

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No.: 50-336/91-02

License No.: DPR-65

Licensee: Northeast Nuclear Energy Company
P.O. Box 270
Hartford, CT 06141-0270

Facility: Millstone Nuclear Power Station, Unit 2

Location: Waterford, Connecticut

Inspection
Dates: January 3 through January 18, 1991

Reporting
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Inspectors: P. Habighorst, Resident Inspector
Millstone Unit 2
Reactor Projects Section 4A, DRP

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Reactor Projects Section 4A
Division of Reactor Projects

Inspection
Summary: Inspection on January 3 through January 18, 1991
(Inspection Report 50-336/91-02)

Areas
Inspected: Events and documentation related to the loss of service water header independence on November 15, 1990 were inspected with emphasis on system design and requirements, corrective maintenance activities on cross-connect valve 2-SW-97A, reportability assessments, and overall conclusions.

Results: See Executive Summary

EXECUTIVE SUMMARY

Millstone Nuclear Station, Unit 2

NRC Region I Special Team Inspection NO. 50-336/91-02

Plant Operations

Loss of plant configuration control on the service water system occurred between November 2 - November 15. Configuration control was not maintained due to mispositioning of a service water cross-connect valve, resulting in a loss of header independence. Upon identification, operators immediately shut the valve. Detection of the condition was complicated by lack of control room annunciators, lack of remote position indication, and the periodicity of service water system valve line-ups.

Maintenance and Surveillance

No significant observations were noted during the report period.

Safety Assessment and Quality Verification

Licensee review of the event was unable to identify a root cause. The most likely cause was personnel error during maintenance activities. The inspector considered licensee corrective actions to be acceptable.

Issuance of the licensee event report (LER) was not timely, and licensee determination that the event was not reportable under 10 CFR 50.72 was incorrect. However, inspector assessment of past LER timeliness indicated that this was an isolated incident.

The control of the service water system is considered a significant safety event in that for approximately 13 days the system was in an unanalyzed condition.

TABLE OF CONTENTS

1.0	PERSONS CONTACTED	1
2.0	OVERVIEW	1
3.0	DESCRIPTION OF SYSTEM AND REQUIREMENTS	1
4.0	SEQUENCE OF EVENTS	2
5.0	CORRECTIVE MAINTENANCE ACTIVITIES ON THE SERVICE WATER CROSS-CONNECT VALVES	3
6.0	REPORTABILITY ASSESSMENT	4
7.0	LICENSEE CORRECTIVE ACTION	5
8.0	INSPECTOR ASSESSMENT AND CONCLUSION	5
9.0	MANAGEMENT MEETING	6

Attachment I: Documents Reviewed

DETAILS

1.0 PERSONS CONTACTED

NORTHEAST NUCLEAR ENERGY COMPANY

W. Romberg, Vice-President, Nuclear Operations, Northeast Utilities

J. Keenan, Director, Millstone Unit II

J. Riley, Supervisor, Maintenance, Millstone Unit II

J. Smith, Supervisor, Operations, Millstone Unit II

R. Bates, Assistant Supervisor Engineering, Unit II

G. Komosky, Senior Engineer, Millstone Unit II

S. Meyers, Shift Supervisor, Millstone Unit II

2.0 OVERVIEW

On November 15, 1990, service water header cross-tie valve 2-SW-97A was found open by a plant engineering technician. Valve 2-SW-97A was required to be closed based on the service water pump configuration in order to maintain separation of two independent headers.

3.0 DESCRIPTION OF SYSTEM AND REQUIREMENTS

The service water system is designed such that it shall be able to provide sufficient water for all modes of operation. It is a vital safety system designed to conform to facility separation and single failure criteria. The service water system provides the ultimate heat sink during postulated accident scenarios.

