May 9, 2001

Mr. R. P. Necci
Vice President - Nuclear Technical Services
c/o Mr. David A. Smith
Dominion Nuclear Connecticut, Inc.
Rope Ferry Road
Waterford, CT 06385

SUBJECT: SAFETY EVALUATION FOR RELIEF REQUESTS ASSOCIATED WITH THIRD 10-YEAR PUMP AND VALVE INSERVICE TESTING PROGRAM, MILLSTONE NUCLEAR POWER STATION, UNIT NO. 2 (TAC NO. MA9162)

Dear Mr. Necci:

By letter dated June 1, 2000, as supplemented on October 2 and December 14, 2000, Northeast Nuclear Energy Company (NNECO) submitted several requests for alternatives to requirements of Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(f) for performing the required testing for certain Class 2 and 3 components in accordance with the American Society of Mechanical Engineers (ASME) Code (the Code) Section XI. Pursuant to 10 CFR 50.55a(a)(3)(i) and 10 CFR 50.55a(f)(5)(iii), NNECO requested that the proposed alternatives be authorized because they provide a commensurate level of quality and safety.

At the time of the June 1, October 2, and December 14, 2000, letters NNECO was the licensed operator of Millstone Nuclear Power Station, Unit 2 (MP2). On March 31, 2001, all of the owners of MP2 transferred their ownership interests in MP2 to Dominion Nuclear Connecticut, Inc. (DNC), and NNECO's operating authority for MP2 was transferred to DNC. By letter dated April 2, 2001, DNC requested that the U.S. Nuclear Regulatory Commission (NRC) continue to review and act upon all requests before the Commission that had been submitted by NNECO.

We have evaluated the proposed alternatives against the requirements of the 1988 Addenda for the ASME Code for Operation and Maintenance (OM) of Nuclear Power Plants (OMa-1988), Part 6 (OM-6) and Part 10 (OM-10), which are referenced in the 1989 Edition of ASME Section XI, Subsections IWP and IWV. The staff concludes the following:

1. For R-2, PR-1, PR-2, and PR-3, the proposed alternatives provide an acceptable level of quality and safety. Therefore, the proposed alternatives are authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the remainder of the third 10-year inservice testing program interval.

2. For R-1, compliance with the Code would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety, and the proposed alternative will provide reasonable assurance of pump and valve operability. Therefore, the proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(ii) for the remainder of the third 10-year inservice testing program interval.

The NRC staff's safety evaluation authorizing the requested alternatives is enclosed. Contact the NRC Project Manager, Dan Collins at (301) 415-1427 if you have any questions. This completes the staff's effort on TAC No. MA9162

Sincerely,

/RA/V Nereses for

James W. Clifford, Chief, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-336

Enclosure: Safety Evaluation

cc w/encl: See next page

The NRC staff's safety evaluation authorizing the requested alternatives is enclosed. Contact the NRC Project Manager, Dan Collins at (301) 415-1427 if you have any questions. This completes the staff's effort on TAC No. MA9162

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ASSOCIATED WITH REQUESTS FOR RELIEF FOR THE THIRD 10-YEAR

PUMP AND VALVE INSERVICE TESTING PROGRAM INTERVAL

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 2

DOMINION NUCLEAR CONNECTICUT, INC.

DOCKET NUMBER 50-336

1.0 INTRODUCTION

Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a, requires that inservice testing (IST) of certain American Society of Mechanical Engineers (ASME) Code Class 1, 2, and 3 pumps and valves be performed in accordance with Section XI of the ASME *Boiler and Pressure Vessel Code* (the Code) and applicable addenda, except where alternatives have been authorized or relief has been requested by the licensee and granted by the Director of the Office of Nuclear Reactor Regulation pursuant to paragraphs (a)(3)(i), (a)(3)(ii), or (f)(6)(i) of 10 CFR 50.55a. In proposing alternatives or requesting relief, the licensee must demonstrate that: (1) the proposed alternatives provide an acceptable level of quality and safety; (2) compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety; or (3) conformance is impractical for its facility. Section 50.55a authorizes the Commission to approve alternatives and to grant relief from ASME code requirements upon making the necessary findings. Nuclear Regulatory Commission (NRC) guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provides alternatives to the Code requirements which are acceptable. Further guidance is given in GL 89-04, Supplement 1, and NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants."

