

NORTHEAST UTILITIES



The Connecticut Light and Power Company
Western Massachusetts Electric Company
Holyoke Water Power Company
Northeast Utilities Service Company
Northeast Nuclear Energy Company

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March 28, 1990
MP-90-304

Re: 10CFR50.73(a)(2)(i)

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

Reference: Facility Operating License No. NPF-49
Docket No. 50-423
Licensee Event Report 90-008-00

Gentlemen:

This letter forwards Licensee Event Report 90-008-00 required to be submitted within thirty (30) days pursuant to 10CFR50.73(a)(i), any operation or condition prohibited by the plant's Technical Specifications.

NNECo believes that this LER does not contain new technical information not previously available to the NRC.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY


Stephen E. Scace
Director, Millstone Station

SES/GTB:mo

Attachment: LER 90-008-00

cc: W. T. Russell, 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		APPROVED DATE NO. 3150-0104 EXPIRES: 4/30/92 Estimated burden per response to comply with this information collection request: 60.0 hrs. Forward comments regarding burden estimate to the Records and Reports Management Branch (D-530), U.S. Nuclear Regulatory Commission, Washington, DC 20555, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503.																						
LICENSEE EVENT REPORT (LER)																										
FACILITY NAME (1) Millstone Nuclear Power Station Unit 3				DOCKET NUMBER (2) 0 6 0 0 0 4 2 3																						
TITLE (4) RCS Rosemount Flow Transmitter Failure Due to Equipment Failure																										
EVENT DATE (5) MONTH DAY YEAR 0 2 2 6 9 0		LER NUMBER (6) SEQUENTIAL NUMBER 0 0 8		REPORT DATE (7) MONTH DAY YEAR 0 0 0 3 2 8 9 0																						
				OTHER FACILITIES INVOLVED (8) FACILITY NAMES 0 6 0 0 0 0 1 1 0 6 0 0 0 0 1 1																						
OPERATING MODE (9) 1		THIS REPORT IS BEING SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR § (Check one or more of the following) (11)																								
POWER LEVEL (10) 1 1 0 0		<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>20.402(b)</td> <td>20.402(b)</td> <td>60.79(a)(2)(iv)</td> <td>75.71(b)</td> </tr> <tr> <td>20.405(b)(1)(i)</td> <td>60.96(a)(1)</td> <td>60.79(a)(2)(v)</td> <td>75.71(b)</td> </tr> <tr> <td>20.405(b)(1)(ii)</td> <td>60.96(a)(2)</td> <td>60.79(a)(2)(vii)</td> <td rowspan="4">OTHER (Specify in abstract below and in text NRC Form 366A)</td> </tr> <tr> <td>20.405(b)(3)(iii)</td> <td>X 60.79(a)(2)(ii)</td> <td>60.79(a)(2)(viii)(A)</td> </tr> <tr> <td>20.405(b)(1)(iv)</td> <td>60.79(a)(2)(iii)</td> <td>60.79(a)(2)(viii)(B)</td> </tr> <tr> <td>20.405(b)(1)(v)</td> <td>60.79(a)(2)(iii)</td> <td>60.79(a)(2)(ix)</td> </tr> </table>				20.402(b)	20.402(b)	60.79(a)(2)(iv)	75.71(b)	20.405(b)(1)(i)	60.96(a)(1)	60.79(a)(2)(v)	75.71(b)	20.405(b)(1)(ii)	60.96(a)(2)	60.79(a)(2)(vii)	OTHER (Specify in abstract below and in text NRC Form 366A)	20.405(b)(3)(iii)	X 60.79(a)(2)(ii)	60.79(a)(2)(viii)(A)	20.405(b)(1)(iv)	60.79(a)(2)(iii)	60.79(a)(2)(viii)(B)	20.405(b)(1)(v)	60.79(a)(2)(iii)	60.79(a)(2)(ix)
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LICENSEE CONTACT FOR THIS LER (12)																										
NAME Gary T. Bohn, Sr. Engineer, Ext. 5515				TELEPHONE NUMBER 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	MANUFACTURER	REPORTABLE TO NRC																						
B	A/B	F/T	R/3/6/9	Y																						
SUPPLEMENTAL REPORT EXPECTED (14)																										
YES (If yes, complete EXPECTED SUBMISSION DATE)				MONTH DAY YEAR 1 1 0 0																						
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ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)																										
<p>On February 26, 1990, at 1100, in Mode 1, 100% power, 586 degrees F, and 2250 psia, a Reportability Evaluation concluded that potentially, 2 of 3 (Rosemount Model 1153HD) Reactor Coolant System (RCS) flow transmitters in one reactor coolant loop may have been inoperable simultaneously, due to undetected transmitter failures between November 1986 and November 1987. The undetected failures were due to gradual oil loss from the operating diaphragm assembly - the subject of a 10CFR21 report concerning Rosemount transmitters.</p> <p>On March 13, 1990, an extensive Engineering review of historical trend, calibration and test data, concluded that there were no simultaneous transmitter failures occurring in the same RCS loop, and that transmitters (3RCS*FT416.444 & 445) had undetected oil loss failures, prior to being declared inoperable in 1986-1987. As a result, the Technical Specification compensatory action (i.e., to trip the associated bistable within 6 hours), was not performed in time.</p> <p>The root cause of the event was inadequate manufacturing. The loss of oil failures went undetected since there was no history of the failure mechanism or its characteristics in 1986-1987.</p> <p>No immediate action was required. Operability of the currently installed Rosemount transmitters has been verified. The established surveillance and testing program should detect future similar failures and prevent recurrence.</p>																										