Operability of the system ensures that sufficient cooling capacity is available for continued operation of vital components and engineered safety feature equipment during normal and accident conditions. The function of the system is to supply a dependable continuous flow of the cooling water to the reactor building closed cooling water (RBCCW) heat exchangers, turbine building closed cooling water (TBCCW) heat exchangers, diesel engine cooling water heat exchangers, vital AC switchgear room cooling coils, chilled water heat exchangers, service water pump bearings, and the circulating water pump bearings. The redundant cooling capacity of the system, assuming a single failure, is consistent with the assumptions used in the final safety analysis accident scenarios.

The system has three supply pumps, the "A," "B," and "C"; and two supply headers, the "A" and "B." The "B" pump is the swing pump and can be aligned to either "A" or "B" service water header. Cross-tie valves are located between the "A" and "B" pumps (2-SW-97A) and between the "B" and "C" pumps (2-SW-97B) to facilitate the swing feature of the "B" pump.

Cross-tie valves 2-SW-97A and 2-SW-97B are 24-inch air-operated butterfly valves. The valves are designed to fail-as-is on loss of instrument air or loss of 125 vdc to the pilot solenoid valves. The valves are electrically interlocked such that only one of the valves can be opened at a time. Remote position indication and controls for the valves are normally available in the control room.

Normally, service water header separation is maintained by operator adherence to operating procedure OP 3.0.1, "Service Water"; automatically, by an installed electrical interlock for the cross-tie valves; control board alarms "Service Water Pump Strainer Power Mismatch"; and "Service Water Pumps Misaligned"; and monthly service water system valve line-ups.

Technical specification 3.7.4.1 requires two independent service water headers to be operable in plant operational modes 1,2,3, and 4. The required action if one of the headers is inoperable is to restore the loop to an operable status within 48 hours or be in the cold shutdown condition within the next 36 hours. Further, technical specification 3.0.4 states that entries into operational modes shall not be made unless the LCO requirements are met without reliance on provisions of action statements.

4.0 SEQUENCE OF EVENTS

The following is a list of events leading to the licensee's discovery of the service water cross-tie valve in the incorrect position:

<u>Date</u>	<u>Time</u>	<u>Event</u>
November 1	3:20 p.m.	Reactor enters Operational Mode 4
November 2	11:15 a.m.	Reactor enters Operational Mode 3
November 2	12:03 p.m. - 4:02 p.m.	Numerous Service Water Pump Shifts between the "A" and "B" Pumps
November 3	9:30 a.m.	Started "C" Service Water Pump uncoupled
November 3	9:55 a.m.	Secured "C" Service Water Pump
November 3	10:30 a.m.	Started "C" Service Water Pump Motor
November 3	10:55 a.m.	Secured "C" Service Water Pump Motor
November 3	1:23 p.m.	Started "C" Service Water Pump and Secured "B" Service Water Pump
November 3	1:55 p.m.	Started "B" Service Water Pump and Secured "C" Service Water Pump
November 4	6:40 p.m.	Reactor enters Operational Mode 2
November 6	1:45 a.m.	Completed a high velocity flush of the "A" Service Water Header
November 8	8:46 p.m.	Reactor enters Operational Mode 1
November 15	3:10 p.m.	Licensee identified 2-SW-97A was identified as open

Between November 3 at 1:55 p.m. and November 15 at 3:10 p.m. the service water system was aligned with the "A" and "B" service water pumps. On November 2, numerous operations with the cross-tie valves occurred in the process of shifting the "A" and "B" service water pumps.

5.0 CORRECTIVE MAINTENANCE ACTIVITIES ON THE SERVICE WATER CROSS-CONNECT VALVES

During the most recent refueling outage, valve 2-SW-97A was removed from the service water system and blank flanged. Authorized work order (AWO) M2 90 09680 removed valve 2-SW-97A to ensure seismicity of the operable service water header during outage maintenance activities. The outage activities included replacement of miscellaneous service water system spoolpieces. The removal and subsequent reinstallation of valve 2-SW-97A was accomplished by the licensee Generation Construction organization.

