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January 28, 1997

Docket No. 50-336
B16104

Re.: 10CFR50.109
10CFR50.54(f)

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Millstone Nuclear Power Station, Unit No. 2
Response to Requested Actions of Generic Letter 96-06
Assurance of Equipment Operability and Containment Integrity During
Design-Basis Accident Conditions

The purpose of this letter is to provide the 120 day response to the NRC Staff regarding the information requested in Generic Letter (GL) 96-06, for Millstone Station Unit No. 2. This information is provided pursuant to 10CFR50.54(f).

In GL 96-06[1], the Staff required licensees to submit a response within 30 days of the date of the subject GL indicating: (1) whether or not the Requested Actions of GL 96-06 would be completed, (2) whether or not Requested Information of GL 96-06 would be submitted, and (3) whether or not the information would be submitted within 120 days of the date of the GL.

Specifically, the GL requests licensees to determine:

(1) If containment air cooler cooling water systems are susceptible to either waterhammer or two-phase flow conditions during postulated accident conditions; and

(2) If piping systems that penetrate containment are susceptible to thermal expansion of fluid so that overpressurization of piping could occur.

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1 Thomas T. Martin to Licensees, Generic Letter 96-06, "Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions," dated September 30, 1996.

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The GL further states that Actions (1) and (2) above be reviewed based on the plant's postulated accident conditions, as well as with respect to the scenarios referenced in the GL. If systems are found to be susceptible to the above conditions, licensees are expected to assess the operability of affected systems and take corrective actions as appropriate in accordance with 10CFR50, Appendix B and the plant operating license.

Accordingly, in a letter dated October 30, 1996[2], Northeast Nuclear Energy Company (NNECO) reported that Millstone Unit No. 2 would complete Requested Action 1 and 2 and submit the written summary report for the action within 120 days of the date of the Generic Letter. The written summary report is contained in Attachment 1.

Commitments

Enclosure 1 provides the regulatory commitments in this submittal .

Issues discovered as a result of the review will be investigated in accordance with the Corrective Action Program and reported in accordance with the provisions of 10CFR50.73.

If you have any additional questions concerning this submittal, please contact Mr. Richard T. Laudenat at (860) 444-5248.

Very truly yours,
NORTHEAST NUCLEAR ENERGY COMPANY

M L Bowling

Martin L. Bowling
Millstone Unit 2 Recovery Officer

Subscribed and sworn to before me

this 28th day of January, 1997

[signature]

Date Commission Expires: 11/30/00

2 T. C. Feigenbaum to U. S. Nuclear Regulatory Commission, "Millstone Nuclear Power Station Unit Nos. 1, 2 and 3, Haddam Neck Plant, Seabrook Station, Response to Generic Letter 96-06, Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions," dated October 30, 1996.

Enclosure

Attachment

cc: W. D. Travers, Dr., Director, Special Projects Office
H. J. Miller, Region I Administrator
P. F. McKee, Deputy Director of Licensing, Special Projects Office
W. D. Lanning, Director, Millstone Oversight Team
D. G. McDonald, Jr., NRC Project Manager, Millstone Unit No. 2
D. Beaulieu, Acting Senior Resident Inspector, Millstone Unit No. 2

Enclosure 1
List of Regulatory Commitments

The following table identifies those actions committed to by NNECO in this document. Any other actions discussed in the submittal represent intended or planned actions by NNECO. They are provided as information and are not regulatory commitments. Please notify the Manager - Nuclear Licensing at the Millstone Nuclear Power Station Unit No. 2 of any questions regarding this document or any associated regulatory commitments.

Commitment Number	Statement of Commitment	Committed Date
B16104-01	Calculations concerning RBCCW voiding during LOCA and MSLB conditions will be finalized.	Prior to Unit Startup
B16104-02	Corrective actions to mitigate or eliminate RBCCW waterhammer concerns will be developed and implemented.	Prior to Unit Startup
B16104-03	A review of each of the nine affected penetrations will be performed and corrective actions to eliminate the potential for thermally induced overpressurization will be developed and implemented.	Prior to Unit Startup

Docket No. 50-336
B16104

Attachment 1

Millstone Nuclear Power Station Unit No. 2

Response to Generic Letter 96-06

Completion of Requested Actions

January 1997

i. Requested Action (1)

Determine if containment air cooler cooling water systems are susceptible to either waterhammer or two-phase flow conditions during postulated accident conditions.

