NORTHEAST UTILITIES

THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

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January 28, 1991

Docket No. 50-336
A08915

Re: Inservice Test Program
10 CFR 50.55a(g)

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

Gentlemen:

Millstone Nuclear Power Station, Unit No. 2
Second Ten-Year Inservice Inspection Testing Program
Response to NRC Staff Request (TAC 75977)

The purpose of this letter is to provide the additional information requested of Northeast Nuclear Energy Company (NNECO) in the NRC Staff's letter regarding the second ten-year inservice test program for Millstone Unit No. 2, dated July 19, 1990.(1)

Background

In a letter dated October 30, 1987,(2) supplemented by letter dated August 26, 1988,(3) NNECO submitted the second ten-year interval Inservice Testing (IST) Program for Millstone Unit No. 2. These letters also requested relief from testing requirements that were determined to be impractical or would result in hardship or unusual difficulties without a compensating increase in the level of quality and safety, and proposed alternatives to provide an acceptable level of quality and safety.

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(1) J. F. Stolz letter to E. J. Mroczka, "Second Ten-Year Inservice Testing Program and the Granting of Relief From Testing Requirements Determined to be Impractical for Millstone, Unit 2 (TAC 75977)," dated July 19, 1990.

(2) E. J. Mroczka letter to the U.S. Nuclear Regulatory Commission, "Millstone Nuclear Power Station, Unit No. 2 Inservice Inspection Testing Program," dated October 30, 1987.

(3) E. J. Mroczka letter to the U.S. Nuclear Regulatory Commission, "Millstone Nuclear Power Station, Unit No. 2 Inservice Inspection Testing Program (TAC #59265)," dated August 26, 1988.

The NRC Staff and contractors reviewed and subsequently provided NNECO with the Safety Evaluation (SE), Technical Evaluation Report (TER), and associated findings, as previously referenced. Relief from certain testing requirements was granted with specified conditions as provided in Table 1 of the SE. The IST program was also found to be acceptable for implementation, provided the omissions and inconsistencies identified in the SE and in Appendix C of the TER were addressed within six months of the receipt of the SE.

Response

NNECO is hereby providing the information, in addition to that originally provided in the relief request, to supplement and clarify information identified in the subject SE and in Appendix C of the TER, as requested. Attachment 1 provides individual responses to each of the five items identified in Appendix C of the TER, including the IST Program Plan modifications. The conditions placed on relief requests IWV-3, IWV-5, IWV-8, IWV-9, IWV-13, IWV-26, IWV-29, and IWV-34 (TER Section 4.1.3) have been incorporated into our IST Program Plan. Attachment 2 provides specific, detailed information for TER Appendix C, item number four, regarding testing of the check valves in the main steam lines to the turbine driven auxiliary feedwater pump. Attachment 3 provides expanded, detailed information and rationale regarding the service water pump vibration testing discussed in TER section 3.2.1, to allow the NRC Staff to complete their review. Upon completion of their review, NNECO requests that the Staff grant full relief for IWP-1.

We trust that the transmittal of this information, including the IST Program Plan modifications, will provide the information and clarification necessary to the NRC Staff. As always, if you have any further questions relating to this issue, please contact my staff.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

E. J. Mroczka
E. J. Mroczka
Senior Vice President

cc: T. T. Martin, Region I Administrator
G. S. Vissing, NRC Project Manager, Millstone Unit No. 2
P. Habighorst, Resident Inspector, Millstone Unit No. 2
W. J. Raymond, Senior Resident Inspector, Millstone Unit Nos. 1, 2, and 3

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Attachment 1

Response to "IST Program Anomalies Identified During the Review"

January 1991

Response to "IST Program Anomalies Identified During the Review"

Item #1:

The licensee proposed to verify closure of the check valves in the air lines to valve operator accumulators by performing a leak test of each accumulator, however, the licensee did not provide a basis for not exercising these valves quarterly or during cold shutdowns as required by the code. This is discussed in Section 4.1.3.1. The reviewer's evaluation concluded that it is impractical to exercise these valves quarterly or during cold shutdowns, therefore, relief should be granted from the Code requirements. The licensee however should document in the IST Program the technical justification for not testing these valves as required by the Code.