On October 30, 1991, valve 2-SW-97A was reinstalled by the Generation Construction organization; the maintenance department installed the instrument air lines and reconnected the electrical limit switches. The retest was performed satisfactorily on October 30. The retest included cycling 2-SW-97A and verifying that, on loss of air or 125 vdc electrical power, the valve fails as-is.

During the outage, under project assignment (PA)-86-230, the control room handswitches and position indicators were relocated to correct human engineering discrepancies on control room panel C06. The retest for correct position indication was performed pursuant to in-service test T-90-09. However, the retest for valve 2-SW-97A was completed on January 10, 1991. The basis for delay of the retest was that operation of all three service water pumps is needed to verify both the interlock feature of the cross-connect valves and remote position indication. During restoration of the "C" service water pump, on January 3, the licensee identified that the limit switches for 2-SW-97A were not working properly. The limit switches were replaced on January 10, and 2-SW-97A was restored to a fully operable status with remote position indication, electrical interlock, and successful valve operation.

In conclusion, service water cross-connect valve 2-SW-97A had neither remote position indication nor electrical interlock protection during the period of time between November 2 and January 10, 1991. Valve 2-SW-97A was believed open from 1:55 p.m. on November 3 (if not sooner) until 3:10 p.m. on November 15, 1990. The position interlock was not reconnected until the "C" service water pump was restored to service, to complete the retest for PA-86-230.

6.0 REPORTABILITY ASSESSMENT

On November 15, upon identification of the mispositioned service water valve the licensee prepared plant incident report (PIR) 90-139.

The initial assessment of reportability by the operations shift supervisor was that this condition was reportable pursuant to 10 CFR 50.73 (a)(2)(v), an event or condition that alone could have prevented the fulfillment of the safety function of structures or systems needed to mitigate the consequences of an accident. The shift supervisor used as guidance for reportability licensee procedure EPIP 4701-4.

Later that day, the reporting requirement was altered by the shift supervisor as reportable pursuant to 10 CFR 50.73(a)(2)(i), operation or condition prohibited by the technical specifications.

The licensee duty officer concurred that the event was reportable pursuant to that requirement. On November 16, the unit director conferred with the Northeast Utilities Service Company (NUSCO) licensing manager for confirmation of the correct reporting criteria. The selected reporting criterion was deemed to be acceptable.

The PIR was sent to the licensee's PIR coordinator to initiate action on the documentation of the licensee event report (LER) on approximately November 19, 1990. The coordinator misinterpreted the unit director's required due date of January 31, 1991, for PIR close-out, with the requirement for the LER issuance. On January 3, 1991, the licensee commenced investigation and documentation for the LER. LER 90-022-00 was issued on January 14 approximately 29 days after the required time interval pursuant to 10 CFR 50.73 (d).

The broad basis of technical specifications is to ensure that the initial conditions and equipment availability assumed in the safety analysis report accident analysis remain bounding. Loss of service water system separation potentially would invalidate the design basis accident (DBA) analysis in that its intended safety functions may not have been accomplished. The DBA assumes one EDG will start and thus one service water pump would be operating on two headers, an unanalyzed thermo-hydraulic configuration. However, licensee personnel did not consider that an event notification, pursuant to 10 CFR 50.72 criteria, was required. NRC review of the licensee reportability assessment identified a potential weakness in the event notification determination process in that notification pursuant to 10 CFR 50.72 was applicable for this event.

7.0 LICENSEE CORRECTIVE ACTION

Upon identification of the mispositioned service water valve, the shift supervisors immediately closed the valve.

The service water surveillance procedure will be changed to include a specific verification for header cross-tie valve alignment when operating the valves in a local manual mode. In addition, enhancements will be made to the valve local position indicator.

Licensee investigation of the event and interview with operations personnel involved with the service water pump swaps on November 2 and 3 concluded proper implementation of controlling procedures (OP-2326A and SP-2612C-1 and SP-2612D-1) was performed.

