NORTHEAST UTILITIES
The Connecticut Light And Power Company
Western Massachusetts Electric Company
Holyoke Water Power Company
Northeast Utilities Service Company
Northeast Nuclear Energy Company

General Offices Selden Street, Berlin Connecticut

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Re: 10CFR50.73(a)(2)(iv)
December 24, 1990
MP-90-1333

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

Reference: Facility Operatin' :ense No. NPF-49
Docket No. 50-
Licensee Even ort 90-019-01

Gentlemen:

This letter forwards Licensee Event Report 90-019-01 required to be submitted by December 28, 1990, in accordance with Licensee Event Report 90-019-00. Licensee Event Report 90-019-00 was submitted pursuant to 10CFR50.73(a)(2)(iv), any event or condition that resulted in automatic actuation of the Reactor Protection System (RPS).

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

FOR: Stephen E. Scace
Director, Millstone Station

BY: Carl H. Clement
Millstone Unit 3 Director

SES/FM:ljs

Attachment: LER 90-019-01

cc: T. T. Martin, Region I Administrator
W. J. Raymond, Senior Resident Inspector, Millstone Unit Nos. 1, 2 and 3
D. H. Jaffe, NRC Project Manager, Millstone Unit No. 3

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NRC Form 366 (6-89)

U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

FACILITY NAME (1): Millstone Nuclear Power Station Unit 3

DOCKET NUMBER (2): 0 5 0 0 0 4 2 3

PAGE (3): 1 OF 0 3

TITLE (4): Reactor Trip Due to Dropped Rod Due to Broken Cable to Stationary Gripper

EVENT DATE (5) MONTH	DAY	YEAR	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	REPORT DATE (7) MONTH	DAY	YEAR	OTHER FACILITIES INVOLVED (8) FACILITY NAMES	DOCKET NUMBER(S)
0 6	0 6	9 0	9 0	0 1 9	0 1	1 2	2 4	9 0		0 5 0 0 0
										0 5 0 0 0

OPERATING MODE (9): 1

POWER LEVEL (10): 1 0 0

THIS REPORT IS BEING SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

20.402(b)	20.405(c)	X 50.73(a)(2)(iv)	73.71(b)
20.405(a)(1)(i)	50.36(c)(1)	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, NRC Form 366A)
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
Frances Marshall, Engineer, Ext. 5400	AREA CODE 2 0 3 4 4 7 - 1 7 9 1

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

CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFAC-TURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE)   X NO

EXPECTED SUBMISSION DATE (15): MONTH | DAY | YEAR

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

On June 6, 1990, at 0618 hours with the plant in Mode 1 at 100% power, 587 degrees Fahrenheit and 2250 psia, an automatic reactor trip from a negative flux rate signal occurred due to a dropped control rod.

The cause of this event was a broken connection in the stationary gripper coil power cable for rod G13. This single dropped rod resulted in a negative flux rate signal on two Power Range Detectors, thereby resulting in a reactor trip signal. The root cause of the broken connection was corrosion at the conductor/pin interface.

As immediate corrective action control room operators performed the actions required by the applicable emergency operating procedure. The broken connector was replaced. A functional test was performed by fully withdrawing and then inserting the affected rod. Long term corrective action will be to inspect and replace connectors as necessary during the third refueling outage.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (6) YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	PAGE (3)
Millstone Nuclear Power Station Unit 3	0 5 0 0 0 4 2 3	9 0	— 0 1 9	— 0 0	0 2 OF 0 3

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

I. Description of Event

On June 6, 1990, at 0618 hours with the plant in Mode 1 at 100% power, 587 degrees Fahrenheit and 2250 psia, an automatic reactor trip from a negative flux rate signal occurred due to a dropped control rod.

At the time of the trip, operators verified that the reactor trip and bypass breakers were open, that all control rods were fully inserted, and that neutron flux was decreasing. A Feedwater Isolation signal was received due to low Reactor Coolant System Average Temperature following the trip. An Auxiliary Feedwater actuation occurred as a result of a steam generator low-low level signal. These are normal plant responses following a trip from 100% power. No additional engineered safety features were required or initiated. There were no operational, maintenance, or construction activities in progress at the time which affected the event. Plant stability, based on Reactor Coolant System Average Temperature, was achieved at approximately 0638 hours on June 6, 1990.

II. Cause of Event

The cause of the dropped rod was a broken connection in the stationary gripper coil power cable for rod G13 in Shutdown Bank B. The single dropped rod resulted in a negative flux rate signal on two out of four Power Range Channels, thereby meeting the required logic for a reactor trip signal.

