Northeast
Nuclear Energy

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The Northeast Utilities System

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

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

December 22, 1995
MP-95-369

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 95-019-00

This letter forwards Licensee Event Report 95-019-00 required to be submitted within thirty (30) days pursuant to 10CFR50.73(a)(2)(i).

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

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

DBM/DD:ljs

Attachment: LER 95-019-00

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

IE22
1/1

NRC Form 366 (4-95) 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: 04/30/98

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-6 F33), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND TO THE PAPERWORK REDUCTION PROJECT

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

TITLE (4)
Reactor Coolant System Pressure Boundary Leak Due to Instrument Line and Drain Line Socket Weld Failure

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
12	01	95	95	- 019 -	00	12	22	95	FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9)	3	THIS REPORT IS BEING SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)			
POWER LEVEL (10)	000	20.2201(b)	20.2203(a)(2)(v)	X 50.73(a)(2)(i)	50.73(a)(2)(viii)
		20.2203(a)(1)	20.2203(a)(3)(i)	50.73(a)(2)(ii)	50.73(a)(2)(x)
		20.2203(a)(2)(i)	20.2203(a)(3)(ii)	50.73(a)(2)(iii)	73.71
		20.2203(a)(2)(ii)	20.2203(a)(4)	50.73(a)(2)(iv)	OTHER
		20.2203(a)(2)(iii)	50.36(c)(1)	50.73(a)(2)(v)	Specify in Abstract below or in NRC Form 366A
		20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Robert L. McGuinness, Senior Engineer	(203) 447-1791 Ext. 6855

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 December 1, 1995, with the plant in Mode 3, at 0% power, a leak was discovered in a 3/4 inch socket weld on a 'C' Reactor Coolant System (RCS) Loop Flow Instrumentation Line, and in a 3/4 inch socket weld on a 'C' Reactor Coolant Pump Seal Injection Drain Line. The weld cracks are believed to have propagated from the weld root pass as a result of vibrations from the nearby Reactor Coolant Pumps (RCP). Similar conditions have previously been reported by LER 94-012-00.

This condition is being reported in accordance with 10CFR50.73(a)(2)(i)(B), as an operation or condition prohibited by Technical Specifications. Technical Specification 3.4.6.2 requires "No Pressure Boundary Leakage" (i.e., nonisolable fault). Although this incident involved a reactor coolant leak, it had low safety significance. Leakage was collected within the containment drain system. The RCS loop and Seal Injection lines are each restricted by a 3/8 inch diameter orifice, which would have minimized leakage in the event of total failure. The normal makeup system has sufficient capacity to maintain pressurizer level and compensate for complete failure of either of these lines.

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Millstone Nuclear Power Station Unit 3	05000423	95	– 019 –	00	02 OF 03

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

I. Description of Event

On December 1, 1995, with the plant in Mode 3, at 0% power, a containment entry was made to investigate body to bonnet check valve leakage. During this containment entry, leaks were identified at 3/4 inch socket welded connections on a 'C' RCS Loop Instrumentation Line and a 'C' RCP Seal Injection Drain Line. The design has a flow restriction in the loop to minimize the rate of coolant loss in the event of any downstream failure. However in accordance with the Technical Specification definition of pressure boundary leakage (i.e., leakage through a nonisolable fault), the leaks were considered to be pressure boundary leakage and a prompt report issued. The identification of pressure boundary leakage in Mode 1–4, constitutes a condition prohibited by Technical Specifications. The socket weld on the Instrument Line was removed and replaced with a butt weld. The removed socket weld connection was saved for subsequent analysis. The weld on the Seal Injection Line was replaced and the drain line capped.

A historical review identified similar socket weld failures of Instrument Lines which were reported by LER 94–012–00. This LER reported socket weld failures which occurred in May of 1992 and September of 1994.

II. Cause of Event

Initial analysis indicates that the root cause of the socket weld failures is vibration induced fatigue which initiates at a stress riser in the socket weld. The stress rise is most probably at the root of the socket weld, which is subject to high stress, and is propagated by the cyclic vibration of the nearby Reactor Coolant Pumps.

