



Northeast
Nuclear Energy

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The Northeast Utilities System

Donald B. Miller Jr.,
Senior Vice President - Millstone

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

June 1, 1994
MP-94-377

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

Reference: Facility Operating License No. DPR-65
Docket No. 50-336
Licensee Event Report 94-012-00

Gentlemen:

This letter forwards Licensee Event Report 94-012-00 required to be submitted within thirty (30) days pursuant to 10CFR50.73(a)(2)(v).

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

Donald B. Miller, Jr.
Senior Vice President - Millstone Station

DBM/RAP:dlr

Attachment: LER 94-012-00

cc: T. T. Martin, Region I Administrator
P. D. Swetland, Senior Resident Inspector, Millstone Unit Nos. 1, 2 and 3
G. S. Vissing, NRC Project Manager, Millstone Unit No. 2

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LICENSEE EVENT REPORT (LER)

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

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (MNB 7714), 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) Millstone Nuclear Power Station Unit 2	DOCKET NUMBER (2) 05000336	PAGE (3) 1 OF 3
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TITLE (4)
Design Deficiency in the ESAS Undervoltage Modules

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
05	05	94	94	012	00	06	01	94		05000
										05000

OPERATING MODE (9) 5	THIS REPORT IS BEING SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)									
POWER LEVEL (10) 0	20.402(b)			20.405(c)			50.73(a)(2)(iv)			73.71(b)
	20.405(a)(1)(i)			50.36(c)(1)			X 50.73(a)(2)(v)			73.71(c)
	20.405(a)(1)(ii)			50.36(c)(2)			50.73(a)(2)(vi)			OTHER
	20.405(a)(1)(iii)			50.73(a)(2)(i)			50.73(a)(2)(vii)(A)			(Specify in Abstract below and in Text, NRC Form 366A)
20.405(a)(1)(iv)			50.73(a)(2)(ii)			50.73(a)(2)(vii)(B)				
20.405(a)(1)(v)			50.73(a)(2)(iii)			50.73(a)(2)(viii)				

LICENSEE CONTACT FOR THIS LER (12)

NAME Philip J. Lutz, Site Licensing	TELEPHONE NUMBER (Include Area Code) (203) 447-1791 Ext. 6585
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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
B	JE	XC	C560	Yes					

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO					

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On May 5, 1994, at 1400 hours, with the plant shutdown in Mode 5, a design deficiency in the Engineered Safety Features Actuation System (ESAS) undervoltage modules that could have prevented automatic undervoltage actuation was discovered. The design deficiency was discovered by an I&C technician who was reviewing previous undervoltage module failures.

The safety consequences of this event have been determined to be negligible since the Engineered Safety Features Actuation System (ESAS) is slightly degraded, but operable.

This is being reported pursuant to requirements of Paragraph 50.73(a)(v)(D), any event or condition that could have prevented the fulfillment of a safety function needed to mitigate the consequences of an accident.

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 INFORMATION AND RECORDS MANAGEMENT BRANCH (MNBB 7714), 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) Millstone Nuclear Power Station Unit 2	DOCKET NUMBER (2) 05000336	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3">LER NUMBER (6)</th> <th rowspan="2">PAGE (3)</th> </tr> <tr> <th>YEAR</th> <th>SEQUENTIAL NUMBER</th> <th>REVISION NUMBER</th> </tr> <tr> <td style="text-align: center;">94</td> <td style="text-align: center;">— 012 —</td> <td style="text-align: center;">00</td> <td style="text-align: center;">02 OF 03</td> </tr> </table>	LER NUMBER (6)			PAGE (3)	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	94	— 012 —	00	02 OF 03
LER NUMBER (6)			PAGE (3)										
YEAR	SEQUENTIAL NUMBER	REVISION NUMBER											
94	— 012 —	00	02 OF 03										

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

I. Description of Event

On May 5, 1994, at 1400 hours, with the plant shutdown in Mode 5, an I&C Technician discovered a design deficiency in the Engineered Safety Features Actuation System (ESAS) that could have prevented automatic undervoltage actuation.

