



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

Nuclear Business Unit

MAY 28 1996

LR-N96144

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

Dear Sir:

HOPE CREEK GENERATING STATION  
DOCKET NO. 50-354  
UNIT NO. 1  
LICENSEE EVENT REPORT NO. 96-016-00

This Licensee Event Report entitled "Unplanned High Pressure Coolant Injection System Inoperability Due to a Failed Fuse and Trip Unit Card Failure Caused by a Shorted Capacitor" is being submitted pursuant to 10CFR50.73(a)(2)(iv) and 10CFR50.73(a)(2)(v)(D).

Sincerely,

Mark E. Reddemann  
General Manager -  
Hope Creek Operations

JWK  
SORC Mtg. 96-055

C Distribution  
LER File

310030

9605310166 960528  
PDR ADOCK 05000354  
S PDR

The power is in your hands.

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Attachment A

The following item represents the commitment that Public Service Electric & Gas (PSE&G) is making to the Nuclear Regulatory Commission (NRC) relative to LER 354/96-016-00. The commitment is as follows:

1. The card that failed has been sent to an independent laboratory for failure analysis of the capacitor. The results of this analysis will be reviewed and, if needed, additional corrective actions assigned by August 29, 1996.

NRC FORM 366 (4-95)		U.S. NUCLEAR REGULATORY COMMISSION			APPROVED BY OMB NO. 3150-0104 EXPIRES 04/30/98 <small>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 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.</small>					
<b>LICENSEE EVENT REPORT (LER)</b> (See reverse for required number of digits/characters for each block)										
FACILITY NAME (1) <b>HOPE CREEK GENERATING STATION</b>					DOCKET NUMBER (2) <b>05000354</b>			PAGE (3) <b>1 OF 5</b>		
TITLE (4) <b>Unplanned High Pressure Coolant Injection System Inoperability Due to a Blown Fuse and Trip Unit Card Failure Caused by a Shorted Capacitor</b>										
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
04	27	96	96	-- 016	-- 00	05	28	96		<b>05000</b>
									FACILITY NAME	DOCKET NUMBER
										<b>05000</b>
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)								
1		20.2201(b)			20.2203(a)(2)(v)			50.73(a)(2)(i)		
POWER LEVEL (10)		20.2203(a)(1)			20.2203(a)(3)(i)			50.73(a)(2)(ii)		
100		20.2203(a)(2)(i)			20.2203(a)(3)(iii)			50.73(a)(2)(iii)		
		20.2203(a)(2)(ii)			20.2203(a)(4)			X 50.73(a)(2)(iv)		
		20.2203(a)(2)(iii)			50.36(c)(1)			X 50.73(a)(2)(v)(D)		
		20.2203(a)(2)(iv)			50.36(c)(2)			50.73(a)(2)(vii)		
LICENSEE CONTACT FOR THIS LER (12)										
NAME <b>John W. Karrick, Hope Creek LER Coordinator</b>								TELEPHONE NUMBER (Include Area Code) <b>609-339-5298</b>		
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)										
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDs		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPDs
B	BJ	CAP	R369	Y						
SUPPLEMENTAL REPORT EXPECTED (14)						EXPECTED SUBMISSION DATE (15)		MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE).						NO				
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)										
<p>On April 27, 1996, a power supply fuse blew in a trip unit card file for the High Pressure Coolant Injection (HPCI) system. This blown fuse resulted in the loss of certain HPCI turbine trip features, inoperability of the HPCI pump minimum flow valve, the inability of the HPCI pump suction valve to close upon receipt of a high steam flow isolation signal, and a HPCI pump suction swap to the suppression pool. The HPCI system was declared inoperable as a result of this condition. The blown fuse was caused by a shorted capacitor in the trip unit card file for the HPCI pump discharge pressure input for minimum flow valve operation.</p> <p>The significance of this event was minimal in that all redundant safety systems were operable and able to fulfill the HPCI accident mitigation function. Also, if it had become necessary, the HPCI system could have been manually initiated and monitored to provide high pressure injection. Corrective actions include the replacement of the blown fuse and card file and HPCI restoration. Additional failure analysis of the shorted capacitor is also being conducted.</p> <p>At 1726 on April 27, 1996 a four hour report to the NRC was made pursuant to 10CFR50.72(b)(2)(iii). This event is being reported pursuant to 10CFR50.73(a)(2)(iv) and 10CFR50.73(a)(2)(v)(D).</p>										

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
HOPE CREEK GENERATING STATION	05000354	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	2 OF 5
		96	- 16	- 00	

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

## PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor (BWR-4)

High Pressure Coolant Injection (HPCI) (EIS Identifier BJ)

## IDENTIFICATION OF OCCURRENCE

Event Date: April 27, 1996

Discovery Date: April 27, 1996

Condition Report: 960427110

## CONDITIONS PRIOR TO OCCURRENCE

The plant was in Operational Condition 1, 100% power. There were no structures, systems, or components that were inoperable at the start of this event that contributed to this event.

## DESCRIPTION OF OCCURRENCE

On April 27, 1996, at 1508 hours, the HPCI Suction Swap and several other HPCI system annunciators were received. Operators noted that narrow range suppression pool level indication had failed downscale. Suppression Pool level and Condensate Storage Tank (CST) levels were verified to be normal. Investigation by the operators also found the "HPCI Logic A Trip Unit Out of File or Power Failure" annunciator illuminated. Further investigation revealed a blown fuse in panel 10C617, which houses a number of HPCI system isolation and turbine trip units.

At 1609, operators declared the HPCI system inoperable based on the loss of HPCI turbine trip protection and minimum flow valve operability. Technical Specification (TS) action 3.5.1.c.1. (14 day LCO) was entered at that time.

