



Northeast
Nuclear Energy

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The Northeast Utilities System

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

Re: 10CFR50.73

MP-94-420

June 17, 1994

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 94-015-00

This letter forwards Licensee Event Report 94-015-00 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/VJ:dtr

Attachment: LER 94-015-00

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 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	PAGE (3) 1 OF 4
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TITLE (4)
Automatic Auxiliary Feedwater Initiation Circuit Single Failure Vulnerability

EVENT DATE (5)			LER NUMBER (5)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
05	19	94	94	-- 015 --	00	06	17	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)(ix)							

LICENSEE CONTACT FOR THIS LER (12)

NAME Philip J. Lutzi, 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 NRPDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRPDS

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)

At approximately 1424 hours on May 19, 1994, an engineering review revealed that the Automatic Auxiliary Feedwater Initiation (AAFI) control circuit does not meet the single failure criterion. The single failure identified was a short circuit across two conductors of the actuation relays associated with the initiation logic matrix.

The root cause of the event is personnel error due to inadequate interface of design and equipment condition. A design interpretation error during the installation of the AAFI design resulted in the compromising of both trains of the AAFI system.

No immediate operator actions were required. A failure modes evaluation concluded that the conductor to conductor short circuit failure was a low probability event to preclude actuation of the AAFI.

As corrective action, a design change is being evaluated for possible implementation during the refueling outage currently scheduled for the Fall of 1994.

To prevent recurrence, a lessons learned presentation on this event will be provided to engineering personnel.

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

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FACILITY NAME (1) Millstone Nuclear Power Station Unit 2	DOCKET NUMBER (2) 05000336	LER NUMBER (6)			PAGE (3) 02 OF 04
		YEAR 94	SEQUENTIAL NUMBER -- 015 --	REVISION NUMBER 00	

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

I. Description of Event

At approximately 1424 hours on May 19, 1994, while in Mode 5 (Cold Shutdown) at 0% power, an engineering review concluded that a single failure could defeat the Automatic Initiation control logic for both trains of the Auxiliary Feedwater System (AFW). This event was determined to be a condition which alone could have prevented fulfillment of a safety function.

The event was evaluated and determined to be a low probability event and the AFW system was determined to be operable (although not required for operation in Mode 5). Also, to determine the credibility of the occurrence of the single failure, probabilistic arguments were developed using the guidance of Institute of Electrical and Electronics Engineers (IEEE) Standard (Std.) 379, "IEEE Standard Application of the Single Failure Criterion to Nuclear Power Generating Station Class 1E Systems," and a review conducted to determine if a history of conductor to conductor shorts in mild environments existed. The probability of the condition occurring was determined to be very low, and no history of conductor to conductor shorts in mild environments was discovered.

Subsequent reviews were performed of correspondence with the NRC which discussed compliance with requirements for an Automatically Initiated Auxiliary Feedwater system per the requirements of NUREG 0737, "Clarification of TMI Action Plan Requirements." The reviews were intended to determine if there had been any discussion regarding the credibility of this single failure vulnerability. No specific discussions regarding exceptions to the requirements for protection against this single failure were identified in the correspondence.

On May 27, 1994, the Automatic Auxiliary Feedwater Initiation (AAFI) control circuit for the auxiliary feedwater system was determined to be inoperable since the design did not meet the single failure requirements of IEEE Std. 279-1971, "Criteria for Protection Systems for Nuclear Power Generating Stations," and since there was no exception taken to the design requirements of the aforementioned IEEE Std. for AAFI.

The AAFI control circuit logic is comprised of a single logic matrix using four independent channels of steam generator level. If any two of the four (2/4) channels sense a low steam generator level, an auxiliary feedwater initiation signal is processed (after a time delay). The single logic matrix is wired to two normally energized relays (one for each train of automatic auxiliary feedwater). The two relays are wired in parallel. A single short circuit could prevent the relays from de-energizing (to actuate AFW).

II. Cause of Event

The root cause of the event is personnel error due to inadequate interface of design and equipment condition. A design interpretation error during the installation of the AAFI design resulted in the compromising of both trains of the AAFI system.