At Millstone Unit No. 2, the Reactor Building Closed Cooling Water (RBCCW) System supplies cooling water to the Containment Air Recirculation (CAR) Coolers as well the following essential and non-essential equipment:

Essential Components:

- High Pressure Safety Injection Pump Seal Coolers
- Low Pressure Safety Injection Pump Seal Coolers
- Containment Spray Pump Seal Coolers
- Engineered Safety Features (ESF) Room Coolers

Non-Essential Components:

- Reactor Vessel Support and Cooling Coils
- Reactor Coolant Pump (RCP) Thermal Barrier, Lube Oil, and Motor Coolers
- Control Element Drive Motor (CEDM) Coolers
- Primary Drain and Quench Tank Heat Exchanger
- Letdown Heat Exchanger
- Degasifier Vent Cooler

The RBCCW system is a closed loop system with two independent headers and a vented surge tank which maintains a hydrostatic head on the system. The heat transferred to the RBCCW system is rejected to the Service Water System.

A. Actions Taken In Response To Requested Action (1)

1. A thermal-hydraulic model of the RBCCW system was developed.

2. Containment pressure and temperature conditions for the evaluation of the performance of the CAR coolers during Loss of Coolant Accident (LOCA) and Main Steam Line Break (MSLB) events were established.

3. Conditions and assumptions for the evaluation of the potential for two-phase conditions in the RBCCW system were established. The following conservative assumptions were made:

- The RBCCW to Service Water heat exchanger had maximum design fouling, 10% tube plugging and minimum service water flow with maximum service water temperature.
- The CAR coolers were assumed to have no tube fouling and the heat transfer capability was based on actual modeling of the coolers (which was higher than the design capability).
- Heat transfer to the RBCCW in the CAR coolers used peak post-accident containment conditions.
- The Shutdown Cooling (SDC) heat exchangers were assumed to have zero tube fouling. Maximum post-LOCA sump water temperatures were assumed.
- RBCCW pump performance was assumed to be degraded by 7% (IST acceptance criteria).
- RBCCW Surge Tank level was assumed to be at the low level alarm point (an elevation of approximately 79 feet).

4. Using the established containment and RBCCW system conditions, the thermal-hydraulic model was used to evaluate the RBCCW system for two-phase conditions and water hammer phenomena during LOCA and MSLB events.

5. The following modes of operation of the RBCCW system were analyzed for two-phase flow conditions following a LOCA:

   - RBCCW system alignment during the injection phase
   - RBCCW system alignment during the injection phase with a simultaneous Loss of Instrument Air
   - RBCCW system alignment during the containment sump recirculation phase with continued flow to non-essential components
   - RBCCW system alignment during the containment sump recirculation phase with continued flow to non-essential components and a simultaneous Loss of Instrument Air
   - RBCCW system alignment during the containment sump recirculation phase with flow aligned to the Spent Fuel Pool heat exchanger and flow isolated to the other non-essential components
   - RBCCW system alignment during the containment sump recirculation phase with flow to non-essential components isolated

The Loss of Instrument Air was considered in these scenarios because it results in a fully open outlet valve on the letdown heat exchanger thereby reducing the RBCCW flow to the CAR coolers and other essential components.

6. Only the injection phase modes of operation of the RBCCW system were considered following a MSLB because a containment sump recirculation is not expected to occur during this event. The heat loads imposed on the CAR coolers during both LOCA and MSLB events were evaluated. LOCA heat loads on the CAR coolers were found to be higher than the MSLB heat loads. Therefore, the LOCA heat loads were used for the two-phase flow calculations and water hammer evaluations.