Response:

The IST Program Plan has been revised to include documentation of the technical justification for not testing these check valves during operation or cold shutdown. A new relief request IWV-34 was added to the IST Program Plan to document the technical justification for testing these valves once per refueling cycle.

Item #2:

The licensee has not clearly identified in their IST Program (RR-IWV-3, RR-IWV-5, RR-IWV-8, RR-IWV-9, and RR-IWV-13) how they propose to implement the sample disassembly and inspection of check valves. The Staff positions for sample disassembly of check valves are identified in Generic Letter 89-04, Attachment 1, Item 2. The licensee should meet these Staff positions whenever they utilize a sample disassembly and inspection of check valves.

Response:

The Staff positions for sample disassembly of check valves identified in Generic Letter 89-04, Attachment 1, Item 2 will be met whenever a sample disassembly and inspection of check valves is used. The IST Program Plan has been modified to specify a sample disassembly and inspection program consistent with Generic Letter 89-04, Attachment 1, Item 2.

Item #3:

In relief requests RR-IWV-5, RR-IWV-8, and RR-IWV-9 (addressed in Sections 4.2.1.3, 4.4.1.1, and 4.3.1.2 respectively of this report), the licensee proposed a sample disassembly and inspection interval of 40 months. The Staff position is that a different valve of each group is required to be disassembled, inspected, and manually full-stroke exercised at each refueling outage, until the entire group has been tested. Extension of the valve exercising interval from that allowed by the Code (quarterly or cold shutdown frequency) to up to once every 13 1/3 years is a substantial change which may not be justified from the standpoint for valve reliability and plant safety. The NRC position relative to extending the valve testing interval above one valve every refueling outage is given in Generic Letter 89-04, Attachment 1, Item 2. The licensee has not provided sufficient information to support extending the sample disassembly test interval for these valves.

Response:

The Staff positions for sample disassembly of check valves identified in Generic Letter 89-04, Attachment 1, Item 2 will be met whenever a sample disassembly and inspection of check valves is used.

Item #4:

In relief request RR-IWV-30, which is addressed in Appendix A, Section 2.3, the licensee stated that check valves 2-MS-4A and 4B, located in the main steam supply lines to the turbine driven auxiliary feedwater pump, are full stroked both open and closed prior to startup from cold shutdown. It is not clear how these valves are verified in the closed position during cold shutdowns. Other facilities typically have problems with verifying the reverse flow closure of similar valves due to the system design, i.e., lack of isolation valves and test connections. Verifying valve closure by leak testing using steam pressure may present a safety hazard since valve leakage could subject test personnel to high pressure steam. The licensee should verify the reverse flow closure capability of these valves by some positive means as required by IWV-3522(a). If this is found to be impractical, the licensee should revise relief request RR-IWV-30 to address this issue and submit it to the NRC for review and approval.

Response:

The piping arrangement at Millstone Unit No. 2 permits testing the check valves in the steam lines to the turbine driven auxiliary feedwater pump in both the open and and closed directions prior to reactor startup from cold shutdown. This test is performed with the reactor in hot shutdown. Attachment 2 provides a description of a typical test procedure, as an example, for one of the two check valves. No additional relief is required.