Continued investigation into the effect of the blown fuse disclosed a loss of the HPCI Auto Isolation Division 1 logic on a HPCI High Steam Flow Isolation signal. As a result, at 1643, BJ-HV-F042, the HPCI Suppression Pool Suction valve, was closed pursuant to TS 3.3.2.b.1.a for a containment isolation trip function without an operable channel.

At 1726, a 4 hour report was made to the NRC pursuant to 10CFR50.72(b)(2)(iii). The loss of the single train HPCI system and the HPCI suction swap Engineered Safety Feature (ESF) actuation are being reported pursuant to 10CFR50.73(a)(2)(v)(D), and 10CFR50.73(a)(2)(iv), respectively.

Troubleshooting efforts revealed a failure in the E41-N650 HPCI pump discharge pressure trip unit that caused the fuse to blow. The trip unit with the failure was replaced, a new fuse was installed, and at 1935 on April 28, 1996, the HPCI system was returned to service.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
HOPE CREEK GENERATING STATION	05000354	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	3 OF 5
		96	- 16	- 00	

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

## ANALYSIS OF OCCURRENCE

The individual trip unit that failed was a Rosemount model number 510DU. The fuse that blew was the 24 VDC power supply fuse to the Z5A Rosemount trip unit card file. The Z5A card file contains 11 trip units. The blown fuse to this card file resulted in a loss of the following functions:

1. HPCI turbine trip on high turbine exhaust pressure.
2. HPCI automatic isolation Division 1 on HPCI steam supply line high flow.
3. HPCI minimum flow valve open permissive on HPCI pump discharge high pressure.
4. HPCI suction swap on high suppression pool level.
5. Suppression pool high and low level alert annunciators.
6. Narrow range suppression pool level indication.

A HPCI suction swap occurred in response to the loss of power associated with the blown fuse. The operators' indications after the fuse blew were consistent with the above list of lost functions. All logic channels and trip functions performed as designed under the loss of power condition.

During the troubleshooting efforts on April 27, the blown power supply fuse was replaced with a new fuse (10 amp) as part of a one time fuse replacement attempt. This fuse blew instantaneously, indicating excessive (>20 amps) current flow through the 24 VDC power supply circuit. Individual trip unit cards were pulled and a short was isolated to the E41-N650 HPCI pump discharge high pressure trip unit. Follow up analysis found that the ceramic power input filtering capacitor (C25) in the E41-N650 card had shorted to ground causing the power supply fuse to blow.

The card and capacitor have been in service for 7 years and 10 months. The trip unit was built in 1981. There is no service life specification listed in vendor information. No maintenance or evolutions were in progress that had the potential to effect the Z5A card file which contained the E41-N650 trip unit. A review of tagouts was performed to determine if any fuses were pulled in the card or in its vicinity. There were no such tagouts performed.



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
HOPE CREEK GENERATING STATION	05000354	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	4 OF 5
		96	- 16	- 00	

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

## APPARENT CAUSE OF OCCURRENCE

The HPCI system was declared inoperable due to the loss of turbine protection and inoperability of the HPCI pump minimum flow valve. The loss of turbine protection and minimum flow operability was caused by the loss of 24 VDC power to card file Z5A that resulted from the blown fuse. The blown fuse was caused by the excessive current that was generated from the shorted input filter capacitor.

## ASSESSMENT OF SAFETY CONSEQUENCES AND IMPLICATIONS

During the period of HPCI unavailability associated with this event, the Core Spray, Low Pressure Coolant Injection, Automatic Depressurization, and Reactor Core Isolation Cooling systems remained operable. These systems were available to mitigate the consequences of an accident. Variations in plant operating mode would not have affected the significance of this event.

The HPCI system is considered a single train safety system, therefore any unplanned inoperability constitutes a condition that alone could have prevented the fulfillment of a safety function. Had the HPCI system received an initiation signal after the fuse had blown, it could have functioned to provide high pressure injection, but would have done so without the protective and isolation features listed above. However, compliance with TS action statements for isolation capability resulted in isolating the pump suction valve, which would have required manual operator action to restore HPCI in the event of an initiation signal.

The suction swap of the HPCI pump suction valves is considered an ESF actuation. In this event, the swap was due to the loss of power to the CST low level trip unit and is considered an invalid signal since there was no CST low level condition. However, the ESF reporting requirements apply because the function had not already been completed nor was the system properly removed from service when the swap occurred.

## PREVIOUS OCCURRENCES

A review of LERs at the Hope Creek Generating Station that involved blown fuses or shorted capacitors was performed. LERs 89-014, 91-007, and 94-012 describe blown fuses in 3 different systems, none of which were caused by shorted capacitors. The corrective actions from these 3 LERs are not expected to have prevented this event. Of the previously reported HPCI system inoperability LERs, none were caused by blown fuses.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6)			PAGE (3)
HOPE CREEK GENERATING STATION	05000354	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	5 OF 5
		96	- 16	- 00	

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As a result of LER 94-012, a corrective action involving fuse verification was initiated. This effort is still in progress and was aimed at resolving potential generic installation discrepancies of fuses. This event did include a similar discrepancy in that the fuse that blew was rated for 5 amps versus the required 10 amps. However, the shorted capacitor drew enough current to have blown a 10 amp fuse and did so instantaneously when the fuse replacement was attempted. The fuse verification effort had not yet covered the panels involved in this event and if it had, it would not have been expected to have prevented this event.

## CORRECTIVE ACTIONS

1. The trip unit card and fuse were replaced and the HPCI system restored on April 28, 1996.
2. The card that failed will be sent to an independent laboratory for failure analysis of the capacitor. The results of this analysis will be reviewed and, if needed, additional corrective actions assigned by August 29, 1996.