III. Analysis of Event

This condition is being reported in accordance with 10CFR50.73(a)(2)(i)(B) as an operation or condition prohibited by Technical Specifications. Technical Specification 3.4.6.2 requires "No Pressure Boundary Leakage." Although this incident involved small reactor coolant leaks, they had low safety significance.

Unidentified reactor coolant leakage is collected in the containment drain system and is monitored to fractions of a gallon per minute, with a maximum allowed leakage of 1 gallon per minute. The Containment Atmosphere Gaseous and Particulate Radioactivity Monitoring System also is used for identification of reactor coolant leaks. The leaks reported here were not distinguishable by either of these systems, and were ultimately identified by a visual inspection. There is the possibility these leaks developed during the plant shutdown, and therefore were not monitored by these systems during plant operation.

The socket welded lines are 3/4 inch diameter, but are each restricted by a 3/8 inch orifice which would have minimized leakage in the event of a total failure. The normal makeup system has sufficient capacity to maintain pressurizer level and compensate for a complete failure of either line.

The root cause of the weld failures has been determined to be vibration induced fatigue resulting in a cracking failure.

IV. Corrective Action

The Technical Specification Action Statement 3.4.6.2.a was entered upon discovery of the noncompliance. The unit proceeded to cold shutdown where the following corrective actions were taken.

- All sixteen RCS Loop Flow Instrument Line socket welds and weld bosses, have been cut out and removed. The Flow Instrument Lines have been restored to service with a butt welded connection to the RCS, which is less susceptible to vibration induced fatigue.

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

- All four RCP Seal Injection Drain Lines have been removed from the existing socket weld. The drain line piping has been replaced with a short capped pipe nipple and rewelded to the socket weld boss. This eliminates any significant stresses on the socket weld connection.

- A detailed technical review was performed to identify any other socket welded connections on the RCS or in other systems directly connected to the RCS which would be subject to vibration induced fatigue. This review identified four Seal Injection Vent Lines and two Safety Injection Vent Lines whose socket welded connections could also be subject to vibration induced fatigue. The existing socket welded connections on these six lines have been reinforced to minimize the socket weld stresses.

- The defective weld on the RCS Instrument Line is being processed for detailed metallurgical analysis. This analysis will provide confirmation of the expected cause for the failure.

- Vibration measurements on the RCS loop piping have been completed with the Reactor Coolant Pumps during startup conditions. The processed vibration data will be used to determine that startup/shutdown conditions of the reactor coolant pumps cause vibration frequencies which propagate cracks on socket weld connections.

Detailed technical review and upgrades of socket welded connections associated with the RCS has minimized the possibility of future socket weld failures. Confirmation of the failure mechanism and RCP vibration frequencies will provide additional assurance that the review has identified any susceptible socket welded connections.

V. Additional Information

A historical review identified similar socket weld failures of Instrument Lines which were reported by LER 94-012-00. This LER reported a socket weld failure which occurred in May of 1992 and September of 1994. The failed socket weld from the September 1994 incident was fully tested to determine the cause of the failure. The detailed testing indicated the weld failure originated at a point of lack of fusion in the root of the weld and propagated by cyclic, vibration induced fatigue. The number of cycles needed to propagate the crack was too low to be caused by normal Reactor Coolant Pump vibrations. Corrective actions at that time involved a series of liquid penetrant and radiographic inspections of all sixteen Instrument Lines on the RCS Coolant Loops. These weld inspections identified two additional socket welds with defects which were removed and the welds reworked. As a confirmation of weld quality, during a refueling outage in May of 1995 all of the sixteen Instrument Lines socket welds were reviewed by liquid penetrant methods, and all welds were found to be acceptable.

Additional corrective actions were ongoing at the time the December 1, 1995, failures were identified. A plan was being developed to record RCP transient vibrations, and with these results detune the frequencies of the socket welded lines, or replace the existing socket welds with butt welded connections.

EIIS Codes

Systems

Reactor Coolant System – AB

Components

Pipe Fitting – PSF