Item #5:

The licensee has identified check valve disassembly and inspection as the alternative to verifying the full-stroke capability of the valves addressed in relief requests RR-IWV-3, RR-IWV-5, RR-IWV-8, RR-IWV-9, and RR-IWV-13. The NRC Staff considers valve disassembly and inspection to be a maintenance procedure that is not a test and not equivalent to the exercising produced by fluid flow. This procedure has some risks which make its routine use as a substitute for testing undesirable when some method of testing is possible. Check valve disassembly is a valuable maintenance tool that can provide a great deal of information about a valve's internal condition and should be performed under the maintenance program at a frequency commensurate with the valve type and service. The licensee should actively pursue the use of alternate testing methods to full-stroke exercise these valves, such as using noninstrusive diagnostic techniques to demonstrate whether they swing fully open during partial flow testing or closed when flow has ceased. In the interim when valve operational readiness cannot practically be determined by observation of system parameters, inspection may be used as an alternative, however, the licensee should perform a partial flow test of each valve prior to returning it to service following the disassembly and inspection procedure. As additional experience with the general applicability of nonintrusive techniques is gained, the Staff anticipates providing the industry with updated guidance on the subject as it relates to Code requirements and particularly, as an improvement over the use of disassembly and inspection.

Response:

Millstone Unit No. 2 performs a partial flow test of each valve prior to returning it to service following the disassembly and inspection procedure. In addition, Millstone Unit No. 2 is actively engaged in the development of noninstrusive techniques for monitoring check valve disk motion. When such techniques have been proven reliable they will be used to perform full stroke testing.

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Attachment 2

Description of Typical Full Stroke Test Procedure
of Turbine Driven Auxiliary Feedwater Pump
Steam Supply Check Valve (2-MS-4A)

January 1991

Description of Typical Full Stroke Test Procedure
of Turbine Driven Auxiliary
Feedwater Pump Steam Supply Check Valve (2-MS-4A)

NOTE

1. This test must be conducted with the plant in Mode 3.

2. Testing should be accomplished with vacuum in the main condenser. If the main condenser is not under vacuum, it may be impossible to obtain sufficient steam flow in the drains header to reduce steam supply pressure and allow the check valve to fully shut.

1. Verify open 2-MS-201 and 2-MS-202.

2. If not already operating, start the Terry Turbine auxiliary feedwater pump.

3. Align the Auxiliary Feedwater System to add water to one or both steam generators.

4. Shut/verify shut valve 2-MS-441 (drain at PI-4191).

5. Open/verify open valve 2-MS-365 (drain downstream of 2-MS-201).

6. Open/verify open valve 2-MS-440 (pressure gage isolation).

7. Shut valve 2-MS-404B (steam trap isolation).

8. Measure and record steam pressure, as indicated on PI-4191.

9. Establish 600 gpm total auxiliary feedwater flow from the Terry Turbine auxiliary feedwater pump to the steam generator(s).

10. Shut 2-MS-201.

11. If desired, reduce auxiliary feedwater flow to the steam generators.

12. Open 2-MS-404C (drain trap bypass) and reduce steam pressure as indicated on PI-4191 by 200 to 600 psig. Record steam pressure, as indicated on PI-4191.

13. Close 2-MS-404C and monitor steam pressure as indicated on PI-4191.

14. If pressure remains at the reduced value or increases slowly (as caused by valve leakage) measure and record the time required for indicated main steam header pressure to return to within 50 psig of normal main steam header pressure recorded in step 8. If time exceeds 60 seconds, record "> 60 seconds."

15. If indicated main steam header pressure increases to within 50 psig of normal steam header pressure in less than 5 seconds, 2-MS-4A is not fully closed:

    15.1 Verify that system lineups are correct and immediately reperform steps 1 through 14.

    15.2 Record the original failure and note that the valve was immediately retested.

    15.3 Record the results of the retest.

16. Verify valve 2-MS-4A fully closed by verifying that the time recorded in step 14 is greater than 5 seconds.

17. Slowly open 2-MS-201.

18. Increase or verify total auxiliary feedwater flow to the steam generators to 600 gpm or greater.

19. Measure and record Terry Turbine speed as indicated on computer point S-4194A, and total auxiliary feedwater flow as indicated on FI-5277 and FI-5278.