During implementation of the AAFI control circuit to satisfy the requirements of NUREG 0737, the decision was made to implement the common control circuit logic matrix due to the low probability of the postulated conductor to conductor short circuit.

IEEE Std. 279 requires system design protection against any postulated short circuits. The most recent review concluded there was no documentation to exempt the requirements of IEEE 279-1971 for protection against the short circuit postulated. The Millstone Unit 2 FSAR indicates that the Class 1E Engineered Safety Feature (ESF) systems meet the requirements of IEEE 279-1971.

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FACILITY NAME (1) Millstone Nuclear Power Station Unit 2	DOCKET NUMBER (2) 05000336	LER NUMBER (6)			PAGE (3) 03 OF 04
		YEAR 94	SEQUENTIAL NUMBER 015	REVISION NUMBER 00	

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

III. Analysis of Event

This event is reportable pursuant to 10CFR50.73(a)(2)(v), as a condition which alone could have prevented fulfillment of a safety function. An immediate notification was completed pursuant to 10CRF50.72(b)(2)(iii).

Automatic initiation of the motor-driven AFW pumps was installed as a follow-up action resulting from the NRC staff reviews regarding the Three Mile Island accident.

The installed configuration of a single logic matrix whereby a short circuit can defeat the common control circuit (albeit of low probability) does not conform to the provisions of IEEE Std. 279-1971 or the Unit's Electrical Separation Specification. The other schemes used in the ESF actuation system utilize redundant and independent logic matrices.

The automatic initiation of AFW is credited in demonstrating that the AFW system meets the reliability requirements specified in Section 10.4.9 of the Standard Review Plan as required by NUREG 0737. In the most limiting (loss of main Feedwater) event when AFW is needed, it is assumed that AFW is manually started within 10 minutes after event initiation. The postulated conductor to conductor single failure which precludes automatic initiation of the AFW is bounded by the existing accident analysis. Also, the existing configuration does not involve undue risk to the public health and safety.

The mitigating factors in the existing design and installation make the failure probability very low and include:

- the control cable is enclosed in a metal casing minimizing the susceptibility to external damage
- the control cable ampacity far exceeds the low (150 milli-amp) control current
- The only other cable in the metal casing is an IEEE qualified low-current carrying cable
- the cable has been in operation for several years with no indication of failure
- the control cabinets are in the control room, are seismically qualified, and are provided with active fire detection and manual fire suppression
- monthly surveillance testing of the automatic initiation circuit will aid in the timely detection of the presence of any short circuits

IV. Corrective Action

No immediate corrective action was required by plant operators in response to this event since AFW was not required for Mode 5. A failure analysis was conducted which concluded that failure postulated was a low probability event.

Due to the complexity of this issue and low occurrence probability, NNECO has concluded that there are no apparent design changes which could provide short-term resolution of this condition. An emergency Technical Specification change was obtained to allow short term operation until the next refueling outage (scheduled for the Fall of 1994), without credit being taken for AAFI. The basis for this is the ability for operators to manually actuate Auxiliary Feedwater within acceptable time requirements. Design change options are being evaluated to resolve this issue with planned implementation during the next refueling outage.

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		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
		94	— 015 —	00	

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

As action to prevent recurrence, details of this event will be provided in a lessons learned presentation to Design and Technical Support Engineering personnel.

V. Additional Information

Pursuant to 10CFR50.90, on May 27, 1994 NNECO proposed to amend its Operating License, DPR-65, to revise the operability requirements for automatic initiation of the AFW system for the remainder of cycle 12 operation. This Amendment (Reference No. 176) was approved by the NRC on June 7, 1994.

The following LER is considered a similar event:

<u>LER Number</u>	<u>LER Title</u>
94-002	Failure to Meet Acceptable Isolation for Class IE Protection Instrument Channels

EIIS Codes

System

- Auxiliary Feedwater System -- BA
- Engineered Safety Features Actuation System -- JE

Components

- Relays -- RLY