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

Estimated burden per response to comply with this information collection request: 60.0 hrs. Forward comments regarding burden estimate to the Records and Reports Management Branch (1P-530), U.S. Nuclear Regulatory Commission, Washington, DC 20555, and to the Paperwork Reduction Project (2160-0106), Office of Management and Budget, Washington, DC 20503.

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (3)	PAGE (3)
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TE-7 (If more space is required, use additional NRC Form 366A-1) (17)

1. Description of Event

On February 26, 1990, at 1100, while in Mode 1 at 100% power, 586 degrees Fahrenheit, and 2250 psia, a Reportability Evaluation concluded that potentially, two out of three (Rosemount Model 1153HD) Reactor Coolant System (RCS) flow transmitters in a single reactor coolant loop may have been inoperable simultaneously, due to undetected transmitter failures between November 1986 and November 1987. The Reportability Evaluation concluded that the Model 1153HD transmitters may have failed earlier than originally determined due to a loss of fill oil from the operating diaphragm assembly. This Reportability Evaluation was the culmination of an on going investigation which started as a Substantial Safety Hazard (SSH) evaluation. The SSH evaluation was initiated during the first refueling outage as a result of the failed Rosemount transmitters. Based on the SSH evaluation conclusions, a 10CFR21 was submitted to the NRC on March 25, 1988.

During the first operating cycle (i.e., from January 1986 through October 1987), a total of 5 out of 12 Rosemount transmitters used to monitor RCS flow were determined to have failed and were declared inoperable. At that time, shift personnel performed the actions necessary to ensure Technical Specifications compliance. Reportability Evaluations were performed in response to each transmitter failure and none of the failures were determined to be reportable. The determinations were based on 1987 information of known transmitter failure mechanisms.

As a result of transmitter failure mechanism knowledge gained to date, it is now known that the loss of fill oil in the transmitter, is a gradual process which could go undetected. The slow loss of fill oil gradually degrades the ability of the transmitters to span full range and causes a significant decrease in the response capability. Based on this information, the potential loss of safety function channel for RCS flow existed prior to the complete transmitter failures identified during the first operating cycle.

On March 13, 1990, following an extensive review of historical trend data, calibration data and test results for two RCS Loop 4 flow transmitters, 3RCS*FT444 and 3RCS*FT445, Engineering personnel concluded that only one transmitter was inoperable at any one time. Transmitter 3RCS*FT444, which failed first, was replaced, calibrated and declared operable on March 22, 1987. At that time, calibration and operability checks were performed on the other two transmitters in RCS Loop 4 (i.e., 3RCS*FT445 and 3RCS*FT446). These transmitters were found to be performing satisfactorily. In addition, the Offsite Facilities Information System (OFIS) historical trend data indicates that transmitter 3RCS*FT445 initially exhibited a degraded operating condition at some point in June, 1987. 3RCS*FT445 was declared inoperable in October 7, 1987, after which its associated bistable was placed in the tripped condition.