The ESAS undervoltage modules sense 4160 volt vital bus voltage and provide actuation signals, through 2 out of 4 logic, on undervoltage. At 106 (out of 120) volts decreasing and an eight second time delay, the ESAS trips open the supply breaker from the Reserve Station Service Transformer. At 85.5 volts decreasing with a 2 second time delay, the ESAS initiates the 4160 volt vital bus Loss of Normal Power (LNP) — that includes shedding of loads, opening of the tie breakers, starting diesels and resequencing vital loads.

There are a total of eight ESAS undervoltage modules, four for each 4160 volt vital bus. Since the 1992 refueling outage, six of the undervoltage modules have failed. Heat stresses on an integrated circuit (IC) chip causes premature wear out of the chip.

Prior to 5/5/94, the cause of the heat stress was believed to be soldering performed on components connected to the IC chip during the 1992 refueling outage. It has now been determined that the heat stress to the IC chip is a result of a design deficiency. The undervoltage modules have a voltage difference between the internal supply and control voltages that results in a circulating current that heats the IC chip.

There were no operator actions required as a result of this event since any failures would be observed as a result of routine shift checks. Additionally, there were no automatic or manually initiated safety systems actuated as a result of this event.

II. Cause of Event

The root cause of the ESAS undervoltage module failures is a design deficiency. The undervoltage modules have a voltage difference between the internal supply and control voltages that results in a circulating current that heat stresses the integrated circuit (IC) chip. The heat stress to the IC chip causes premature wear out to the undervoltage modules.

III. Analysis of Event

This is being reported pursuant to requirements of Paragraph 50.73(a)(2)(v)(D), any event or condition that could have prevented the fulfillment of a safety function needed to mitigate the consequences of an accident.

The safety consequences of this event have been determined to be negligible since the Engineered Safety Features Actuation System (ESAS) is slightly degraded but operable. The failures have occurred with frequencies between six months and approximately one year after installation.

The effect of an undervoltage module failure would be lower setpoints for both the "degraded voltage" action and the "undervoltage" action functions. In this case, degraded voltage action should take place at about 90% of normal bus voltage, and the undervoltage action should occur when bus voltage drops to 70% or less. Therefore, if the setpoints were to decrease due to the circuit failure in the undervoltage module, this would be detected during the next shift check of the bus voltage display on the ESAS.

If a degraded voltage condition were to develop during the interval when the setpoint had decreased, the actuation would not take place. The actuation, on a degraded voltage condition, trips open the feeder breakers to the 24C and 24D buses from the RSST, so that an impact is only created if the RSST is the selected source of power to the vital buses. The RSST is the selected source of power during shutdown below 20% reactor power, while the plant is shutdown, and during plant startup below 20% reactor power.

**LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION**

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		YEAR 94	SEQUENTIAL NUMBER 012	REVISION NUMBER 00	

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

In an undervoltage condition, a decreased setpoint is not a concern since the effective action takes place in response to a total loss of bus voltage, and the setpoint will never drop fully to zero. This action is the LNP response and results in opening all supply breakers, shedding loads, starting the diesel generators, and sequentially restoring loads to the buses that have been re-energized by the diesel generators.

Since the ESAS undervoltage logic is 2 out of 4 to trip on either bus, it would take 6 simultaneous failures, 3 in each facility, to prevent the undervoltage protection from performing its safety function. This is not considered a credible failure.

IV. Corrective Action

The first indication of a degraded undervoltage module is a voltage display meter on the front of the ESAS sensor cabinet that shows either zero volts or lower than normal voltage. The Operations Department is aware of this potential problem and the panel meter voltages are checked and recorded once per shift, which far exceeds the frequency of failure. It was during these checks that all previous failures were identified. Because the module first goes to a degraded condition that may last eighteen hours the module will be found and replaced while still able to perform its safety function on a loss of normal power to a 4160 volt vital bus.

The ESAS is considered operable, although degraded. A design change to correct the accelerated aging problem will be implemented during the 1994 refueling outage.

V. Additional Information

Similar LERs: None

EIIS Codes for referenced components:

ESAS	JE-XC-C560
4160 volt vital bus	EB-BU-G084