



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

Nuclear Business Unit

JAN 27 1997  
LR-N970056

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

HOPE CREEK GENERATING STATION  
DOCKET NO. 50-354  
UNIT NO. 1  
LICENSEE EVENT REPORT NO. 96-029-00

Dear Sir:

This Licensee Event Report entitled "Unplanned Reactor Core Isolation Cooling System Inoperability Due to a Stuck Open Governor Valve Caused by Stem Corrosion" is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(v).

Sincerely,

Mark Bezilla  
General Manager,  
Hope Creek Operations

JWK/mrh  
SORC Mtg. 97-005

C Distribution  
LER File

9702040150 970127  
PDR ADOCK 05000354  
S PDR

The power is in your hands.

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Attachment A

The following items represent the commitments that the Public Service Electric and Gas Company is making to the Nuclear Regulatory Commission relative to LER 354/96-029-00:

1. Consistent with the recommendations of the OEF documents, the RCIC governor valve stem is being exercised on a weekly basis to qualitatively assess the force to move the stem. This action will continue until the stem material is upgraded.
2. A design change to upgrade the stem material will be completed by April 30, 1997.
3. This event will be reviewed and discussed with Hope Creek System Managers for lessons learned by February 28, 1997.
4. A sample of OEF responses will be reviewed to verify adequacy of the response. This review will be completed by March 31, 1997.

## LICENSEE EVENT REPORT (LER)

(See reverse for required number of  
digits/characters for each block)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.

FACILITY NAME (1)

Hope Creek Generating Station

DOCKET NUMBER (2)

05000354

PAGE (3)

1 OF 5

TITLE (4)

Unplanned Reactor Core Isolation Cooling System Inoperability Due to a Stuck Open Governor  
Valve Caused by Stem Corrosion

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	
12	28	96	96	-- 029	-- 00	01	27	97	FACILITY NAME	DOCKET NUMBER	
										05000	
									FACILITY NAME	DOCKET NUMBER	
										05000	
OPERATING MODE (9)		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)								
			20.2201(b)			20.2203(a)(2)(v)			50.73(a)(2)(i)(B)		50.73(a)(2)(viii)
POWER LEVEL (10)		100	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)			50.73(a)(2)(iv)		OTHER
			20.2203(a)(2)(iii)			50.36(c)(1)			X 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

John W. Karrick, Hope Creek LER Coordinator

TELEPHONE NUMBER (Include Area Code)

(609) 339-5298

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC
X	BN	SCV	T147	Y					

## SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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## ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On December 28, 1996, during the beginning of a routine In-Service Test, the Reactor Core Isolation Cooling (RCIC) system turbine tripped on overspeed. The overspeed was caused by a stuck open turbine governor valve which is designed to throttle closed in response to turbine speed during system startup. The governor valve stuck open due to corrosion of the valve stem. The corrosion was most likely caused by the combination of a susceptible valve stem material, and dissimilar materials and impurities in the valve packing. Previous industry Operating Experience Feedback (OEF) information exists, which if fully implemented, could have prevented this event.

The valve stem was replaced and the RCIC system was returned to service on December 30, 1996. A design change to upgrade the stem material will be completed and the valve stem will be exercised weekly until the design change is completed. Other corrective actions include appropriate disciplinary actions, discussion of this event with System Managers, and a review of other OEF responses. This event resulted in a brief unavailability of the RCIC system during which time the High Pressure Coolant Injection system was available to complete the same function; therefore the safety consequences were minimal. A four hour notification was made at 1325 on December 28, 1996 pursuant to 10CFR50.72(b)(2)(iii)(D).

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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)  
Reactor Core Isolation Cooling System - EIIS Identifier {BN}

IDENTIFICATION OF OCCURRENCE

Event date: 12/28/96  
Discovery date: 12/28/96  
Problem Report: 961228069

CONDITIONS PRIOR TO OCCURRENCE

The plant was in OPERATIONAL CONDITION 1 (POWER OPERATION) at 100% of rated thermal power. There were no other structures, systems, or components that were inoperable at the beginning of the event that contributed to the event.

DESCRIPTION OF OCCURRENCE

On December 28, 1996, at 1101 hours, during scheduled In-Service Testing (IST) of the Reactor Core Isolation Cooling (RCIC) pump, the RCIC Turbine tripped on mechanical overspeed approximately seven seconds after the pump was started. The system was declared inoperable and a 14 day Limiting Condition for Operation (LCO) was entered pursuant to Technical Specification (TS) 3.7.4. A four hour notification was made at 1325 hours pursuant to 10CFR50.72(b)(2)(iii)(D) as an event or condition alone that could have prevented fulfillment of a safety function.

The overspeed condition resulted from failure of the governor valve to properly respond. The governor valve is normally open in standby, and did not throttle closed on pump start due to corrosion on the governor valve stem. The valve stem was replaced, the IST was successfully completed, the system was restored to an operable status, and the LCO was exited on December 30, 1996.

ANALYSIS OF OCCURRENCE

Several industry Operating Experience Feedback (OEF) documents exist regarding similar overspeed trips at other facilities. Within this OEF information, it was identified that the corrosion and failure rate of the governor valve stems was higher for those stems made of 410 Stainless Steel (SS) which were liquid nitrided versus the original gas nitrided stems. According to INPO SER 4-95, the change in the nitriding process occurred in 1977. Other than the procurement dates, it is not possible to identify a gas nitrided stem from a liquid nitrided stem and the part numbers for these stems are identical regardless of which process was used.