Engineering personnel also determined, by firm evidence that transmitters 3RCS*FT416, 3RCS*FT444, and 3RCS*FT445 were the only transmitters which had been inoperable prior to initial discovery. The remaining two transmitters, 3RCS*FT425 and 3RCS*FT434, did experience a loss of oil, but their functional capability was never lost. Although the compensatory Technical Specification actions were taken immediately after the instrument failures were initially identified, the 6 hour time limit for tripping the respective bistables as required by Technical Specification 3.3.1 had actually elapsed, based on the historical data obtained.

Since all of the existing Rosemount transmitters have been verified to be operable, no immediate corrective action was required in response to this event.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

Estimated burden per response to comply with this information collection request: 60.0 hrs. Forward comments regarding burden estimate to the Records and Reports Management Branch (3-650), U.S. Nuclear Regulatory Commission, Washington, DC 20546, and to the Paperwork Reduction Project (3160-0106), Office of Management and Budget, Washington, DC 20503.

FACILITY NAME (1)

DOCKET NUMBER (2)

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PAGE (3)

Millstone Nuclear Power Station
Unit 3

YEAR

INCIDENTAL
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NUMBER

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TEXT (If more space is required, use additional NRC Form 366A, 6) (17)

II. Cause of Event

The root cause of the event was deficient manufacturing of the Rosemount Model 1153HD transmitters, which resulted in the potential for undetected failure of the transmitters. Due to the undetected failure mode of the Rosemount Model 1153HD transmitters, plant personnel were not aware of the actual transmitter (loss of oil) failures until a complete failure of the instruments had occurred. The failed transmitters were returned to Rosemount, Inc. and their evaluation determined that a loss of fill oil had occurred.

NNECo received a 10CFR21 Notification, dated February 7, 1989 from Rosemount stating that potential failures could occur in certain Model 1153 and Model 1154 transmitters from suspect groups. The failure mode was a loss of fill oil from the transmitter sensing module due to an internal leak. Rosemount further indicated that the transmitters could exhibit reduced performance prior to a complete detector failure.

III. Analysis of Event

This event is being reported pursuant to 10CFR50.73(a)(2)(i), as a condition prohibited by the Plant's Technical Specifications. Technical Specification 3.3.1 requires that the bistable associated with a failed RCS flow transmitter be put in the tripped condition within 6 hours. At various periods throughout the first operating cycle, the plant operated with undetected failed transmitters for greater than the Action Statement allowable time.

The NUREG - 1022 reporting guidance states that when situations are found during surveillance, it should be assumed that the situation occurred at the time of discovery, unless there is firm evidence to believe otherwise. Northeast Nuclear Energy Company has concluded that there is now firm evidence that the transmitters in question failed prior to discovery.

As part of the required actions in response to the February 26, 1990 Reportability Evaluation, an immediate notification was performed pursuant to 10CFR50.72(b)(2)(iii), any event or condition that alone could have prevented the fulfillment of the safety function of systems that are needed to mitigate the consequences of an accident. The notification was based on the conclusion that the possibility of having two inoperable RCS flow transmitters simultaneously could have degraded the ability of the Reactor Protection System (RPS) to perform its safety function to mitigate the consequences of an RCS line break occurring in the respective loop. Based on the Engineering analysis documented on March 13, 1990, objective evidence determined that there was never a time when two flow transmitters in a single RCS loop were inoperable simultaneously. As a result, the February 26, 1990 10CFR50.72(b)(2)(iii) immediate notification was in error and the notification was withdrawn on March 13, 1990.

There are three RCS flow transmitters in each of the four RCS loops. These transmitters are used to protect the core upon loss of (or low) coolant flow by initiating a reactor trip via the Reactor Protection System. Two out of three flow transmitters per loop are required to initiate a loss of flow trip signal when the plant is in Mode 1 (Power Operation). Throughout this event and at all times, at least two flow transmitters were operable in each of the four RCS loops, to provide inputs to the RPS. Therefore, this event posed no significant safety concern.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

Estimated burden per response to comply with this information collection request: 50-0 hrs. Forward comments regarding burden estimate to the Records and Reports Management Branch (D-530), U.S. Nuclear Regulatory Commission, Washington, DC 20555, and to the Paperwork Reduction Project (3150-0106), Office of Management and Budget, Washington, DC 20503.

