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Nuclear Energy

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The Northeast Utilities System

JUN 27 1996

Docket No. 50-336
B15737

Re: 10 CFR 50.73

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

This letter forwards Licensee Event Report (LER) 96-001-01 documenting an event that occurred at Millstone Nuclear Power Station, Unit No. 2 on January 4, 1996. This LER is being submitted pursuant to 10 CFR 50.73(a)(2)(i).

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

P. M. Richardson
Director - Millstone Unit No. 2

Attachment: LER 96-001-01

cc: T. T. Martin, Region I Administrator
P. D. Swetland, Senior Resident Inspector, Millstone Unit No. 2
D. G. McDonald, Jr., 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 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 (2-150 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 5
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TITLE (4)
Reactor Coolant System Heatup Rate Exceeded Technical Specification Limit

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
01	04	96	96	001	01	6	25	96	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)			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 M. D. Ehredt, Nuclear Licensing Supervisor	TELEPHONE NUMBER (Include Area Code) (860)440-2142
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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		MONTH	DAY	YEAR
YES (If yes, complete EXPECTED SUBMISSION DATE)				<input checked="" type="checkbox"/> NO				

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

On January 4, 1996 at 1815 hours, with the plant in Mode 1 at 100% power, an engineering review identified that the Reactor Coolant System (RCS) heatup rate requirements of Technical Specifications (TS) section 3.4.9.1 were not satisfied during an RCS heatup on December 17, 1995. The RCS heatup rate was determined to be 72°F in a one hour period, which was in excess of the Technical Specification's limit of 50°F per hour. The action statement requirement to perform an engineering evaluation of the structural integrity of the RCS and its acceptability for continued operation was not performed until January 4, 1996. This event is being reported pursuant to the requirements of 10 CFR 50.73(a)(2)(i)(B), "reporting of any operation or condition prohibited by the plant's Technical Specifications."

Supplement 1 to this LER is being submitted since the Event Review Team (ERT) has completed their investigation of this event. The ERT determined the root causes to include design and procedural weaknesses for controlling the plant heatup rate, and ineffective corrective actions implemented subsequent to the August 1995 RCS heatup event. Planned corrective actions include changes to the plant operating procedures, changes to the plant heatup/cooldown monitoring computer program, and operator training to address this event and the August 1995 RCS heatup event.

There were no automatic or manually initiated safety responses resulting from this event.

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

I. Description of Event

On January 4, 1996 at 1600 hours, with the plant in Mode 1 at 100% power, an engineering review concluded that the Reactor Coolant System (RCS) heatup rate requirements of the TS Limiting Condition for Operation (LCO) 3.4.9.1 (a) were not satisfied during the RCS heatup on December 17, 1995. Engineering determined that the RCS heatup rate was 72°F in a one hour period, which exceeded the LCO limit of 50°F per hour. During the RCS heatup on December 17, 1995, the operating shift was unable to detect that the heatup rate limit in LCO 3.4.9.1(a) had been exceeded.

Utilizing the existing procedures based on the computer program data, the operating shift noted that the RCS heatup rate was 49.5°F in the one hour period following the start of the Reactor Coolant Pumps (RCP). Operators initiated an Adverse Condition Report (ACR) to document the unusual heatup rate. However, in accordance with the procedures and computer program data, it was believed, at that time, that the heatup rate had not exceeded the LCO limit.

As a result of the ACR, an engineering review of the RCS heatup data was performed on December 18, 1995, which concluded that the RCS heatup rate limit was not exceeded. However, this initial review did not consider the affect of shutdown cooling (SDC) injection temperature at the time that the SDC system was secured. An additional engineering review of the RCS heatup data was performed in January 1996 after additional questions were raised concerning the RCS heatup rate ACR. The January 1996 engineering review noted the following events of the RCS heatup on December 17, 1995:

- The SDC system was secured at 0425 hours in preparation to start RCPs
- At the time that SDC was secured, the SDC injection temperature was 155°F
- Shortly after securing SDC, the RCS loop 2 cold leg temperature was observed to increase from 155°F to 185°F
- The "B" RCP was started at 0448 hours and the "D" RCP was started at 0451 hours
- At 0525 hours, the RCS loop 2 cold leg temperature was 227°F (one hour after securing SDC)

Based on the above, it was concluded that the heatup rate was 72°F in a one-hour period, which exceeded the LCO limit.

II. Cause of Event

An Event Review Team's (ERT) review of this event identified the following root causes that resulted in the plant heatup rate exceeding TS limits:

- a. Computer software specifications and bases documents to procedures do not provide sufficient detail concerning what constitutes a heatup/cool-down or which instruments should be utilized for calculating the heatup/cool-down rates in the reactor coolant or pressurizer. The lack of design document detail led to less than adequate operating procedures and monitoring capabilities to control heatup, and the computer heatup/cool-down program was not capable of accurately detecting and conveying to the operators the RCS heatup and cool-down rates. As a result, the operators were unaware of the event.

The plant surveillance procedure used to monitor RCS heatup and cool-down rates requires that the RCS heatup rate be assessed at least once every 30 minutes during a plant heatup. This assessment

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uses the average of the RCS loop 1 and loop 2 cold leg temperature values. The plant computer heatup/cool-down monitoring software program was developed to reflect the above procedure requirements. During the December 17, 1995 RCS heatup, the average of the RCS loop 1 and loop 2 temperatures was 170°F. The combination of using the average of the loop cold leg temperatures and the averaging methodology used by the plant computer concealed the magnitude of the reactor vessel downcomer heatup rate.