20. Close 2-MS-202.

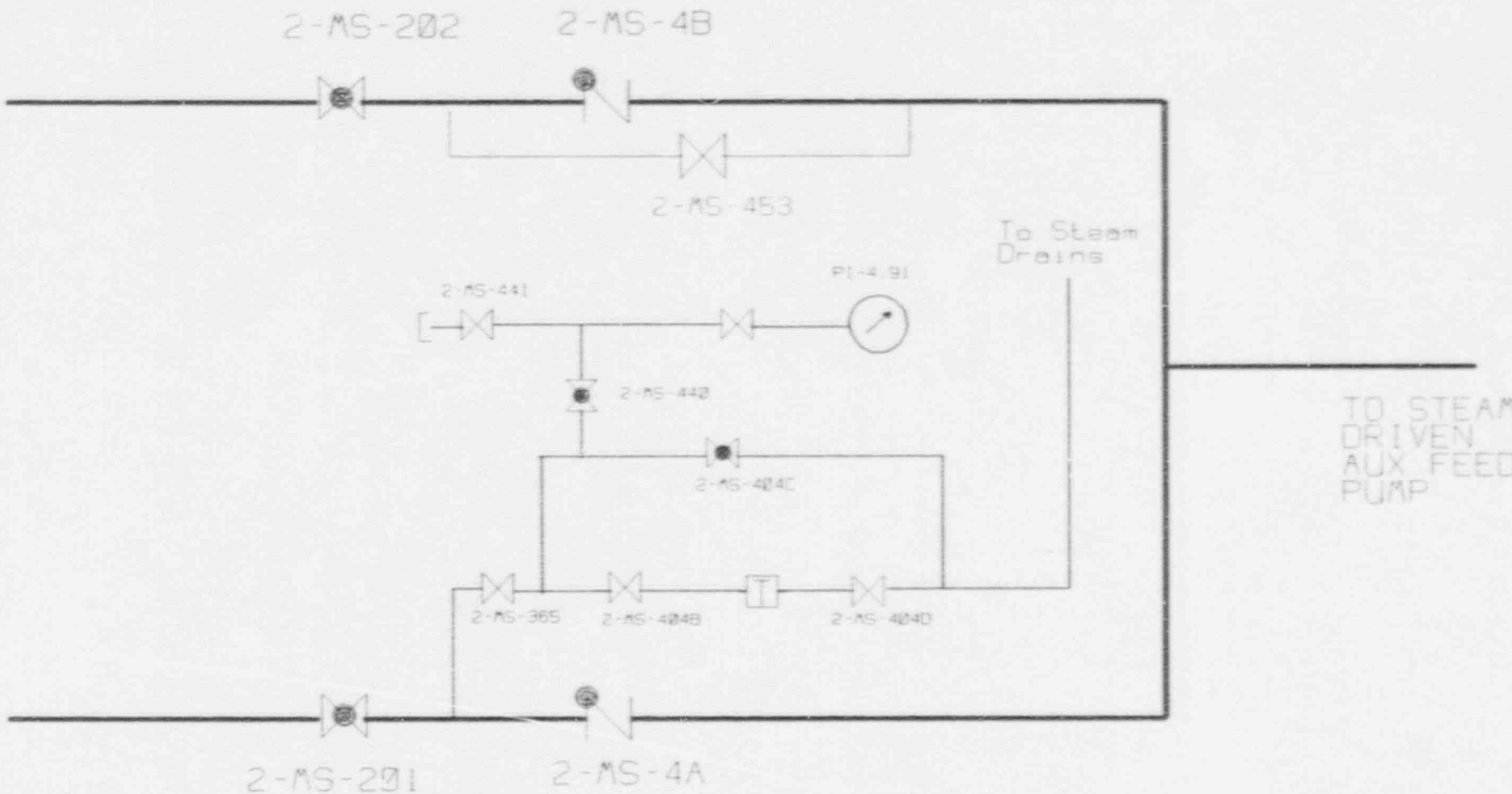
21. Measure and record Terry Turbine speed as indicated on computer point S-4194A, and total auxiliary feedwater flow as indicated on FI-5277 and FI-5278.