The root cause of the broken connection was corrosion at the conductor/pin interface, caused by semi-fluid material found inside the connector. The intended material inside the connector is a hard cured epoxy resin potting compound to seal out moisture. The cable and connector assembly were sent to an independent materials testing facility for analysis. The material found was not conclusively identified, but it was determined to be corrosive upon contact with bare metal, such as the conductor wire.

The connector cable failure affected the Rod Control System in the following manner. To hold a control rod in a given position, a holding current is applied to the stationary gripper coil. This coil is mounted outside the Control Rod Drive Mechanism (CRDM) pressure housing. The coil is magnetically coupled to the stationary gripper arm assemblies, which are inside the CRDM pressure housing. The gripper arms engage with circumferential grooves on the drive rod assembly, which is in turn connected to the affected control rod. If power to the stationary gripper coil is lost, the magnetic flux holding the gripper arms in place will be interrupted. The gripper arms will disengage from the drive rod, and the control rod will be released. Thus, when the G13 stationary gripper coil connector broke, power to the coil was lost, and the rod fell from its fully withdrawn position.

Because rod G13 is located on the core periphery, excore Power Range Channels 42 and 44 detected the rapid drop in nuclear power due to the falling rod. A reactor trip signal will be generated when two out of four Power Range channels generate a rate trip. As a result, a high negative flux rate trip signal was generated on both of these channels. The setpoint for this signal is a change of less than or equal to 5% rated thermal power with a time constant of greater than or equal to 2 seconds.

III. Analysis of Event

This event is being reported in accordance with 10CFR50.73(a)(2)(iv) as an event or condition that resulted in automatic actuation of any Engineered Safety Feature, including the Reactor Protection System. Immediate notifications were made in accordance with 10CFR50.72(b)(2)(ii).

There were no significant safety consequences due to this event. The intended design function of the negative rate trip is to mitigate the effects of a multiple rod drop event at high power. Multiple dropped rods, without a subsequent reactor trip, could cause local flux peaking, resulting in a localized, non-conservative Departure from Nucleate Boiling Ratio (DNBR) values. By initiating a reactor trip, and thereby causing full insertion of all control rods, the negative rate trip prevents these limiting DNBR values from occurring.

Although this trip signal protects against multiple dropped rods, discussions with the fuel vendor indicated that under certain conditions, a single dropped rod could cause a reactor trip. Based on the reactivity worth of rod G13 and its geometrical relation to Power Range Channels 42 and 44, receipt of two negative rate signals upon the rod drop is a valid assumption. Further discussion with the fuel vendor indicated that there have been several instances at similar plants where a single dropped rod caused a reactor trip. The response of the Reactor Protection System in generating a reactor trip signal due to rod G13 dropping is therefore conservative with respect to its design basis.

IV. Corrective Action

In order to determine which control rods had dropped, a special procedure was performed in which each control rod was individually latched and withdrawn approximately 8 inches off the bottom. Rod G13 in Shutdown Bank B was the only rod that would not move. Subsequent continuity checking from the Rod Control cabinets to the CRDM coil indicated an electrical fault in a section of cable inside Containment. A Containment entry was made, and the faulted section was identified and removed. Bench testing and inspection revealed that a stationary gripper coil power cable had broken in the connector. The connector was replaced, the cable was continuity checked, and the cable was then reinstalled. The entire power loop, from the Rod Control Cabinets to the CRDM coil stack, was then continuity checked. As a final functional test, rod G13 was latched and withdrawn to its fully withdrawn position and then reinserted. No problems with rod G13 were experienced. As an additional test, the continuity of all other control rods, from the Rod Control cabinets to the CRDM coil stacks, was verified to be satisfactory. Long term action to prevent recurrence will be to inspect a minimum of 10 connecters during the third refueling outage. If neither the semi-fluid material nor damage to the connectors is found, no further action will be taken. If either similar semi-fluid material or damage to the connectors is found, all 61 connectors will be inspected. At that time, the severity of the damage will be assessed and the appropriate action will be taken, from single pin replacement to multiple connector replacement.

V. Additional Information

There have been no similar events with the same root cause and sequence of events.

EIIS Codes

System

Control Rod Drive System - AA
Reactor Coolant System - AB
Auxiliary Feedwater System -BA
Plant Protection System - JC
Excore Monitoring System - IG

Component

Cable, Low Voltage - Power - CBL4
Coil - CL
Rod - ROD
Detector - DET