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ANALYSIS OF OCCURRENCE (continued)

The initial HCGS response to the original OEF information concluded that no immediate design change to upgrade the stem material was required. The basis for that conclusion included a good maintenance history of the initial stems (gas nitrided), previously existing recurring tasks to perform 18 month inspections of the stem, good steam admission valve performance regarding leakage, good plant chemistry and chemical control programs, and good IST performance history of the RCIC turbine. The maintenance procedure for overhauling the governor valve was revised to include details on the proper sequence of the carbon spacers and flat washers used in the valve's packing arrangement.

As a result of additional OEF information being received, a design change request (DCR 4HE-0312) was issued by the System Manager during Refuel Outage (RFO) 6 (November 1995-March 1996) to replace the spacers and washers with high carbon content, low sulfur materials. Replacement of the valve stem with upgraded materials (e.g. Inconel 718) was not part of this DCR. This DCR was not included in the scope of RFO-6 and at the time of this event, it had not yet been implemented.

The stem material at plant startup (1986) was gas nitrided 410 SS and remained in service until 1990 when it was replaced with a similar gas nitrided stem as a result of routine Preventative Maintenance (PM) activities. The 1990 stem remained in service until RFO-6 (March 1996) when it was replaced with a liquid nitrided 410 SS stem, again as a result of PM inspections. Engineering personnel failed to recognize the increased failure potential associated with the installation of the liquid nitrided stem in RFO-6.

The OEF program and missed opportunities for event mitigation have been discussed in LERs 95-033-14, 95-016-02, 95-017-00, and 95-022-00. OEF Program improvements have occurred, including generation of Corrective Program Action Requests to track OEF reviews. These improvements have been effective in communicating the incoming OEF information to station personnel. To ensure the station responses to the OEF information have been adequate, a sample of OEF closure documents will be reviewed as a corrective action to this event.

APPARENT CAUSE OF OCCURRENCE

The overspeed condition was caused by corrosion induced binding of the RCIC governor valve stem. Similar to the conclusions in the OEF documents, the precise corrosion mechanism at the HCGS has not been determined. The combination of the susceptible liquid nitrided 410 SS stem, potential impurities in the spacers and washers, and sulfur content in the packing material is considered the most probable source of corrosion.

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APPARENT CAUSE OF OCCURRENCE (continued)

Hope Creek station personnel failed to avert this event by untimely and incomplete implementation of well documented recommendations from OEF information. This failure was caused by inadequate review and response to the initial and follow-up OEF information by System Engineering.

ASSESSMENT OF SAFETY CONSEQUENCES

The RCIC system is designed to ensure that sufficient reactor water inventory is maintained in the reactor vessel to allow for adequate core cooling. This prevents reactor fuel from overheating during the following conditions:

1. When the vessel is isolated and maintained in the hot standby condition.
2. When the vessel is isolated and accompanied by loss of coolant flow from the reactor feedwater system.
3. When a complete plant shutdown is started under conditions of loss of the normal feedwater system and before the reactor is depressurized to the level for the operation of the shutdown cooling system.

The RCIC governor valve stem was replaced and the system was successfully restored to an operable status within 2 days. The High Pressure Coolant Injection (HPCI) system, which is capable of fulfilling the above core cooling functions, remained operable during the time required to restore the RCIC system to an operable status. This event resulted in minimal safety consequences.

PREVIOUS OCCURRENCES

A review of Hope Creek LERs over the last two years revealed LER 95-019-00 and 96-003-00 which involved issues that impacted RCIC system availability. However, the causes and corrective actions in those LERs were unrelated to this event. The OEF program and missed opportunities for event mitigation have been discussed in LERs 95-033-14, 95-016-02, 95-017-00, and 95-022-00. OEF Program improvements have occurred, including generation of Corrective Program Action Requests to track OEF reviews. These improvements have been effective in communicating the incoming OEF information to station personnel. To ensure the station responses to the OEF information have been adequate, a sample of OEF closure documents will be reviewed as a corrective action to this event.

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CORRECTIVE ACTIONS

1. Due to parts availability, the stem installed in response to this event was the 410 SS liquid nitrided material. Consistent with the recommendations of the OEF documents, the stem is being exercised on a weekly basis to qualitatively assess the force to move the stem. This action will continue until the stem material is upgraded.
2. A design change to upgrade the stem material will be completed by April 30, 1997.
3. This event will be reviewed and discussed with Hope Creek System Managers for lessons learned by February 28, 1997.
4. Appropriate disciplinary action for the System Engineering personnel involved has been completed.
5. A sample of OEF responses will be reviewed to verify adequacy of the response. This review will be completed by March 31, 1997.

REFERENCES

INPO SER 4-95.

NRC Information Notice 94-66, Supplement 1.

NRC 1995 Region IV Inspection Report Results on Terry Turbine Systems.

Dresser-Rand to Salem/PSE&amp;G letter dated March 22, 1993.

Terry Turbine User's Group Newsletter dated August, 1996.