Dominion Nuclear Connecticut, Inc.
Millstone Power Station
Rope Ferry Road
Waterford, CT 06385

Dominion

OCT 2 2002

Docket No. 50-336
B18761

RE: 10 CFR 50.73(a)(2)(i)(A)

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Millstone Power Station, Unit No. 2
Licensee Event Report 2002-004-00
Reactor Shutdown Due to Entry into Technical Specification 3.0.3

This letter forwards Licensee Event Report (LER) 2002-004-00, documenting an event that occurred at Millstone Power Station, Unit No. 2 on August 3, 2002. This LER is being submitted pursuant to 10 CFR 50.73(a)(2)(i)(A).

There are no regulatory commitments contained within this letter.

Should you have any questions regarding this submittal, please contact Mr. David W. Dodson at (860) 447-1791, extension 2346.

Very truly yours,

DOMINION NUCLEAR CONNECTICUT, INC.

Stephen P. Sarver - Acting Director
Nuclear Station Operations and Maintenance

Attachment (1): LER 2002-004-00

cc: H. J. Miller, Region I Administrator
R. B. Ennis, NRC Senior Project Manager, Millstone Unit No. 2
NRC Senior Resident Inspector, Millstone Unit No. 2

IE22

Docket No. 50-336
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Attachment 1

Millstone Power Station, Unit No. 2

LER 2002-004-00

NRC FORM 366 (7-2001) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 7-31-2004

Estimated burden per response to comply with this mandatory information collection request. 50 hours Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records Management Branch (T-6 E6), U S Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to bjs1@nrc gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503 If a means used to impose information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

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

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TITLE (4)
Reactor Shutdown Due to Entry into Technical Specification 3.0.3

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
08	03	2002	2002	– 004 –	00	10	02	2002	FACILITY NAME	DOCKET NUMBER
										05000

OPERATING MODE (9)	1
POWER LEVEL (10)	100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check all that apply) (11)

	20.2201(b)		20 2203(a)(3)(ii)		50.73(a)(2)(ii)(B)		50.73(a)(2)(ix)(A)
	20.2201(d)		20 2203(a)(4)		50.73(a)(2)(iii)		50 73(a)(2)(x)
	20 2203(a)(1)		50 36(c)(1)(i)(A)		50 73(a)(2)(iv)(A)		73.71(a)(4)
	20 2203(a)(2)(i)		50 36(c)(1)(ii)(A)		50 73(a)(2)(v)(A)		73.71(a)(5)
	20 2203(a)(2)(ii)		50 36(c)(2)		50.73(a)(2)(v)(B)		OTHER
	20 2203(a)(2)(iii)		50 46(a)(3)(ii)		50.73(a)(2)(v)(C)		Specify in Abstract below or
	20 2203(a)(2)(iv)	X	50.73(a)(2)(i)(A)		50.73(a)(2)(v)(D)		in NRC Form 366A
	20.2203(a)(2)(v)		50.73(a)(2)(i)(B)		50.73(a)(2)(vii)		
	20 2203(a)(2)(vi)		50.73(a)(2)(i)(C)		50.73(a)(2)(viii)(A)		
	20.2203(a)(3)(i)		50.73(a)(2)(ii)(A)		50.73(a)(2)(viii)(B)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
David W. Dodson, Supervisor-Licensing	860-447-1791

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
B	CB	PSX	NA	Y					

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

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

On August 3, 2002 at 1213, a controlled shutdown was commenced due to an entry into Technical Specification (TS) 3.0.3. The entry into TS 3.0.3 was due to two leaks at socket welded tee and elbow fittings in the charging header. The cracking of the welds is an industry known susceptibility associated with the use of socket welds in the charging system. The cause of the weld failures was high cycle fatigue resulting from high vibration levels induced by the positive displacement charging pumps.

The release due to the leak did not exceed limits as specified by the offsite dose calculation manual, and therefore, had negligible impact on the dose to the public. The flow rate through the charging header remained at the design flow rate while borating the Reactor Coolant System to the required plant condition and associated shutdown margin. The system demonstrated its functionality by meeting the system requirement of injecting boric acid at a flow rate greater than what is required for operability. Therefore, this event did not constitute a safety system functional failure and was not safety significant.