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TEXT (If more space is required, use additional NRC Form 366A, 6/1/77)

IV. Corrective Action

Upon initial discovery of the failures, each transmitter was taken out of service and the affected signal channel bistable was placed in the tripped condition or the transmitter was immediately replaced (if the transmitter failure was identified while the plant was shutdown). All of the failed transmitters were replaced with tested spares since attempts made to calibrate the failed transmitters were unsuccessful. Extensive Engineering analysis (as described in Section V., Additional Information) has been performed to establish the failure mechanism, method of detection, and overall impact on system operability. The monitoring and testing methods that are presently in place will preclude these transmitters from degrading their intended safety function without being detected.

Engineering personnel have also reviewed Rosemount transmitter data for the other units operated by Northeast Utilities, (i.e., Millstone Unit 1, Millstone Unit 2 and Connecticut Yankee - Haddam Neck), and concluded that there are no reportable conditions associated with these plants due to the Rosemount transmitter failures. The surveillance and testing program already in place should identify any future failures of the Rosemount transmitters. Therefore, no additional corrective action is deemed necessary.

V. Additional Information

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

The subject of Rosemount Transmitter Failures has been extremely important to NNECo and the following is a chronological summary of correspondence which has been exchanged pertinent to this issue:

- Letter, E.J.Mroccka (Northeast Utilities) to W.T.Russell (NRC Region I), B12863, "Report of Substantial Safety Hazard" - March 25, 1988.
- Letter, Rosemount, Inc. (Steve Wanck), to Northeast Utilities (Director of QA), "Notification Under 10 CFR21" - February 7, 1989.
- Letter, E.J.Mroccka (Northeast Utilities) to U.S. Nuclear Regulatory Commission, B13178, "Rosemount Transmitters" - April 13, 1989.
- Letter, E.J.Mroccka (Northeast Utilities) to U.S. Nuclear Regulatory Commission, AO8132, "Response to Inspection 50-423/89-04" - August 1, 1989.
- Letter, E.J.Mroccka (Northeast Utilities) to U.S. Nuclear Regulatory Commission, B13366, "Rosemount Transmitters" - October 31, 1989.

NNECo has evaluated the function and the potential failure effects of all installed Model 1153 and 1154 transmitters at Millstone Unit 3. The evaluation determined that: (1) the failures exhibited an infant mortality characteristic (i.e., the probability of transmitter failure significantly decreases with the age of the transmitter), and (2) the failures are due to small manufacturing process variations that are lot-dependent. It was further concluded that the majority of the transmitters subject to the failure mechanism would have already failed, and that future failures would be small in number and detectable using the installed enhanced surveillance program.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

Estimated burden per response to comply with this information collection request: 50.0 hrs. Forward comments regarding burden estimate to the Records and Reports Management Branch (p-630), U.S. Nuclear Regulatory Commission, Washington, DC 20545, and to the Paperwork Reduction Project (3160-0104), Office of Management and Budget, Washington, DC 20503.

FACILITY NAME (1)

DOCKET NUMBER (2)

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Millstone Nuclear Power Station
Unit 3

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

V. Additional Information (Continued)

NNECo completed an operability determination on July 31, 1989, identifying four bases for assured operability of Rosemount Model 1153 and Model 1154 transmitters installed at Millstone Unit 3. These bases were as follows:

- The probability of failure significantly decreases with time in service (the "infant mortality" characteristic).
- Transmitters operating at low static pressure are less susceptible to the failure mode.
- Testing performed during the second refueling outage did not identify any transmitters with a loss of oil defect.
- Monitoring, testing, and analysis of transmitter output will provide indication of oil loss.

An information letter was submitted to the NRC on October 31, 1989 which communicated that the licensee had reviewed the effects of failed transmitters on both RPS reliability and calculated core-melt frequency for the first cycle of plant operation. It was concluded that historically there had been no unsafe operation of Millstone Unit 3 from a risk assessment perspective, even though calculated RPS unavailability had increased by 12 percent for the first cycle.

NNECo has concluded that with respect to the loss of fill oil issue, the plant is now in compliance with General Design Criteria (GDC) - 21 (Protection System Reliability & Testing), 22 (Protection System Independence), 23(Protection System Failure Modes) and 29(Protection Against Anticipated Operational Occurrences), 10CFR50.55a(h), and IEEE - 279 (Criteria for Protection Systems for Nuclear Power Generating Stations), 379 (Guide to the Application of the Single Failure Criteria to Nuclear Power Generating Station Class 1E Systems), and 603 (Standard Criteria for Safety Systems for Nuclear Power Generating Stations).

EHS CODESSystem

Reactor Coolant System - AB

Component

Flow Transmitter - FT