22. Reduce or secure auxiliary feedwater flow as directed by the Shift Supervisor.

23. Calculate the change in Terry Turbine speed and auxiliary feedwater flow between Steps 19 and 21.

24. Verify 2-MS-4A fully opened by verifying that Terry Turbine speed change was less than 50 rpm and total auxiliary feedwater flow change was less 50 gpm when 2-MS-202 was shut.

SIMPLIFIED MAIN STEAM DIAGRAM



VALVES AND COMPONENTS NOT ESSENTIAL TO TEST OF 2-MS-4A NOT SHOWN

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Attachment 3

Service Water Pump Vibration Limits

January 1991

Service Water Pump Vibration Limits

Additional testing has been conducted to confirm that the applied "service factor" of 2 is appropriate and provides adequate assurance that the Service Water Pumps will fulfill their safety related functions. The following information expands on that provided in relief request RR-IWP-1.

Measurements for this vertical line shaft pump are normally taken on the upper motor bearing housing in three orthogonal directions. This location, while most distant from the pump, is expected to be the most responsive to any change in unit condition. Additional measurements have been taken on the lower motor bearing housing and on the below grade section of the pump casing.

Experience and testing has shown that vibration at the upper motor bearing housing is two to three times higher than measurements taken closer to the pump. Figure 1 demonstrates the differences in upper and lower motor bearing housing vibration levels. Recent testing performed with temporary accelerometers installed on the pump column, showed that when the upper motor housing vibration level was 0.42 inches per second, the actual pump vibration level was 0.16 inches per second.

Modal testing of the Service Water Pumps has shown that the natural frequency of the upper end pump/motor assembly is extremely close to the running frequency of the unit. The resonance margins are from 1.7 percent to 8.5 percent in the direction perpendicular to flow. A 20 percent margin is desirable to avoid undue vibration sensitivity to relatively minor changes in unit condition. This response is caused by an extremely flexible pump-to-motor adapter resulting in a cantilever action of the motor. The vibration is higher in the direction perpendicular to pump discharge flow than parallel to pump discharge flow. This is expected since the resonance margin is less and the attached piping provides additional stiffness in the parallel-to-flow direction. Figure 2 shows the difference in vibration levels between the parallel to flow and perpendicular to flow directions.

The below grade portion of the assembly has a significantly lower natural frequency (approximately 2.5 Hz). This contributes significantly to the lower observed vibration and, in conjunction with the rigid attachment of the pump upper housing to the intake structure, effectively prevents the response seen at the upper motor bearing from being reflected in the pump housing. As noted above, testing has indicated that actual pump vibration levels are less than one-half those measured at the upper motor bearing housing.

Motor bearing loading, rotor deflection relative to the stator, and structural vibratory stresses have been considered and judged to be well within acceptable limits for extended operation near the required action vibration level.

