



**Northeast  
Nuclear Energy**

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The Northeast Utilities System

FEB 20 2001

Docket No. 50-336  
B18280

Re: 10 CFR 50.73(a)(2)(v)

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

Millstone Nuclear Power Station, Unit No. 2  
Licensee Event Report 2000-012-01  
Work on Non-Vital Chiller Caused Vital Chillers to be Inoperable

This letter forwards Supplemental Licensee Event Report (LER) 2000-012-01, documenting an event that was determined to be reportable at Millstone Nuclear Power Station, Unit No. 2, on July 24, 2000. This supplemental LER is being submitted to reflect a revised reportability assessment against 10 CFR 50.73(a)(2)(v).

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,

NORTHEAST NUCLEAR ENERGY COMPANY



C. J. Schwarz

Master Process Owner - Operate the Asset

Attachment (1): LER 2000-012-01

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

IE22

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Attachment 1

Millstone Nuclear Power Station, Unit No. 2

LER 2000-012-01

**LICENSEE EVENT REPORT (LER)**(See reverse for required number of  
digits/characters for each block)

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), 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. If an 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.

FACILITY NAME (1)

Millstone Nuclear Power Station Unit 2

DOCKET NUMBER (2)

05000336

PAGE (3)

1 OF 3

TITLE (4)

HISTORICAL LER: Work on Non-Vital Chiller Caused Vital Chillers to be Inoperable

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
07	24	2000	2000	-- 012 --	01	2	20	2001	FACILITY NAME	DOCKET NUMBER
OPERATING MODE (9)		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)							
POWER LEVEL (10)		100	20.2201(b)			20.2203(a)(2)(v)		<input checked="" type="checkbox"/>	50.73(a)(2)(i)	50.73(a)(2)(viii)
			20.2203(a)(1)			20.2203(a)(3)(i)		<input checked="" type="checkbox"/>	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)		<input checked="" type="checkbox"/>	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

D. W. Dodson, Team Lead - Compliance

TELEPHONE NUMBER (Include Area Code)

(860) 447-1791, x2346

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX

## SUPPLEMENTAL REPORT EXPECTED (14)

YES

(If yes, complete EXPECTED SUBMISSION DATE).

☒

NO

EXPECTED  
SUBMISSION  
DATE (15)

MONTH

DAY

YEAR

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

On April 19, 2000, with the unit in Mode 1 at 100% power, restoration from a maintenance activity on a non-vital chiller introduced air into the vital chilled water system. The air migrated through the system and caused the pumps for the vital chillers to become air-bound. The vital chillers provide necessary cooling for the two DC switchgear rooms during accident situations. This condition went undetected until April 23, 2000, at which time the unit was in Mode 5 for refueling. The DC busses were administratively inoperable for 80.5 hours in Modes 1 through 4. Therefore, the limiting condition for operation for TS 3.8.2.3, which requires both trains of DC busses be operable in Modes 1 through 4, was not met. The vital chillers X169A/B were discovered air-bound during routine surveillance testing. The vital chillers were restored to operable status prior to entry into Mode 4 from the refueling outage. On July 24, 2000, during a regulatory review, it was determined that this was a reportable condition.

The cause of this event was determined to be inadequate restoration from work performed on non-vital chiller X196B on April 19, 2000, in conjunction with a system piping arrangement conducive to air entrapment.

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

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
Millstone Nuclear Power Station Unit 2	05000336	2000	-- 012 --	01	2 OF 3

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

**I. Description of Event**

On July 24, 2000, it was determined that a reportable condition existed from April 19 to April 23, 2000, with the Unit in Mode 1 (100% power) through Mode 4 (entering refueling outage) because both vital chillers, which support 125-volt DC switchgear operability, were unknowingly air-bound as a result of maintenance activities, and were unable to perform their intended function. The vital chillers [CHU] provide necessary cooling for both trains of DC switchgear during accident situations. Technical Specification (TS) 3.8.2.3 requires, in Modes 1 through 4, that both DC bus trains [EJ] be energized and operable. The TS allows two hours to restore the inoperable bus or to be in cold shutdown within the next 36 hours. With both busses administratively inoperable, TS 3.0.3 would have required a Unit shutdown (hot standby) within six hours.

On April 19, 2000, at 1650, with the Unit in Mode 1 at 100% power, non-vital chiller X196B was aligned and placed in service after restoration of maintenance activities. Maintenance activities included draining chilled water from the evaporator for freon leak inspections, and then filling and venting activities to restore the system. Restoration of the non-vital chiller unknowingly caused air intrusion into the vital portion of the chilled water system. It has been determined that this air intrusion caused the vital chillers to become air-bound, a condition that went undetected until after the unit entered Mode 5 for a planned refueling outage. Mode 5 entry occurred on April 23, 2000 at 0123. Consequently, for an 80.5 hour period, the DC busses were administratively inoperable, and the limiting condition for operation for TS 3.8.2.3 was not met. At no time during this period did either DC switchgear room exceed its design basis temperature for operability.