In its letter of June 1, 2000, Northeast Nuclear Energy Company (NNECO), the then licensee for Millstone Nuclear Power Station, Unit 2 (MP2), submitted several relief requests for their third 10-year interval IST program for pumps and valves. Additional information was provided in letters dated October 2 and December 14, 2000. The third 10-year interval for MP2 began on April 1, 1999, and is scheduled to end on March 31, 2009.

At the time of the June1, October 2, and December 14, 2000, letters NNECO was the licensed operator of MP2. On March 31, 2001, all of the owners of MP2 transferred their ownership interests in MP2 to Dominion Nuclear Connecticut, Inc. (DNC), and NNECO's operating authority for MP2 was transferred to DNC. By letter dated April 2, 2001, DNC requested that the NRC continue to review and act upon all requests before the Commission that had been submitted by NNECO. Accordingly, the NRC has reviewed the proposed alternative testing method for these pumps and valves against the requirements of OMa-1988, Part 6 (OM-6) and

Part 10 (OM-10), which are referenced in the 1989 Edition of ASME Section XI, Subsections IWP and IWV. Our findings are included below.

2.0 RELIEF REQUESTS

2.1 Relief Request R-1

The licensee has requested relief from the full stroke exercise requirements of OM-10, Paragraph 4.2.1.2, for manually operated gate valves 2-FIRE-94A/B/C which isolate the fire water system from the auxiliary feedwater (AFW) system. The licensee has proposed to place these valves in a sample exercise program and exercise one valve each refueling outage.

2.1.1 Licensee's Basis for Requesting Relief (as stated)

> The normally closed six inch manually operated gate valves serve as the Fire Water/AFW system boundary valves which ties in directly to each of the three AFW pump suction lines. The normally isolated fire water system provides an alternate source of water to the AFW pumps during long term cooling in the event the normal condensate storage tank (CST) supply is depleted. An eight inch fire water header supplies the three parallel six inch lines, one for each of the three AFW pumps, which tie directly into the normal AFW suction path from the CST. There is no drain path available between the eight inch header and the three six inch isolation valves.
>
> Manual full stroke or part stroke testing each valve during reactor operation, cold shut down, and refueling is not practical since the firewater discharge flow path goes directly to the suction of the AFW [pumps] and could cause plant equipment damage. Cycling the valves would result in chemical and particulate contamination of the AFW system and/or CST. The AFW suction line spool piping could be removed and the fire water routed away from the AFW system using temporary piping however, this would create a hardship with the significant maintenance preparation and restoration activities, the proper disposal of the chlorinated firewater, and system flushing required after each valve cycle to insure the AFW system does not become contaminated when restored.
>
> Manual full stroke testing each valve every refueling would be unduly burdensome, creating an unwarranted environmental impact and impacting outage work completion (An AFW pump is required to be available during refueling outages for shutdown risk purposes).
>
> All the valves have been verified capable of performing their safety function with successful testing performed during RFO 13 [refueling outage number 13 in May of 2000]. A work history review back to 1985 did not identify any component problems.

2.1.2 Alternative Testing

> The following alternate test plan avoids undue hardship and does not compromise component level quality or safety and is adequate to meet the fundamental objective of detecting degradation.

Unit No. 2 proposes testing the fire water valves (2-FIRE-94A/B/C) on a sample frequency of one valve each refuel cycle. A selected valve in the group will be manually full-stroked every refueling outage and all the valves in the group will be manually full-stroked within 3 refueling cycles. If the selected valve being manually full-stroked is not capable of being full-stroke exercised the remaining valves in the group will be manually full-stroke exercised during the same outage.

A full stroke exercise test will be performed in accordance with OM-10 after any maintenance that could affect the full-stroke capability of the valve.