The two failed welds were replaced and the two downstream elbows and their welds were also replaced. All repaired welds were replaced with reinforced leg socket welds to reduce the likelihood of recurrence of cracking at these specific locations. As an interim corrective action to prevent recurrence, an anti-vibration clamp was installed on the header piping.

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

1. Event Description

On August 3, 2002 at approximately 1000, with Millstone Unit No. 2 (MP2) operating at 100% power, the control room received the charging pump area radiation monitor alarm, RM-8997. A review of the Plant Process Computer noted that an increasing radiation trend existed. A Health Physics Technician was dispatched to the Auxilliary Building and reported water on the floor of the "C" charging pump cubicle and a spray of water from the charging pump discharge piping. A Plant Equipment Operator was sent to investigate the source of the leakage and determined it was on the common charging pump discharge header piping (PSX)(CB). Technical Specification (TS) 3.5.2, "Emergency Core Cooling Systems," and TS 3.0.3, Limiting Conditions for Operation (LCOs) were entered because the point at which the leaks took place in the header rendered the emergency core cooling boron injection flow path inoperable. TS 3.1.2.2, "Flow Paths-Operating," LCO was entered because the charging header was leaking, and therefore, the flow path could not be considered operable. However, it was not isolated and it remained functional as a flow path to borate the Reactor Coolant System (RCS) to the required plant condition. Technical Requirements Manual requirement 3.4.10, "Structural Integrity," LCO was also entered because the leaks were due to weld failures in ASME Class 2 piping. Operations commenced a controlled shutdown of the unit at 1213 due to entry into TS 3.0.3. The header remained in service while borating the RCS to the required plant condition and associated shutdown margin.

MP2 was shut down to hot standby (Mode 3) condition at approximately 1630. At 2106 the unit was further cooled down and depressurized to less than 1750 psia. At this time TS 3.5.2 and TS 3.0.3 were exited. Subsequently, the charging system was cross-tied to the facility 1 High Pressure Safety Injection (HPSI) System to satisfy the TS 3.1.2.2 requirement for one train of charging necessary to provide boration. The cross-tied flow path was demonstrated to be operable by running the "A" charging pump through the flow path to maintain pressurizer level within its required operating band. This action was repeated three more times during the shutdown to maintain pressurizer level within the required band.

The leaks occurred at the socket welds at a tee and elbow connection at the common charging header between valves 2-CH-338 (a header isolation valve between the "A" and "B" charging discharge) and 2-CH-429 (the charging header containment isolation valve). The failure of the welds occurred from the inside out, and therefore, were difficult to detect until through wall leakage occurred. The two welds are located within an inch of each other. The two failed welds were replaced and the two downstream elbows and their welds were also replaced. All repaired welds were replaced with reinforced leg socket welds to reduce the likelihood of recurrence of cracking at these specific locations.

On August 6, 2002 at 0145, following the repairs to the common charging header, the charging system was retested and returned to service without incident, the facility 1 HPSI system was restored and the plant commenced a heatup evolution.

This event is being reported pursuant to 10 CFR 50.73(a)(2)(i)(A), "The completion of any nuclear plant shutdown required by the plant's Technical Specifications."

2. Cause

The cause of the weld failures was high cycle fatigue resulting from high vibration levels induced by the positive displacement charging pumps. The positive displacement charging pumps at Millstone Unit No. 2 operate under normal conditions at a certain level of pressure pulsations and high vibration levels. These levels, over time, will lead to high cycle fatigue cracking at areas of stress concentration such as the point at which the charging lines enter the socket weld joints. The general vibration levels may have increased since the removal of insulation from the header piping in 1999, however, there are no baseline data to confirm this.