On April 24 and 25, 2000, with the Unit in Mode 5, routine surveillance activities resulted in the vital chillers tripping due to pump air-binding. Troubleshooting of the vital chilled water system commenced and, over a period of a few weeks, significant amounts of air were removed from the system. Some of this air was believed to have migrated to localized high points in the system at the vital pump suction. Additional air was discovered near cooler X40 which is the system high point. By May 23, 2000, both vital chillers were fully vented and were considered operable.

This condition is being reported in accordance with 10 CFR 50.73(a)(2)(i)(B), any operation or condition prohibited by the plant's Technical Specifications, and 10 CFR 50.73(a)(2)(ii)(B), a condition that was outside the design basis of the plant, and 10 CFR 50.73(a)(2)(v), an event or condition that alone could have prevented the fulfillment of a safety function. In the latter instance, reportability is conservative given that two trains of an essential support system were rendered inoperable and the failure would not have been readily detectable. Additional information regarding the expected outcome of an actual design basis event is discussed under Section III of this report.

**II. Cause of Event**

The cause of this event was determined to be inadequate restoration from work performed on non-vital chiller X196B on April 19, 2000, in conjunction with a system piping arrangement conducive to air entrapment.

The investigation determined that a significant amount of air had been introduced during the draining and filling activities for non-vital chiller X196B. Because the non-vital and vital portions of the system are cross-connected during normal operations, entrained air could enter the DC switchgear room coolers and vital chiller pump suction and discharge lines. It was also determined that the system design was vulnerable to air entrapment at several high elevation points. Another point in the piping (cable vault cooler X40) was determined to be at too low of a pressure to provide adequate venting, and was potentially causing additional air to be sucked into the vital chilled water system. Since it was not previously recognized that the vital chilled water system design was vulnerable to air entrapment, the maintenance activities/procedures on April 19, 2000, were inadequate in reducing air introduction during filling and did not provide specific instructions for fully venting the system.

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

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
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Millstone Nuclear Power Station Unit 2	05000336	2000	-- 012 --	01	3 OF 3

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

**III. Analysis of Event**

During the 80.5 hours when the vital chillers were unknowingly air-bound, the DC switchgear rooms were cooled by the non-vital chilled water system and therefore did not exceed their design basis temperature.

If a postulated accident (loss of normal power or safety injection) were to have occurred during this time period, the temperatures in the affected areas would have gradually increased above the design basis allowable value. Diagnosis and response to the event would be delayed until priority alarms (i.e., Inverter Trouble) resulting from equipment degradation were received in the control room. Under these circumstances, an operator would have been dispatched to the affected equipment space, identified the loss of cooling, and instituted proceduralized compensatory actions (e.g., opening of doors with subsequent installation of supplemental cooling fans) for all affected areas. These compensatory measures have been demonstrated through conservative calculations to be effective at maintaining room temperatures below the design basis allowable value. Given the conservative assumptions utilized in the current design basis calculations, the fact that the rooms do not heat up at the same rate, and the uncomplicated nature of the mitigating actions, it is expected that sufficient time would have been available for operators to respond prior to redundant equipment being impacted.

Based on the short duration (80.5 hours) of this condition, the expected operator response, and the significant conservatism inherent in the design calculations, this event is considered to have a low safety significance.

**IV. Corrective Action**

When the vital chillers were first discovered to be air-bound in Mode 5, immediate corrective actions were taken to troubleshoot and vent the vital chilled water system in an attempt to restore the vital chillers. Troubleshooting was conducted to determine the extent of condition, a procedure modification was performed to correct the venting problem at cooler X40, and additional venting and testing were required before the vital chillers were considered fully operable. An evaluation is ongoing to determine the need for installation of automatic vent valves at vital locations in the system. An investigation was conducted and appropriate corrective actions are being addressed in accordance with the Millstone Corrective Action Program.

Corrective actions determined to prevent recurrence of this condition include:

1. Develop procedural instructions to provide periodic venting of the non-vital (auxiliary) and vital chilled water systems and provide special instructions for venting and filling the chilled water systems after work activities that challenge the vital chilled water system (such as pressure boundary work that could introduce air).
2. Modify the work order system database as needed to flag maintenance activities that require special instructions for restoration/system venting affecting vital chilled water system.

**V. Additional Information**

None

**Similar Events**

No previous similar conditions involving air entrapment in vital chilled water system were identified.

Energy Industry Identification System (EIIIS) codes are identified in the text as [XX]