The sample group was selected utilizing a methodology similar to the guidelines established in NUREG-1482 for check valve disassembly groups since they are the same manufacturer, model, size, application, and orientation.

2.1.3 Evaluation

The Code requires that Category A and B valves be exercised to their safety position once every 3 months. In addition, power-operated valves are required to be stroke timed every 3 months unless this testing is impractical where it is then deferred to either plant shutdowns or refueling outages. Active safety-related valves without power actuators, which require a plant operator to turn a hand wheel or other device to actuate the valve to its safety position, are referred to as manual valves. Manual valves are required to meet the Code exercise requirements. They are not required to meet the stroke-time testing requirements.

The three fire water valves isolate the fire water from the suction supply of the AFW system. According to the Final Safety Analysis Report (FSAR), in the event that the CST becomes depleted and cannot be replenished by normal makeup, the operators can connect the fire water system to the AFW pump suctions. Each of the three fire water valves is currently exercised every refueling outage. The licensee stated that it is not practical to test each valve at power, during cold shutdowns, and refueling outages, because the water in the fire water system would contaminate the AFW system and CST.

In a phone conversation with the licensee on December 7, 2000, the licensee provided clarifying information regarding how each valve is exercised each refueling outage. In order to exercise each fire water valve without contaminating the AFW system with fire water, the flow path from the CST is isolated and a spool piece is removed between the AFW pump and the fire water isolation valve. A blind flange with a fire hose fitting is attached to the line. The fire hose is connected to the fitting and then run to a drain approximately 300 feet from the connection. When the valve is exercised, the water in the line is diverted through the fire hose to the drain. There are no existing valves in the fire water or AFW suction lines that facilitate exercising these valves. By letter dated December 14, 2000, NNECO provided a revised relief request R-1 that reflects these clarifications.

The licensee has provided an acceptable basis for the impracticality of testing these valves quarterly and during cold shutdowns. The Code allows deferral of testing to refueling outages without requesting relief when impracticality has been demonstrated. The licensee is requesting that the testing interval be further increased to three refueling outages for each valve based on the hardship of testing all three valves every refueling outage. The exercise of

each valve would be performed on a staggered basis with one valve being tested each refueling outage. In the event that a valve selected for testing during a refueling outage is not capable of being exercised to its safety position, the other two valves will be exercised during the same refueling outage. In addition, a valve will be exercised to its safety position after any maintenance that could affect the capability of the valve to perform its safety function.

The licensee has proposed to exercise these valves on a sample frequency similar to the philosophy for disassembly and inspection of check valves on a sample basis. The licensee stated that all three valves are of the same size, manufacturer and model number. In addition, these valves are oriented in the same position and see identical service conditions. All three valves were successfully exercised in May of 2000. The licensee has reviewed the work history of these valves from 1985 to the present and no issues were identified.

Based on the fact that exercising each valve every refueling outage requires significant effort to configure the system for the exercise, the NRC staff finds that compliance with the current Code requirements results in hardship without a compensating increase in the level of quality and safety. Although the proposed testing increases the exercise interval of each valve to 3 refueling outages, the NRC staff finds that the proposed alternative provides reasonable assurance of operational readiness because the testing is performed on a staggered basis. This is consistent with the philosophy of GL 89-04, Position 2, concerning sample disassembly and inspection of check valves. Further assurance is provided by the review of the work history of these valves which did not identify any issues. Finally, the licensee has committed to: 1) exercise the other two valves during the same refueling outage if a valve selected for testing is not capable of being exercised to its safety position, and 2) exercise a valve to its safety position after any maintenance that could affect the capability of the valve to perform its safety function.

2.1.4 Conclusion

The proposed alternative, to exercise the manually operated gate valves 2-FIRE-94A/B/C once every three refueling outages on a staggered basis, is authorized for the remainder of the third 10-year interval pursuant to 10 CFR 50.55a(a)(3)(ii) on the basis that compliance with the Code full-stroke exercise requirements of OM-10, Paragraph 4.2.1.2, results in a hardship without a compensating increase in the level of quality and safety.