The plant heatup procedures also did not provide adequate instructions for establishing system conditions prior to the termination of SDC and starting the RCPs, such as the evaluation of the RCS heat balance, increasing the SDC injection temperature to minimize the reactor vessel downcomer heatup rate when SDC is secured, and controlling the heatup rate and sources of heat input at low temperatures. During the December 17, 1995 RCS heatup there still remained significant core decay heat, since the reactor had been shutdown for approximately 3 days following 120 days of operation at full power. This decay heat, combined with the heat input from two operating RCPs, created a heatup rate condition which approached 50°F per hour. Additionally, since the heatup started near 185°F, the steam generators were ineffective in controlling the heatup rate until after they had begun to steam (i.e., at about 230°F).

- b. The evaluation of the heatup event in the summer of 1995 identified inadequate training and lack of detail in the heatup procedure as the primary causes. However, the corrective actions identified as a result of the heatup event were ineffective and not correctly prioritized.
- c. Weaknesses and limitations in the plant design and procedures placed additional demands on the operators and did not provide them with adequate means of monitoring and controlling heatups.

Current operating procedures require the operator to secure SDC and raise reactor pressure, prior to starting the first RCP, due to minimum RCP seal pressure and SDC design pressure limits. TS LCO 3.4.1.3 allows operation under certain plant conditions, with the RCPs and SDC pumps out of service for up to 1 hour, and requires the operator to enter into a 1 hour TS Action. This causes significant thermal-hydraulic changes in the region of the reactor vessel downcomer.

The root causes summarized above were submitted in a Northeast Utilities' letter B15653 dated April 19, 1996, in response to an NRC request to provide the results of a detailed assessment of the causal factors underlying the weaknesses found in the procedures that are utilized to maintain RCS temperature within required limits.

III. Analysis of Event

This event is being reported pursuant to the requirements of 10 CFR 50.73(a)(2)(i)(B), "reporting of any operation or condition prohibited by the plant's Technical Specifications." The requirements for TS LCO 3.4.9.1(a) were not met when the RCS heatup rate exceeded the TS limit and the corresponding actions were not completed. Additionally, the requirements for TS LCO 3.0.4 were not met when the plant continued to change modes to full power operation, while not having met the actions of TS LCO 3.4.9.1(a).

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The LCO for TS section 3.4.9.1(a) requires that the RCS heatup rate be limited to "50°F in any one hour period with T_{avg} above 140°F." This limit was exceeded at 0525 hours on December 17, 1995 when the RCS heatup rate was 72°F in a one hour period.

The action for this TS LCO requires that "with any of the above limits exceeded, restore the temperature and/or pressure to within the limit within 30 minutes; perform an engineering evaluation to determine the effects of the out-of-limit condition on the structural integrity of the Reactor Coolant System; determine that the Reactor Coolant System remains acceptable for continued operations or be in at least HOT STANDBY within the next 6 hours and reduce the RCS T_{avg} and pressure to less than 200°F and 500 psia, respectively, within the following 30 hours."

Since the exceeded RCS heatup rate was not identified by the operating shift on December 17, 1995, the TS LCO was not entered. The action for this LCO is to perform an engineering evaluation of the structural integrity of the RCS and its acceptability for continued operation, which was not performed until January 4, 1996.

Subsequent to the discovery of this event, an engineering evaluation was performed and concluded that the structural integrity of the RCS was not affected and remained acceptable for continued operation.

During the RCS heatup on December 17, 1995, the pressurizer heatup rate limit of 100°F/hr contained in TS LCO 3.4.9.2(a) was also exceeded. The required actions for TS LCO 3.4.9.2(a) are to restore the heatup rate within 30 minutes and to perform an engineering evaluation to determine the affects of the out-of-limit condition. This action was met. However, as part of the detailed assessment of the weaknesses in the procedures for controlling plant heatups, the ERT also evaluated the events related to exceeding the pressurizer heatup rate. The ERT concluded that the primary cause was that neither personnel nor procedures recognized the need to manage non-condensable gases in the pressurizer, that exist during short shutdowns when the primary system boundary has not been breached. Accumulation of non-condensable gases blanketing the steam space temperature detector and subsequent utilization of pressurizer spray, which mixed the steam space volume, was a primary cause of the temperature transient at the top of the pressurizer. Plant procedures did not provide guidance for evaluation of, or the actions to be taken, when differences between the pressurizer steam space and water space temperature were observed.

IV. Corrective Action:

Changes to the plant operating and surveillance procedures, the plant heatup/cooldown monitoring computer program, and the operator training program will be implemented to allow operators to properly monitor and control the RCS and pressurizer heatup rate.

Detailed corrective actions planned to be completed were submitted on April 19, 1996 in response to the request to provide the results of a detailed assessment of the causal factors underlying the event. In summary, the corrective actions include:

- Revising procedures to incorporate consistent definitions, monitoring details based on computer software improvements, and equipment manipulation strategies for both heatups and cooldowns.
- Developing new procedures in the area of reactor coolant system heat balance.

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- Completing an investigation into single RCP operation and operation of RCPs in parallel with SDC.
- Developing a new program for the management of non-condensable gases in the RCS.
- Providing additional training for the detection and mitigation of non-condensable gases, and plant heatup and cooldown evolution's.
- Developing strengthened administrative controls for tracking and completing ERT commitments.

Corrective actions will be completed prior to entry into Mode 4. As committed in the April 19, 1996 letter, the detailed schedule for completion of the corrective actions will be forwarded to the resident NRC inspector when finalized.

V. Additional Information

Similar Events

LER 95-030 reported an event that resulted in a RCS heatup rate that exceeded the TS limit.

LER 96-007 reported an event that resulted in a RCS cooldown rate that exceeded the TS limit.

Manufacturer Data

None