Northeast
Nuclear Energy

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The Northeast Utilities System

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

Re: 10CFR50.73(a)(2)(ii)
April 14, 1994
MP-94-265

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 94-006-00

Gentlemen:

This letter forwards Licensee Event Report 94-006-00 required to be submitted within thirty (30) days pursuant to 10CFR50.73(a)(2)(ii).

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

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

DBM/BM:ljs

Attachment: LER 94-006-00

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

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NRC Form 366 (5-92) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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

APPROVED BY OMB NO. 3150-0104
EXPIRES: 5/31/95

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)	DOCKET NUMBER (2)	PAGE (3)
Millstone Nuclear Power Station Unit 3	05000423	1 OF 04

TITLE (4)
Auxiliary Feedwater Pipe Restraints Inadequate Design Due to Design Error

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
										05000
03	15	94	94	- 006 -	00	04	14	94	FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	1	THIS REPORT IS BEING SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)					
		20.402(b)		20.405(c)		50.73(a)(2)(iv)	73.71(b)
POWER LEVEL (10)	100%	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
		20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)	(Specify in Abstract below and in Text, NRC Form 366A)
		20.405(a)(1)(iv)	X	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 (Include Area Code)
William J. Temple, Site Licensing	(203) 437-5904

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

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 March 15, 1994, with the plant in MODE 1 at 100% power, an engineering review determined that portions of the Auxiliary Feedwater (AFW) system did not meet design requirements for normal use, due to inadequate pipe rupture restraints.

This condition has historically existed since the first cycle of plant operation. It is reported as a condition outside the design basis because the AFW system was not adequately designed to restrain a high energy line break (HELB) when the system was used for normal plant startup, hot standby, and shutdown.

The condition has low safety significance because the existing supports on the line meet the "faulted" stress limits. The missing HELB restraints have no affect on the loading combinations required for the AFW system to perform its design basis safety functions. Thus, the AFW system is fully operable per Technical Specifications to perform all credited safety functions.

The root cause of the condition was a design error. The plant design for the AFW system includes a postulated HELB, so that the AFW system can be used during normal plant startup, hot standby, and shutdown. Restraints on portions of the AFW system were not installed during the original plant construction, due to changes in the intended use of the AFW system. As corrective action, the condition was promptly reported when self-identified, and night orders were issued to limit use of the AFW system for normal plant operation. Plans are being made to strengthen several pipe supports, and make permanent procedure changes to isolate moderate energy portions of the system, so that the AFW can be used during limited portions of normal startup, hot standby, and shutdown.

I. Description of Event

On March 15, 1994, with the plant in MODE 1 at 100% power, an engineering review determined that one of the Auxiliary Feedwater (AFW) lines did not meet design requirements due to inadequate pipe rupture restraints. The Loop "A" Steam Generator AFW supply line support configuration was not designed in the same manner as the other three supply lines. Loop "A" was missing two rupture restraints. During the investigation it was determined that the turbine driven AFW supply lines are not isolated from the motor driven AFW supply lines. Therefore, a section of the four lines from the turbine driven AFW pump to the containment isolation valves are high energy lines because they are pressurized by operation of the motor driven pumps during normal plant startup, hot standby, and shutdown. These lines had previously been considered moderate energy piping.

This condition was self identified as a result of followup investigations of an internal Safety System Functional Inspection (SSFI) observation of the AFW system. The SSFI was performed to verify if the AFW system was capable of performing its intended functions as described in the system design basis. The followup investigation led to the conclusion that neither the "A" train motor driven supply line nor the four turbine driven supply lines were adequately designed for a high energy pipe break. The missing pipe rupture restraints on the "A" train were designed to protect the break exclusion zone. The break exclusion zone is defined as the piping between the containment penetration and the containment isolation valves.

The AFW system is designed to maintain the heat removal capacity of the steam generators when the main feedwater system is isolated or otherwise unavailable during accident or transient conditions. Technical Specification 3.7.1.2 requires three (3) independent auxiliary feedwater pumps and associated flowpaths to be OPERABLE in MODES 1, 2, and 3. This ensures that the Reactor Coolant System (RCS) can be cooled down to less than 350 degrees-F from normal operating or accident conditions, at which point the Residual Heat Removal (RHR) system can be placed in service.

The AFW system was also designed to be used for normal plant startup, hot standby, and cooldown to control RCS temperature. The discharge lines from the two (2) motor driven AFW pumps were designed as high energy lines so that they could also be used for normal plant operation. The discharge lines from the turbine driven AFW pump were designed as moderate energy lines because they were not designed to be used during normal plant operation. This design took credit for: isolation valves in the turbine driven pump discharge lines whenever the motor driven pumps were used during normal plant operation; and not using the turbine driven AFW pump for normal plant startup, hot standby, and shutdown.

