



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

Nuclear Business Unit

FEB 01 1996

LR-N96025

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

Attn.: Document Control Desk

Dear Sir:

HOPE CREEK GENERATING STATION
LICENSE NO. NPF-57
DOCKET NO. 50-354
UNIT NO. 1
LICENSEE EVENT REPORT NO. 95-026-01

This supplemental Licensee Event Report entitled
"Nondetectable Failure: Shutdown LCO Action Statement
Entered Due to Inoperable Accumulator Trouble Annunciator"
is being submitted on a voluntary basis.

Sincerely,

M. E. Reddemann
General Manager -
Hope Creek Operations

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PDR ADOCK 05000354
S PDR

Attachment LER
SORC Mtg. 96-012
JJK

C Distribution
LER File 3.7

The power is in your hands.

120063

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 500 HR. 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.

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TITLE (4)
Nondetectable Failure: Shutdown LCO Action Statement Entered Due to Inoperable Accumulator Trouble Annunciator

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
10	26	95	95	026	01	01	29	96		05000
										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) 092	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)	<input checked="" type="checkbox"/> OTHER	Specify in Abstract below or in NRC Form 366A Voluntary Report					
	20 2203(a)(2)(iii)	50 36(c)(1)	50 73(a)(2)(v)							
	20 2203(a)(2)(iv)	50 36(c)(2)	50 73(a)(2)(vii)							

LICENSEE CONTACT FOR THIS LER (12)

NAME Jeff Keenan, Hope Creek Licensing	TELEPHONE NUMBER (include Area Code) 609 - 339 - 5429
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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
				N					

SUPPLEMENTAL REPORT EXPECTED (14)

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

On October 20, 1995, during a weekly control rod Technical Specification (TS) surveillance test it was discovered that the Reactor Manual Control System (RMCS) Display Memory Module (DMM) was locked up and therefore inoperable. Failure of the RMCS or DMM renders the Control Rod Scram Accumulator alarm inoperable. The operator correctly entered the applicable action statement for an inoperable control rod scram accumulator alarm. The RMCS was declared operable and the action statement exited before affecting any shutdown actions. This event was conservatively reported due to questions regarding the reportability of events requiring shutdown statements. After further review, including an analysis of NUREG-1022, it is concluded that this event does not need to be reported. Corrective actions have been developed and will be pursued to prevent recurrence of this event. This report is being issued on a voluntary basis.

Causes of this event are the power supply to the DMM operating erratically, annunciator design deficiencies, and less than adequate operator verification and validation. Corrective actions include development of RMCS preventative maintenance tasks, operator training, procedural enhancements, and hardware modifications to the RMCS.

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PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor (BWR/4)
Annunciator System, EIIS Identifier - AB

IDENTIFICATION OF OCCURRENCE

Event Date: October 20, 1995 and October 26, 1995
Initially determined reportable: October 30, 1995
Report Date: November 29, 1995
Supplement Date: January 29, 1996

DESCRIPTION OF OCCURRENCE

On 10/20/95, at 2104 hours, a weekly Control Rod Drive exercise, was initiated. This surveillance test fulfills Technical Specification (TS) requirement 4.1.3.1.2 for control rod operability. Rod 02-19 was selected. The Reactor Operator (RO) gave an insertion command for the rod. The insertion command caused no response in rod position indication on the Four Rod Display (FRD) or the Full Core Display (FCD). The FRD still indicated Position 48 and the FCD red light was still illuminated signifying the rod was full out. Furthermore the insert and settle lights on the Rod Select Module (RSM) did not illuminate. This would indicate no rod movement. The RO perceived that either the insert push-button contacts were dirty or the push-button was not depressed fully.

The RO gave another insert command to rod 02-19 and subsequently rod 10-11, with similar results. The operator failed to notice that the rod select light on the FCD for the selected rod was not illuminated. The RO communicated the condition to the Work Control Nuclear Shift Supervisor (WC NSS) who witnessed the next insert command. It was noted that control rod, 42-03, was indicating "selected" on the FCD even though rod 02-19 was selected on the RSM. Insertion of rod 42-03 was attempted and failed to indicate any movement on the FCD, FRD or RSM. The LCO action statement was entered for TS 3.1.3.7 due to the inoperability of the control rod position indication system.