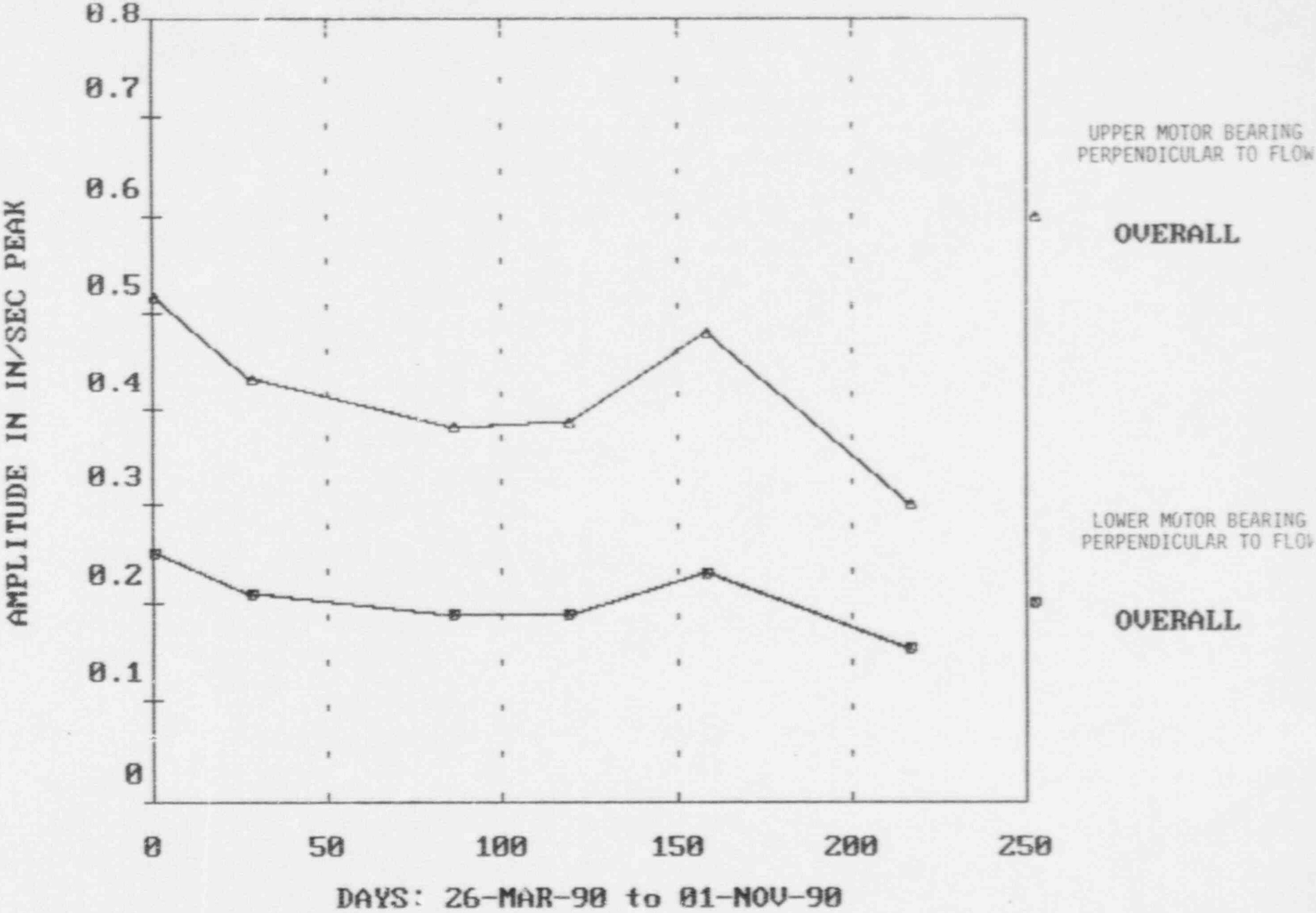
The Alert and Required Action vibration levels are based on the assumption that measured vibration levels are indicative of actual pump condition. With the amplification provided by the near resonance conditions of the pump/motor assembly, very small changes in pump condition result in markedly higher measured vibration levels. Thus assignment of higher-than-normal Alert and Required Action levels will continue to provide assurance that the Service Water Pumps will not seriously degrade without identification and correction.

The above information demonstrates that the concern stated in the technical review, ". . . the assignment of 1.4 inches/second as the required action maximum limit does not seem reasonable since the pump is likely to fail prior to reaching this limit" is unfounded for these specific pumps. However, further review of historical data for these pumps indicates that assignment of a Required Action level of 1.0 inches/second would not be excessively burdensome. Therefore, relief request IWP-1 and the Millstone Unit No. 2 IST program have been revised to specify a Required Action level of 1.0 inches/second for the Service Water Pumps.

This additional information and the proposed reduction in the Required Action level to 1.0 inches/second addresses the technical concerns expressed in the TER section 3.2.1. Permanent relief request for IWP-1 is hereby requested from NRC Staff.