2.2 Relief Request R-2

The licensee is requesting relief from the test requirements of OM-10, Paragraph 4.2.1.1, for the manual valves listed below in the main steam (MS), reactor building closed cooling (RB), AFW, and containment spray (CS) systems. The licensee has proposed to exercise these valves at least once every 18 months.

Valve		Function
2-CN-29A 2-CN-30	2-CN-29B	close to allow suction flow path from the fire main
2-FW-56A	2-FW-56B	open to allow manual control of auxiliary feedwater

2-RB-39	2-RB-41	close when entering post accident long term cooling or to
2-RB-43	2-RB-56A	isolate a faulted reactor building header
2-RB-56B	2-RB-56C	
2-RB-107A	2-RB-107B	
2-RB-107C		

2.2.1 Licensee's Basis For Requesting Relief (as stated)

> The RB and AFW system valves are manual valves. The predominant degradation and failure mechanisms (motor failures, electrical failures, switch settings, etc) associated with power-operated valves [motor-operated and air-operated valves] do not exist for manual valves. These valves are normally open (except two AFW valves that are closed) and are closed to prevent loss of system inventory. The two AFW valves are normally closed and are opened to allow flow.
>
> These valves are not operated during power operation except for surveillance testing. Testing these valves on a quarterly frequency solely to meet the requirements of ASME/ANSI 1987, OMa-1988 provides limited value. Quarterly testing is unnecessary for detecting valve degradation, does not decrease the potential for a component failure and the proposed alternative testing will provide a level of safety comparable to the current Code testing.

2.2.2 Alternative Testing

The licensee proposed:

> Manually full stroke exercise the valves at least once every 18 months. The 25 percent grace period allowed for other Technical Specification surveillances will be allowed for this frequency to facilitate scheduling of the surveillance due to plant conditions or other constraints.

2.2.3 Evaluation

The Code requires that Category A and B valves be exercised to their safety position once every 3 months. In addition, power-operated valves are required to be stroke timed every 3 months unless this testing is impractical where it is then deferred to either plant shutdowns or refueling outages. Active safety-related valves without power actuators, which require a plant operator to turn a hand wheel or other device to actuate the valve to its safety position, are referred to as manual valves. Manual valves are required to meet the Code exercise requirements. They are not required to meet the stroke-time testing requirements.

The licensee's submittal of October 2, 2000, specifies that the manual valves in Relief Request R-2 would be exercised on an 18-month frequency with a 25-percent grace period to allow for scheduling flexibility. The proposed testing results in approximately an 80-percent reduction in the testing of the specified manual valves, and therefore, a corresponding reduction in the burden of testing these valves, while performing an exercise test at a nominal interval of 18 months. This proposed test interval is consistent with the more simplistic Code testing requirements for valves (e.g., OM-10, Paragraph 4.1, valve position verification requirement

performed once every 2 years). In addition, the test frequency is also consistent with the valve exercising requirements of OM-10, Paragraph 4.2.1.2, which allows testing of components to be deferred from a quarterly interval to cold shutdowns or refueling outages when such testing is impractical to perform. Therefore, the NRC staff finds that the proposed alternative provides an acceptable level of quality and safety.

The NRC is currently considering rulemaking to 10 CFR 50.55a which will incorporate, by reference, the 1998 Edition of the ASME OM Code through the 2000 Addenda. OMa Code-1999, Subsection ISTC 3540, includes new requirements for exercise testing of manual valves. When the final rule is issued, the licensee should apply the testing requirements specified for manual valves, including any limitations or modifications to the requirements in Subsection ISTC 3540. Implementation of Code requirements of a later edition or addenda to the ASME OM Code require approval by the NRC in accordance with 10 CFR 50.55a(f)(4)(iv) and must incorporate any related requirements.

The licensee's proposed alternative does not discuss more frequent testing of manual valves operating under adverse conditions. As noted in ASME OMa Code-1999 Addendum, subsection ISTC-3540, examples of adverse conditions include harsh service environment, lubricant hardening, corrosive or sediment laden process fluid, or degraded valve components. Upon issuance of the final rule discussed above, it will be the licensee's responsibility to assess whether or not these valves require an exercise test more frequently than once every 18 months.