8.0 INSPECTOR ASSESSMENT AND CONCLUSION

This event documents loss of service water header independence by mispositioning of a cross-connect valve. As documented in the licensee event report, the licensee was unable to identify a specific root cause of the event, but considers the most likely cause to be either improper positioning of the cross-tie valve by the Operations Department or inadvertent repositioning of the valve during maintenance activities.

This condition is prohibited by technical specifications and is considered an apparent violation (50-336/90-02-01). The period of time that the cross-connect valve could have been mispositioned was approximately 13 days. In accordance with technical specification 3.7.4.1, the licensee was required to enter technical specification action 3.0.3, and commence a plant shutdown within one hour of having both service water headers inoperable.

On November 7, the licensee was accomplishing a verification of service water flow through the RBCCW heat exchangers. The objective of the surveillance was to verify adequate service water flow through the RBCCW heat exchangers when subjected to accident conditions. The test verified the service water pump will not exceed pump run-out at approximately 15,700 gallons per minute (gpm), and verified flow through the RBCCW heat exchanger was greater than or equal to 11,000 gpm. The surveillance was deemed to be acceptable at the time; however, in the inspector's review of the surveillance results with the cognizant engineer after November 15, the data of service water flow vs. discharge head on the "A" service water header indicated that the manufacturer's head vs. flow curve has been exceeded.

The inspector reviewed licensee controls to determine the opportunities for discovery. The inspector reviewed the plant equipment operator shift logs for the intake structure, required service water surveillances (i.e. valve line-ups), control room annunciators, the engineering surveillance for accident service water flows, and the plant heat-up check lists prior to restart of the facility. These controls were accomplished properly, however, the inoperable interlock and annunciators rendered these aids not available.

The service water system is a vital support system and loss of independence of the system resulted in a potential degradation to the reactor building component cooling water system and the emergency diesel generators. The open cross-connect valve could prevent the service water system from performing its analyzed safety function. The failure to notify the NRC of this non-emergency event is considered a violation of 10 CFR 50.72(b)(ii) (50-336/90-02-02).

The issuance of the LER was beyond the required 30 days per 10 CFR 50.73 d, which is an apparent violation (50-336/91-02-03). In review of LER's in the past two years, all were reported within a 30-day interval from event notification to documentation to the NRC. The inspector considered that the tardiness in the event report was isolated, and not indicative of breakdown in the administrative process to timely document events to the NRC.

9.0 MANAGEMENT MEETING

The inspector met with Millstone 2 management at the conclusion of the inspection to discuss the inspection findings including the apparent violations. No proprietary information was covered within the scope of the inspection, and no written information was given to the licensee.

Attachment I: Documents Reviewed

AWO M2 90 11621, Rebuild/replace regulator for 2-SW-97A

AWO M2 90 08263, Handswitch/associated lights need to be reinstalled on C06. PA-86-230
Correction of Human Engineering Discrepancies

AWO M2 91 0080, Replaced Unit Switches on 2-SW-97A Control Room Log Entries

EN 21203, "Service Water Flow thru RBCCW heat exchangers

SP 2669A, "Plant Equipment Operator Rounds"

T-90-09, "Verify Operability of Control Switch for Control Room Design Review"

Drawing 25203-32016 sh. 16 "Service Water Cooling Pump Discharge SV-HV6482"

Drawing 25203-32013, sh. C "Control Switch Development"

Drawing 25203-26008, "Service Water System"

Final Safety Analysis Report, Chapter 9.7.2.

OP 2326A, "Service Water System"

M2-OP-SEC-2326, "Service Water System"

NUREG 1022, "Licensee Event Report System"

SP 2612D "Service Water Valve Line-up"

SP 2612E-1 "Service Water Power Operability Valve Test"

EN 2125-1, "Power/Air Lost Service Water Test"

NU Reporting Guidance on 10 CFR 50.72 and 10 CFR 50.73

Licensee Event Report 90-022-00