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

The cracking of the welds is an industry known susceptibility associated with the use of socket welds in the charging system. However, since 1982 no cracked socket welds had occurred on the MP2 charging system until a condition report identified a leak at a cracked socket weld of the "B" charging pump discharge branch line on May 26, 1999. This cracked weld at a ¾ inch branch fitting was determined to be caused by high amplitude vibrations and the inherent welding defects of the socket weld design. Since the entire system is potentially susceptible to flaw initiation and propagation, and subsequent leakage at the welds of the sockets of the piping fittings, previous efforts to identify the most susceptible locations have resulted in weld enhancements of ½ inch and ¾ inch socket welds. The location of this latest failure was not weld reinforced prior to its failure on August 3, 2002. The reason for this is that the need for reinforcements to these welds was identified after the last shutdown for refueling, and the repairs could not be performed on line.

Previously on November 28, 2001, a leak in the "A" charging pump header occurred at a cracked socket weld due to vibration induced fatigue failure. An extent of condition investigation resulted in the analysis of six socket welds removed during the refueling outage in 2002. A number of welding defects were identified at the root of the socket welds which could propagate if located in high vibration locations. In July 2002, an engineering analysis concluded that the section of the charging header outside of containment was susceptible to future failure due to pressure and vibration induced fatigue. Corrective actions proposed for this section of the common charging header included reinforcing the socket welds, replacing them with butt welds, or eliminating the source of the vibrations. Evaluation of these recommended corrective actions had not been completed prior to the event which took place on August 3, 2002 that resulted in the plant shutdown. After the system was returned to service, vibration data was obtained on the header. A condition report was written on August 15, 2002 to document the need for an anti-vibration clamp on the charging header to reduce the likelihood of additional weld failures. On August 27, 2002 a condition report was initiated to document a failed instrument tube at the toe of the socket weld, downstream of the root valve for the pressure sensor on the common charging header. An anti-vibration clamp assembly was installed on August 31, 2002. The effectiveness of this corrective action was subsequently confirmed to reduce header vibration levels to acceptable magnitudes at various locations on the charging header.

3. Assessment of Safety Consequences

The spray of water released through the leak did contain low levels of radioactivity. Any release to the Auxilliary Building is a monitored release pathway. The release due to the leak did not exceed limits as specified by the offsite dose calculation manual, and therefore, had negligible impact on the dose to the public.

The flow rate through the charging header remained at the design flow rate while borating the RCS to the required plant condition and associated shutdown margin. This event was classified as a Maintenance Rule Functional Failure. However, the system did not accrue unavailability until the charging header was isolated for repairs. The system demonstrated its functionality by meeting the system requirement of injecting boric acid at a flow rate greater than what is required for operability. Therefore, this event did not constitute a safety system functional failure and was not safety significant.

In addition to inventory and reactivity control, the charging system is used during accident conditions for auxiliary pressurizer spray for Appendix R scenarios and for emergency core cooling hot leg injection post-LOCA (Loss of Coolant Accident). Since the leak rate was very small, auxiliary pressurizer spray would still have been available for pressure control in Appendix R scenarios. The redundant path through the Shutdown Cooling System was available for emergency core cooling post-LOCA hot leg recirculation. Thus, for postulated as well as actual conditions, this event was not safety significant.

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

4. Corrective Action

As a result of this condition, the following actions were performed to restore compliance:

- The two failed welds were replaced and the two downstream elbows and their welds were also replaced.
- All repaired welds were replaced with an improved stress reduced socket weld to reduce the likelihood of recurrence of cracking at these specific locations.

As an interim corrective action to prevent recurrence, an anti-vibration clamp was installed on the header piping.

An investigation was conducted and long term corrective actions are being addressed in accordance with the Millstone Corrective Action Program.

5. Previous Occurrences

No previous similar LERs were identified.

Condition Report CR M2-99-1734 documented a failed socket weld on the inlet to the "B" charging pump discharge relief valve. This crack originated on the outside at the toe of the socket weld and propagated inward until the pressure boundary was compromised. The leak was isolated and repaired, including a subsequent reinforcement of the susceptible weld.

Condition Report CR-01-11536 documented a failed socket weld on the "A" charging pump discharge pipe at a socket weld. This failure occurred from the inside out, at the root of the weld, and propagated outward until the pressure boundary was compromised. The leak was isolated, the old weld fully removed, and a new stress reduced socket weld was utilized to reattach the socket weld fitting to the discharge pipe.