The WC NSS observed the inserted rod positions on the NSSS computer. Rod 02-19 had been inserted three notches to position 42 and both rod's 10-11 and 42-03 had been inserted one notch to position 46. TS 3.1.3.5 for the control rod scram accumulators was not entered at this time.

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At the same time the NSS entered abnormal procedure HC.OP-AB.ZZ-106(Q) due to the symptom of a RMCS fault. A determination was later made that TS 3.1.3.7 should not be invoked since both the NSSS computer and Control Room Integrated Display System (CRIDS) contained rod position information.

Before troubleshooting, the three rods previously inserted were withdrawn at 2133 using the NSSS computer for rod position indication. The fault/status lights on the DMM were checked. The status lights on each card indicated that the internal clock was inoperable.

At 2228, the Display Memory Module (DMM) logic 5 Volt power supply was down-powered and the source selector and display clock cards were reseated. The Operator entered TS LCO 3.1.3.5 (Control Rod Scram Accumulators) because it was known that the control rod scram accumulator alarms would be inoperable during the time the FCD was down-powered. When the system was re-powered, two HCU Accumulator alarms came in which alerted the operators to the fact the HCU accumulator alarms had been inoperable during the RMCS lock-up.

Several control rods were then selected and the FCD rod select light was verified to be correctly indicating the selected rod. Until the problem was verified to be corrected a temporary log was set up to select a different rod every hour to verify that RMCS was not locked-up and the HCU accumulator alarms remained operable.

On 10/26/95, at 1708, while Hope Creek was at approximately 92.4% power, and during the performance of the temporary log rod selection process, RMCS was again found to be in a lock-up condition. The four lights indicating the clock inoperable condition were lit. The Operator entered LCO 3.1.3.5 for HCU accumulator alarms and complied with the "otherwise, be in at least HOT SHUTDOWN within 12 hours" action statement. There were no attempts at rod motion during this occurrence of RMCS lockup.

The "Volts OK/Low" light on the 5 Volt power supply was lit indicating the voltage was below the low voltage setpoint. While attempting to take voltage readings, the lock-up condition cleared itself. Recorders were hooked up to continuously monitor voltages to narrow down the location of the fault should it reoccur. At 1927, after evaluation and discussion, the DC buffer card was replaced. At 2225 the LCO was exited due to the clearing of the fault in the RMCS and the twelve hour LCO was exited before affecting any shutdown actions. There have been no known lock-ups of the RMCS system attributed to the DMM since the above occurrence.

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ANALYSIS OF OCCURRENCE

The operator failed to verify and validate the position of movement of the control rods by alternative means when he did not receive the expected results from the insert signals. There was a lack of rod movement by observing the FRD, FCD and RSM which appeared to be independent sources of rod position indication.

The operator training lesson plan states the following:

"To prevent inadvertent operator errors, reactor performance and rod positions are constantly monitored by systems which either give an alarm demanding operator attention or completely block all rod movement until the error has been corrected."

Since the failure mode of the RMCS that has been identified in this event was not previously known to the operators or training center personnel, the above statement was believed to be true. Consequently, the operator is given a false sense of security that rods are not going to move if RMCS has a fault. Shift personnel questioned were very surprised that this mode of failure is possible.

A contributing cause is based on prior experience with the push-buttons. The rod control push-button had a history of not always working. Dirty contacts has been the attributed mode of failure. As a consequence several push-buttons were replaced coming out of the last refueling outage and the 7/12/95 forced outage.

For the 10/20 event, the maximum time that the "lock-up" DMM condition could have existed is 13.5 hours. This information was derived based on log data and interviewing the RO on that shift.

On 10/26, the operators entered the "shutdown" statement of the LCO 3.1.3.5. The RMCS system was in a locked-up condition for a maximum of 58 minutes before the operators discovered the condition.

Prior Similar Occurrences

A similar hardware failure occurred in 1990 wherein the FCD did not respond to selected rods. The source selector, clock, DC buffer and receiver cards were removed and re-seated. No evidence of a recurrence of this problem from 1990 to 1995 was found in the search.