The original design of the pipe rupture restraints which were not installed, included several 6-inch by 6-inch by 1/2-inch tube steel members, some greater than 10 feet in length. The rupture restraints were to be attached to the containment exterior structure to minimize seismic anchor displacement pipe stress levels within the break exclusion zone. The original rupture restraints were designed as dual function supports, to function as both pipe supports and rupture restraints. The installed pipe support configuration did not consider pipe rupture loads. The pipe supports are all attached to the Engineered Safety Features (ESF) building. The rigid restraints are typically designed with 2-inch by 2-inch and 3-inch by 3-inch tube steel, but are relatively short members since they attach to the ESF building.

II. Cause of Event

The root cause of the condition was a design error. This occurred when there was a change in the classification of the energy level of the AFW system. There was an inadequate review of the installation status of the pipe rupture restraints after the AFW system was reclassified as a high energy system. The original plant design was a high energy AFW system. During construction this was downgraded to moderate energy, then upgraded to high energy before initial operation. The plant design for the AFW system includes a postulated HELB, so that the AFW system can be used during normal plant startup, hot standby, and shutdown. Two restraints on one line were not installed during the original plant construction, due to a change followed by a reversal of the change in the intended use of the AFW system for startup, hot standby, and shutdown.

III. Analysis of Event

This is a report of a condition that has historically existed since the first cycle of plant operation. It is reported under 10CFR50.73(a)(2)(ii)(B) as a condition outside the design basis. The AFW line was found to be missing two pipe rupture restraints. The condition was promptly reported to the NRC. Confirmatory structural evaluations showed that the line was not adequately designed to restrain a high energy pipe break when the system was used for normal plant startup, hot standby, and shutdown. The analysis indicates that two minor modifications to two existing pipe supports are required to demonstrate design basis compliance along with isolation of the turbine supplied AFW lines during normal plant startup, hot standby, and shutdown.

The HELB design criteria are not applicable to accident, emergency, or upset plant conditions. For accident, emergency, and plant upset conditions, including a reactor trip, the HELB loads need not be postulated. However, a HELB and the resulting HELB loads need to be assumed in combination with normal plant operation defined as reactor startup, hot standby, power operation, and cooldown to cold shutdown. The AFW system is adequately designed to perform its safety functions for all load combinations involving accidents, emergencies, and plant upset conditions. The system is fully operable to perform its safety functions, and is in compliance with Technical Specification requirements. However, when previously used during normal plant operation, a portion of the AFW system did not have adequate pipe support for the HELB loads from a potential initiating event.

Unanalyzed ruptures in the AFW system had the potential of exceeding the pipe stress allowable limit in the break exclusion zones in all four AFW trains. One unanalyzed rupture is attributable to the "A" train missing pipe rupture restraints. A detailed analysis of this rupture determined that the AFW system was operable. The break exclusion stress limit of 1.8 S_h was met and pipe support stress levels met ASME III, Appendix F limits. The results of the analysis were then applied to the AFW turbine supplied line breaks. These breaks were found to be acceptable based on:

- The distance from the location of the turbine supplied line breaks with respect to the break exclusion zone which is greater than the analyzed case. The increased distance tends to reduce the pipe rupture loads.
- The number of piping elbows between the break and the break exclusion zone is greater for the turbine supplied lines. The larger number of elbows tends to reduce the pipe rupture loads.
- Comparison of the pipe supports (excluding the rupture restraints on the B, C, and D trains) indicates that the supports are of similar design and would be expected to accommodate anticipated pipe rupture loads.

The condition has low safety significance. The existing pipe supports on the AFW "A" line meet "faulted" stress limits. A detailed pipe break analysis was performed for the one AFW train that was missing pipe rupture restraints. The pipe stress levels within the break exclusion zone (between the penetration and the first support upstream of each containment isolation valve) for this train have been demonstrated to be within the design basis stress limit of 1.8 S_h. The missing HELB rupture restraints had no affect on the loading combinations required for the AFW system to perform its design basis safety functions. Thus, the AFW system was fully operable per Technical Specifications to perform all credited safety functions.

IV. Corrective Action

As corrective action, the condition was promptly reported when discovered, and a procedure change in the form of a night order was immediately made to limit use of the AFW system for normal plant operation. The affected portion of the AFW "A" line has been caution tagged to alert operations personnel to this condition. Plans are being made to strengthen several pipe supports, and make procedure changes to isolate moderate energy portions of the system. The high energy line break concern associated with the four turbine driven supply lines is anticipated to be resolved by closure of the line isolation valves during appropriate normal AFW system operation. This will allow the AFW system to be used during normal plant startup, hot standby, and shutdown.

V. Additional Information

No other similar events have been identified. No other cases have occurred where design changes were made to change high energy piping systems to moderate energy, then back to high energy.

EIIS Codes

System
BA (Auxiliary/Emergency Feedwater System)

Component
SPT (Support)