B. Conclusions That Were Reached Relative To Susceptibility For Waterhammer And Two-Phase Flow In The Containment Air Cooler RBCCW System

1. Four locations within the RBCCW system were chosen to be evaluated for two-phase flow conditions. These locations were chosen based on elevations relative to the RBCCW Surge Tank and the expected pressure and temperature conditions.

   a. CAR Cooler Units X-35A and X-35B

      The top of the cooling coils for these units are at an approximate elevation of 46 feet. The downstream piping from these coolers drops nearly 50 feet before reaching the RBCCW outlet throttle valves. The other two CAR Coolers are at a significantly lower elevation (approximately 6 feet).

   b. CEDM Coolers

      These coolers and their downstream piping were evaluated for two-phase flow conditions primarily due to their elevation (approximately the 50 foot level).

   c. RCP Coolers and Lube Oil Coolers

      While these coolers are at a relatively low level in the system (approximately the 20 foot elevation), they were evaluated due to the significant pressure drops across their RBCCW throttle valves.

d. Shutdown Cooling Heat Exchangers

While these heat exchangers are at a low level in the system (the minus 40 foot elevation), they do add a significant amount of heat to the RBCCW system during the recirculation phase of a LOCA.

2. In the event of a LOCA or MSLB, with no concurrent Loss of Offsite Power, preliminary results indicate that, so long as the RBCCW pumps remain in operation, two-phase flow conditions will not occur in the four RBCCW locations listed in section I.B.1. above. Therefore, neither degradation of system performance nor waterhammer events will occur under these conditions.

3. In the event of a LOCA or MSLB, with a concurrent Loss of Offsite Power (LOOP), preliminary results indicate that some void formation will occur in the upper CAR coolers (X-35A and X-35B) and may occur in the CEDM coolers. No voiding is expected in the RCP coolers, Lube Oil Coolers or Shutdown Cooling Heat Exchangers.

In the event of a Loss of Offsite Power, the RBCCW Pumps and the CAR Fans trip. The CAR Fans will restart at time 19 seconds after the LOOP while the RBCCW Pumps do not restart until 25 seconds after the LOOP. Since CAR Fan coastdown is slower than the RBCCW pump coastdown, the water in the upper CAR coolers will reach saturation temperature and voiding may occur in the higher cooling coils and at the cooler outlet. Following the restart of the RBCCW pumps, all system voids are expected to condense/collapse. While the collapse of voids may cause pressure pulses in the RBCCW system, the preliminary assessment does not indicate that any damage will occur.

Voiding in the CEDM coolers is not expected to be significant due to the fact that weighted backdraft dampers limit coastdown flow from the CEDM cooler fans and the fans do not restart after a LOOP.

4. A third condition may occur in which an RBCCW pump initially fails to start after a LOOP and flow to the affected header is restored manually some later time during the event. This train of events could result in more significant voiding of the affected RBCCW system and could produce a more severe waterhammer condition.

C. Basis For Continued Operability Of Affected Systems And Components

Millstone Unit No. 2 is currently in an extended outage condition. The events which would lead to a two-phase flow condition (LOCA/MSLB) are not possible in the current mode of operation.

D. Corrective Actions Implemented Or Are Planned To Be Implemented

1. Calculations concerning RBCCW voiding during LOCA and MSLB conditions will be finalized prior to unit startup.

2. Corrective actions to mitigate or eliminate RBCCW waterhammer concerns will be developed and implemented prior to unit startup.

II. Requested Action (2)

Determine if piping systems that penetrate containment are susceptible to thermal expansion of fluid so that overpressurization of piping could occur.

A. Actions Taken In Response To Requested Action (2)

1. Eighty nine (89) penetrations to the Millstone Unit No. 2 containment were evaluated for susceptibility to overpressurization conditions due to fluid thermal expansion during either normal or post-accident conditions.