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Cause of the Occurrence

Equipment

The root cause of the hardware failure has been determined to involve power supply problems to the display memory module (DMM) card file. Specifically, during troubleshooting the output voltage from the power supply was found to be erratic. In addition, the screw that holds the clamp to the power supply was found to be loose. Upon tightening the connection the voltage supplied to the DMM card file improved. Furthermore, the setpoint on the DC buffer card for the low voltage cutout was found to be set a little high which would have allowed the system to lock up prematurely. Finally, the edge connectors of some of the DMM file data memory cards were found to be dirty and have oxidation buildup.

An additional contributing factor involved an annunciator design deficiency. There was lack of a positive failure annunciator or other indication to alert operators to a DMM lock-up.

Human Performance and Training Issues

Significant causal factors associated with operator actions include:

- The RO and the WC NSS attempted to continue the surveillance test despite problems with the RMCS.
- The RO failed to verify and validate the position or movement of the control rods when he did not receive the expected results from the insert signals.
- The RO failed to check the select light on the full core display.

Other contributing causal factors associated with operator actions include:

- previous experience with the insert push-button,
- inadequate training and lesson plan,
- the failure to identify the inoperability of the HCU Accumulator is attributed to the inability in discerning the interrelationship between the control rod scram accumulator alarm and the RMCS, and
- the similar hardware failure at Hope Creek was not incorporated into the lesson plan or the simulator training.

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Safety Significance

The safety significance of this event was minimal under these core conditions. However under different core conditions and with much more severe rod mispositionings this scenario could have led to localized fuel damage. Nothing that occurred in the event could have degraded the ability of the reactor to reach a safe shutdown condition.

The Accumulators remained capable of performing their safety function throughout this event. The as-found nitrogen pressure within the Accumulators was well above the minimum limit of 940 psig required by the TS. The alarm function was the only attribute of operability that was effected.

In the event all the accumulators became depressurized without detection, the Control Rod Drive (CRD) system would still have been capable of shutting down the reactor by scrambling all control rods. In this case, the flange check valves in the CRD mechanisms open to apply reactor pressure below the control rod drive pistons. Scram time using only reactor pressure is only fractions of a second slower than with the accumulator assistance.

Corrective Actions

1. Power supply to the RMCS DMM was replaced. Troubleshooting was completed, including tightening loose connections, card cleaning, and low voltage checkout adjustment.
2. Review preventative maintenance tasks associated with the RMCS system for proper frequency and the addition or establishment of activities that will ensure connections are secure, setpoints are correct, and panels are clean. This review is to be completed by May 31, 1996.
3. Before RFO6 restart, proper guidance and direction for identifying and rectifying locked-up conditions of the RMCS will be provided to the RO's. This includes consulting the NSSS computer (or equivalent CRIDS screen) for rod position indication whenever the expected results are not achieved.

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4. A rolldown of this event to all ROs will be completed before unit restart from the current refueling outage. This rolldown will include:
 - a brief description of this event,
 - reaffirmation of expectations regarding the use of system operating procedure guidance,
 - expectations regarding problem identification threshold when equipment is not functioning as designed,
 - stress the importance of qualification, validation and verification of control room indications, particularly when unexpected or uncertain conditions are observed.
5. A modification was implemented to actuate an annunciator to identify an inoperable DMM condition. The modification has been installed and is in service.
6. Incorporate the RMCS failure into Operator simulator and classroom training and train all licensed operators. The following will be included in the training:
 - the purpose of verifying the rod select light on the FCD,
 - known failure mechanisms and their consequences that affect the Rod Select Module panel lights, the Full Core Display and the Four Rod Display,
 - cautions concerning reliance on using the FCD, FRD and/or the RSM as a means of checking the operability of the FCD, FRD and/or the RSM due to their lack of independence,
 - the NSSS computer (or equivalent CRIDS screen) should be consulted for rod position indication whenever the expected results are not achieved, and
 - caution that the HCU accumulator alarms are inoperable when the DMM locks-up,
 - identify the affected systems and components of a locked-up RMCS condition, including the affected TS LCOs.

The above items are to be completed by 6/30/96.
7. To address potential generic hardware implications, a review of procedures for periodic maintenance on power supplies in TS applicable annunciator/display systems will be conducted. This review will be completed by 6/30/96.
8. The procedure frequency and tasks will be revised as necessary to reflect lessons learned from this event. These revisions will be completed by 8/31/96.
9. The appropriate level of personnel accountability has been administered to the RO and NSS involved for failing to verify all control room indications.