'A' channel provides indication to the control room.

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ANALYSIS OF OCCURRENCE (Cont'd)

Channel 'A' was found to be calibrated approximately 0.1 inches high but still within its calibration tolerance, while channel 'E' was found out of calibration about 0.25 inches high. This transmitter out of calibration contributed to the HPCI suction swap occurring at a lower level than the 78.5 inches setpoint.

A review of calibration records over the last five years for the narrow range 'A' and 'E' transmitter was conducted to identify any trend in the transmitters being out of calibration. The 'A' transmitter was found out of calibration one time within the past 5 years. The 'E' transmitter had not been found out of calibration any other time within the past 5 years.

As mentioned previously, the Torus water level and Torus water temperature were higher than typical due in part to leakage into the Torus as a result of 3 weeping SRVs. Because of high Torus water temperature, Torus Cooling was placed in service. One method for controlling Torus water level, using the Torus Water Clean-up Pump to pass Torus Water through the Fuel Pool Cooling and Clean-up System Filter Demineralizer and into the CST, was unavailable, as was the case during the July 3, 1995 ESF actuation. In addition, Drywell Nitrogen Makeup is required more frequently due to leakage of Nitrogen out of the Drywell through the open bypass valves around the moisture removal traps on the Primary Containment Instrument Gas Compressor.

The operators were also unaware of a method to reduce Torus water level using the 'B' RHR loop that was available to them.

The LER on the July 3, 1995 ESF actuation of this system was reviewed in Licensed Operator Requalification Training. However, the shift operating crew did not expect an imminent trip of the high level instrumentation based on the indicated level.

The SPDS indication, which is easily read and is perceived to be more accurate because it is a digital output to one decimal point (i.e. one tenth inch), is the average of the wide range indicators. The wide range indicators, and ultimately SPDS, have a larger inaccuracy than the narrow range indication, even though the narrow range is displayed on a strip recorder and the smallest specified increment is one inch. The slight pressure increase, and the resultant level increase, from the Drywell Nitrogen Makeup was not readily apparent on the wide range instrumentation. The narrow range level indicator and recorder (LI/LR-4805) are the normal method to observe torus water level, as taught in Initial License Operator Training.

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ANALYSIS OF OCCURRENCE (Cont'd)

The operators were not aware that SPDS was fed by the wide range transmitters and that as a result the SPDS indication could be more inaccurate than the narrow range indication. The operators also did not know that the narrow range transmitters were the transmitters that feed the trip unit which generates the ESF actuation. Therefore, the operators were using the less accurate SPDS indications to influence their decision to not reduce Torus water level.

There is no guidance in the "Drywell Nitrogen Makeup" procedure as to the maximum Torus water level for which makeup could take place. In addition, the allowable Torus water level upper band of 78 inches, as specified in the daily surveillance log, does not consider evolutions that may affect Torus water level such as Drywell Nitrogen Makeup.

The Simulator fidelity does not include "total loop" accuracy allowances. When operators are being trained in the Simulator, the ESF actuation that causes HPCI suction swapover on high Torus water level occurs when both SPDS and the narrow range indicator are indicating 78.5 inches of water in the Torus. The simulator also does not model the affect that Drywell Nitrogen Makeup has on Torus water level. These simulator modeling limitations have contributed to operator reliance on less accurate instrumentation.

APPARENT CAUSE OF OCCURRENCE

The previous root cause analysis for the July 3, 1995 ESF actuation and the associated corrective actions were inadequate and ineffective in preventing recurrence of the event. This was a result of ineffective implementation of the then recently revised Corrective Action Program.

The NBU is currently conducting a thorough, in depth root cause analysis in order to determine the root cause of this event and take corrective actions to prevent recurrence. A supplement will provide the root cause, contributing factors, and associated corrective actions to prevent recurrence.

Areas being evaluated include, but are not limited to:

1. The allowable Torus upper level band of 78 inches, specified on the daily surveillance log, does not consider evolutions that may affect Torus level.

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APPARENT CAUSE OF OCCURRENCE (Cont'd)

2. One of the two narrow range transmitters was found out of calibration high by 0.25 inches.
3. Degraded Equipment Conditions:
  - Letdown via Torus Water Cleanup System was unavailable during this event and the previous ESF actuation.
  - SRV leakage requiring more frequent Torus cooldown and letdown.
  - Nitrogen leakage from drywell, via the PCIG system, requiring more frequent Drywell Nitrogen Make-up
4. Operators were not aware of recent revisions to procedures which were related to this event.
5. Simulator fidelity does not include "total loop" accuracy allowances. The simulator also does not model the affect that Drywell Makeup has on Torus water level. These simulator modeling limitations have contributed to operator reliance on less accurate instrumentation.

SAFETY SIGNIFICANCE

There is no negative safety impact introduced by the automatic transfer of the HPCI suction path.

The HPCI Torus Suction Valve automatically opens upon receipt of a low CST level or high Torus level. The automatic suction transfer has no impact on the initiation or operation (other than to shift to a more reliable suction source) of the HPCI system, nor on the conditions under which the system will isolate. The opening interlock itself provides increased system reliability. Therefore, there is no impact on the ability of HPCI to perform its intended function.

PREVIOUS OCCURRENCES

There was one previous occurrence of an unplanned HPCI suction swapover reported in LER 95-014 dated August 2, 1995.



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CORRECTIVE ACTIONS

1. The roles and responsibilities of the personnel assigned implementation of the CAP will be emphasized to the organization. Station Management will emphasize specific expectations to Station personnel regarding the rigor of this process in preventing repeat events. (11/10/95)
2. As an interim action, a night order was issued on 9/11/95 to administratively limit Torus water level to 77 inches as indicated on the narrow range indicator.
3. Calibration checks were completed for all Torus water level transmitters. The one narrow range transmitter found out of calibration was recalibrated.
4. Appropriate corrective maintenance will be completed on the Torus Water Clean-up System during Refueling Outage (RFO) 6.
5. Appropriate corrective maintenance will be performed on the weeping SRVs during RFO6.
6. Potential design changes are being evaluated to minimize Nitrogen leakage from the Drywell due to the Primary Containment Instrument Gas system and will be implemented during a PCIG system outage in 1996.
7. A supplement to LER 95-020-00 will be provided by 11/30/95.
8. The LER for the previous event of July 3, 1995 (LER 95-014-00) will be reviewed and revised as appropriate.