2. An initial screening process eliminated penetrations from being considered susceptible to fluid thermal expansion overpressurization if one or more of the following conditions were met:

   - The fluid contained in the system is not a liquid.
   - The system is open during both normal and post-accident conditions.
   - Local pressure relief is provided for potentially isolated portions of the system.
   - The inboard isolation valve is a check valve which would allow the fluid to expand. (example: Feedwater line)
   - The system piping communicates, either directly or through an inboard check valve, with the containment atmosphere. (example: Containment Spray line)

B. Conclusions That Were Reached Relative To Susceptibility For Overpressurization Of Piping That Penetrates Containment

Of the 89 penetrations evaluated, nine (9) were determined to have the potential for a thermal induced overpressurization:

1. Penetration # 2: Chemical and Volume Control System Letdown Line

   The letdown line draws water from the LOOP 2B RCP suction line. The water enters a regenerative heat exchanger (inside containment) and then exits out of containment. There are two segments of this line that could be isolated without provision for relief:

a. Between Valves 2-CH-515 and 2-CH-516

These valves are located upstream of the regenerative heat exchanger and are both fail close 3" globe valves. Due to their location in the system these valves are expected to trap hot primary system water. This fluid should not experience any additional heatup or resulting overpressurization from any containment conditions that would develop in post-accident scenarios.

b. Between Valves 2-CH-516 and 2-CH-089

This segment of piping contains the regenerative heat exchanger which cools the flow through the letdown line. This section of piping has a potential for thermal overpressurization.

2. Penetration #10: Reactor Coolant Shutdown Cooling Line

The reactor coolant SDC line draws water from the RCS hot leg during shutdown cooling operations. Cold water can be trapped between the containment isolation valves 2-SI-651 and 2-SI-709.

3. Penetration #14: Containment Sump to Aerated Waste Drain Tank

This line carries water from the sump pumps to the AWDT. Two sections of piping have a potential for thermally induced overpressurization:

a. Between Isolation Valves 2-SSP-16.1 and 2-SSP-16.2

Both valves are fail closed 3" globe valves. The system removes water from the containment sump in non-accident conditions and will contain water initially at relatively low temperatures.

b. Between Isolation Valves 2-SSP-16.1 and Pump discharge Check Valves 2-SSP-15A and 15B

The closure of the inboard isolation valve will trap relatively low temperature water and introduce the potential for overpressure conditions. This system performs no essential post-accident functions and a thermal overpressure

condition in this portion of the piping would not impact containment integrity or the capability of safety systems to perform their functions.

4. Penetration #21: RCS Sampling Lines

The sampling lines draw water from the pressurizer surge and vent lines, the RCS, and the primary drain and quench tank cooling lines. These lines are provided with individual isolation valves which are used to perform sample operations for each system. While this fluid is primarily hot, there exists a potential for relatively cool water to exist in the piping which could be trapped between the individual isolation valves and the outboard containment isolation valve.

5. Penetration #35: Drain From the Primary Drain Tank

This line transports the Primary Drain Tank pump discharge to the degasifier system. The piping segment between valves 2-LRR-43.1 and 2-LRR-43.2 can be isolated without provision for pressure relief and therefore has a potential for overpressurization.

6. Penetration #43: RCP Seals Controlled Bleedoff

The piping segment between the inside isolation valve 2-CH-506 and the outside isolation valves 2-CH-198 and 2-CH-505 can be isolated without provision for pressure relief and therefore has a potential for overpressurization.

7. Penetration #49: Fire Protection System

The fire protection piping inside containment is left water filled and with the vents open. The inside header containment valve (2-FIRE-120) and the outside containment header valve (2-FIRE-108) are closed, however. This results in an isolated segment of line without provision for pressure relief and, therefore, has a potential for overpressurization.

8. Penetrations # 67 and 68: Refuel Pool Cooling and Purification Supply and Return Lines

These lines are in service only during refueling operations. However, as the system is taken out of service, there are several piping segments that have a

potential for isolating cold water with no provision for pressure relief. These segments include:

a. Between containment isolation valves 2-RW-63 and 2-RW-154
b. Between containment isolation valves 2-RW-21 and 2-RW-232
c. Between in-containment valve 2-RW-22 and the inboard containment isolation valve 2-RW-232.

C. <u>Basis For Continued Operability Of Affected Systems And Components</u>

Millstone Unit No. 2 is currently in an extended outage condition. The events which would lead to a thermal induced overpressurization condition (LOCA/MSLB/or other significant containment heating) are not possible in the current mode of operation.

D. <u>Corrective actions implemented or are planned to be implemented</u>

A review of each of the nine affected penetrations will be performed and corrective actions to eliminate the potential for thermally induced overpressurization will be developed and implemented prior to unit startup.