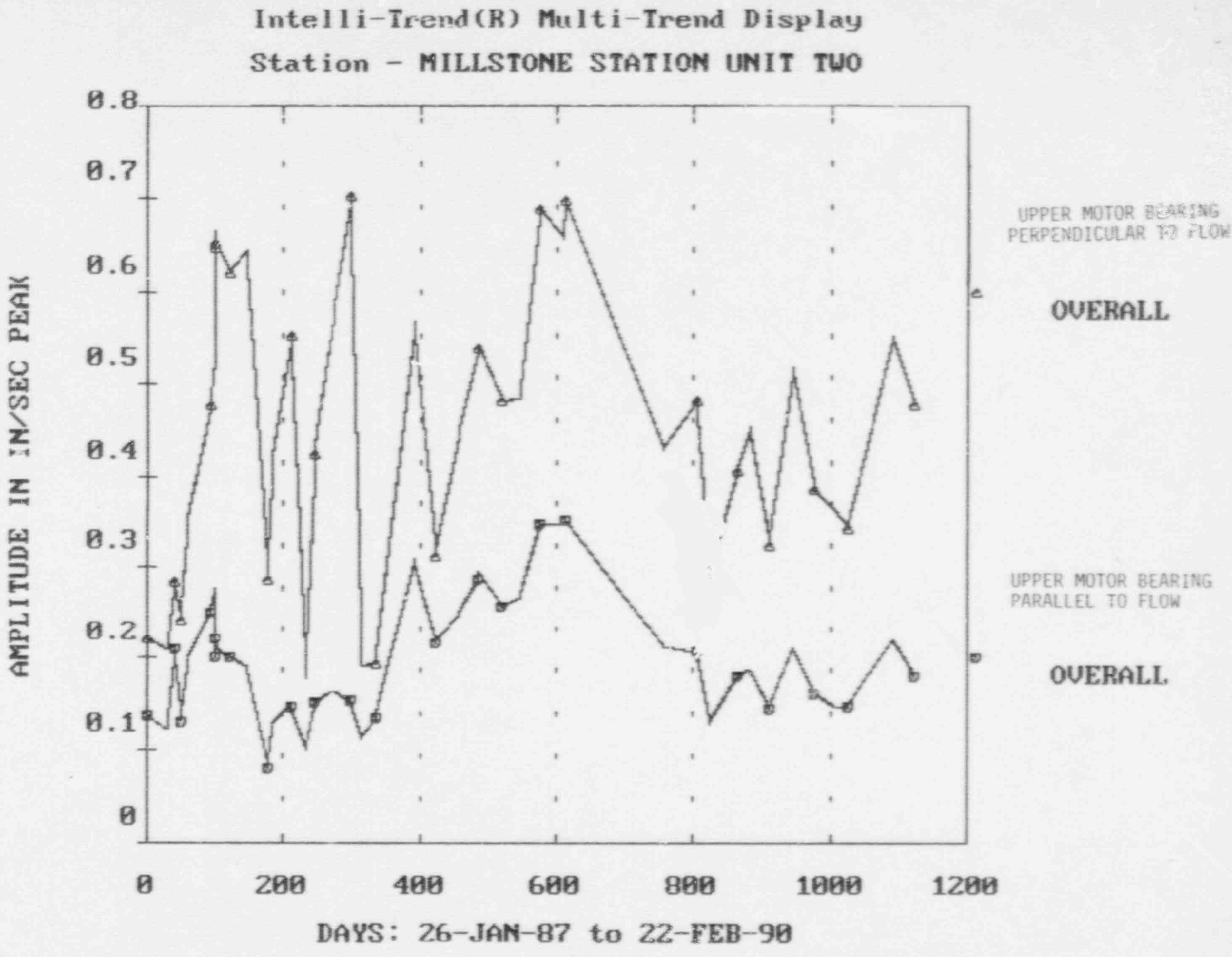
Intelli-Trend(R) Multi-Trend Display

Station - Millstone Unit 2



SERVICE WATER PUMP C
OVERALL VIBRATION LEVEL

FIGURE 1



SERVICE WATER PUMP C
OVERALL VIBRATION LEVEL

FIGURE 2