

EXPIRES 04/30/98

### 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 (3150-0104), 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 3
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TITLE (4)  
Single Failure Vulnerability of the AFW System via the Condenser Hotwell Make-up Valve

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
08	28	91	97	-- 025 --	00	07	29	97	FACILITY NAME	DOCKET NUMBER

OPERATING MODE (9) 5	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)									
POWER LEVEL (10) 000	20.2201(b)	20.2203(a)(2)(v)	50.73(a)(2)(i)	50.73(a)(2)(viii)						
	20.2203(a)(1)	20.2203(a)(3)(i)	X 50.73(a)(2)(ii)	50.73(a)(2)(x)						
	20.2203(a)(2)(i)	20.2203(a)(3)(iii)	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 of NRC Form 366A						
20.2203(a)(2)(iv)	50.36(c)(2)	50.73(a)(2)(vii)								

LICENSEE CONTACT FOR THIS LER (12)

NAME R. G. Joshi, MP2 Nuclear Licensing Manager	TELEPHONE NUMBER (include Area Code) (860) 440-2080
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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)

YES (If yes, complete EXPECTED SUBMISSION DATE).	X NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
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ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On August 28, 1991 it was discovered that a single active failure of the hotwell make-up valve (2-CN-241) could result in a diversion of water from the Condensate Storage Tank (CST) to the Condenser Hotwell such that sufficient volume would not be available in the CST for Auxiliary FeedWater (AFW) requirements to cooldown the Reactor Coolant System.

The cause of this condition was a failure to consider single failure scenarios in the original design requirements for condensate make-up to the AFW System.

To correct this deficiency, actions were taken to ensure that the CST was maintained at a level that would ensure sufficient water volume was available even if a single failure of the hotwell make-up valve were to occur. Additionally, the trim package for the hotwell make-up valve was changed such that CST drainage to the condenser hotwell would be lessened. The applicable calculations shall be reviewed to verify CST volume losses caused by the single failure of the hotwell make-up valve and the applicable Emergency Operating Procedures will be revised to specify required operator actions. An evaluation shall be performed to identify if system enhancements are necessary to ensure the CST has adequate water volume to meet postulated accident requirements.

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

I. Description of Event

On August 28, 1991, during a single failure vulnerability review of facility safety systems, it was discovered that a single active failure of the hotwell make-up valve (2-CN-241) [ISV] could result in a diversion of water from the Condensate Storage Tank (CST) [KA] [TK] to the Condenser Hotwell such that sufficient volume would not be available in the CST for Auxiliary FeedWater (AFW) [BA] requirements to cooldown the Reactor Coolant System (RCS) [AB]. At the time of discovery of this condition, the plant was in Mode 5 at 0 percent power.

The original reportability evaluation for this deficiency concluded that this condition was not reportable under 10 CFR 50.73 since during cycle 11 the CST inventory was sufficiently higher than the Technical Specification (TS) required limit of 150,000 gallons. Therefore, even with the postulated single failure of the hotwell make-up valve, sufficient volume would have been available to meet FSAR Chapter 14 RCS cooldown requirements. However, the original reportability evaluation did not address CST levels prior to cycle 11 and since the facility TS only require 150,000 gallons of water be maintained in the tank, it cannot be easily shown that CST levels were sufficient prior to cycle 11. This deficiency was discovered on June 26, 1997.

The hotwell make-up valve closes on a low-level condition in the CST, on a loss of control air, or on a loss of power to its solenoid. Credible failure modes for this valve include a failure of the valve control system or a binding of the valve internals. The potential draindown of the CST is enhanced by the fact that condenser vacuum is maintained following a plant trip due to the continued operation of the circulating water pumps. Even if the pumps were to fail, degradation in condenser vacuum due to inleakage could be minor over the first 30 minutes. Therefore, operator action is credited for manually closing the valve within 30 minutes of the valve failing to close. An additional aid to the operator, which resulted from another facility modification, was the modification of the CST low-level alarm so that it alarmed at 62 percent (168,000 gallons).

This condition is considered to be reportable under 10 CFR 50.73(a)(2)(ii)(B), any condition that was outside the design basis of the plant.

II. Cause of Event

The cause of this condition was a failure to consider single failure scenarios in the original design requirements for condensate make-up to the AFW System.

III. Analysis of Event

The primary function of the CST is to provide an adequate source of make-up water for the condensate and feedwater system via the condenser hotwell and for the AFW System. The make-up to the condenser hotwell is controlled by the hotwell level control system modulating the make-up valve 2-CN-241. The CST level control system monitors the CST level and closes 2-CN-241 if the tank level reaches the low level interlock to ensure the TS minimum volume of 150,000 gallons.

A single failure of 2-CN-241 coincident with an AFW initiation could have resulted in a loss of CST inventory to the condenser hotwell. However, the affect of this single failure is minimized by the fact that CST water volume is typically maintained above the Technical Specification required volume and by the fact that makeup to the CST from other water sources (non-credited) is possible during a postulated accident. Therefore, this condition is not considered to be safety significant.

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

IV. Corrective Action

As a result of this event, the following actions have been, or will be, performed.

1. In 1991 a night order was issued to maintain the CST level at 76 percent (190,000 gallons) until the potential leakage to the condenser hotwell could be minimized by throttling an associated isolation valve.
2. In 1992 the trim package for the hotwell make-up valve was changed to reduce port trim such that water draindown from the CST through the condenser hotwell valve would be lessened.
3. The applicable Emergency Operating Procedures will be revised prior to entry into Mode 4 from the current outage to determine appropriate action to remotely isolate the hotwell make-up valve if it fails to close in response to a low-level alarm.
4. An evaluation shall be performed prior to entry into Mode 3 from the current outage to review appropriate calculations relating to CST volume losses caused by a single failure of the hotwell make-up valve and to evaluate the need for system enhancements to ensure the CST has adequate water volume to meet postulated accident requirements.

V. Additional Information

Similar Events

Previous LERs that involve single failure vulnerabilities include:

- 96-022: This LER documented a deficiency in which it was determined that a single failure of the hydrogen purge valve interlock to the Enclosure Building Filtration System (EBFS) heaters would de-energize the heaters for both trains of emergency charcoal filtration that service the Spent Fuel Pool and the EBFS. The cause of this event was an error in the original design of the hydrogen purge valve interlock. A design change was implemented to correct the single failure susceptibility of the EBFS heaters.
- 96-017: This LER documented a deficiency in which it was determined that the hydrogen monitoring system does not meet the single failure criterion. Existing procedural guidance required that alternate electrical power be established by installing a temporary jumper to the respective outside containment isolation valve that could be potentially de-energized following a loss of a single DC bus. It was concluded that this guidance did not meet the single failure criterion. Corrective actions included a design change to permanently re-power the outside containment sample line isolation valves to meet the single failure criterion, and a continuing investigation to verify that the post accident sampling system and hydrogen monitoring system comply with their design basis.
- 94-015: This LER documented a deficiency in which it was determined that the Automatic Auxiliary Feedwater Initiation control circuit did not meet the single failure criterion. The single failure identified was a short circuit across two conductors of the actuation relays associated with the initiation logic matrix. Corrective action for this deficiency included an evaluation to determine if a design change was necessary.

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