2.2.4 Conclusion

The proposed alternative to the valve exercise frequency requirements of OM-10, Paragraph 4.2.1.1, for the manual valves listed above, is authorized for the remainder of the third 10-year interval pursuant to 10 CFR 50.55a(a)(3)(i) based on the NRC staff's finding that the alternative to exercise each manual valve on an 18-month frequency with a 25-percent grace period, provides an acceptable level of quality and safety.

2.3 Relief Request PR-1

The licensee has requested relief from the frequency response range requirements of OM-6, Paragraph 4.6.1.6, for service water pumps P5A, P5B, and P5C. The licensee has proposed to use vibration instrumentation with a response range from 5.3 hertz to at least 1,000 hertz.

2.3.1 Licensee's Basis For Requesting Relief (as stated)

> Millstone is transitioning from the TEC 1330 VLF SmartMeter to the ENTEK/IRD dataPAC 1500 vibration data collector due to Y2K issues with the TEC 1330 meter. The TEC 1330 meter is no longer being manufactured and technical support is being phased out. The vendor recommended the data PAC 1500 as a suitable replacement for the TEC 1330 meter.
>
> Vibration personnel detected large errors in overall vibration measurement results when field validation testing the dataPAC 1500 data collectors. Investigation revealed that the dataPAC 1500 use the entire meter's frequency response range (i.e., 0.36 Hz to 75.3 KHz) in calculating and displaying overall vibration results (called magnitude readings)

whereas the TEC 1330 meter calculated overall vibration based on user specified upper and lower frequency limits. The TEC 1330 meter frequency response range was setup for [approximately] 4.0 Hz to 1000 Hz.

Integration noise is created by processing the input signal from the accelerometer, which affects the lower response range. The integration noise is reduced in the dataPAC 1500 by filtering the vibration input signal through a 5.3 Hz high pass filter to obtain repeatable overall vibration data. This results in the lower bound of the Code-required frequency response range not being met. The TEC 1330 meter used a special algorithm in the data collector to subtract integration noise from the vibration measurement.

The service water pumps are vertical line shaft turbine pumps with the same constant running speed of 885 rpm (equivalent to 14.7 Hz). Compliance with paragraph 4.6.1.6 would require using vibration instrumentation with a frequency response range of 4.9 Hz to at least 1000 Hz for these pumps.

Vibration instrumentation with a frequency response range from 5.3 Hz to 1000 Hz for monitoring vibration of the service water pumps is acceptable because:

- Overall vibration data would still contain vibration components from 0.36 Hz to 75.3 KHz but vibration amplitudes at frequencies below 5.3 Hz would be attenuated. The amount of attenuation for a particular frequency below 5.3 Hz is dependent on the high pass filter's characteristics. Inputting a known signal amplitude at 4.9 Hz into the data PAC 1500 resulted in its amplitude being reduced to only 85% of its original value. Spectral vibration data collected using the 5.3 Hz high pass filter would still provide observable and trendable vibration data that would indicate developing mechanical faults down to 4.9 Hz.

- Millstone has not identified any potential mechanical faults for the service water pumps below 6 Hz. The credible mechanical faults below pump running speed on these vertical line shaft pumps are structural resonance at the system's reed natural frequencies and pump shaft whirl. Millstone has identified the reed natural frequencies of these service water pumps to lie between 6 Hz and pump running speed. Non-IST required pump shaft measurements using a shaft stick or proximity probe are required to confirm pump shaft whirl. Millstone routinely collects and trends vertical pump line shaft vibration data primarily to trend line shaft bearing wear and has never identified subsynchronous shaft vibration (shaft whirl) on their service water pumps.

- Overall vibration limits are only one indicator of component condition and may miss some mechanical faults entirely. Spectral vibration analysis is much more sensitive than overall vibration in detecting mechanical faults. Vibration analysts use spectral data to extract and trend vibration data from various frequency bands that were defined to detect particular machine faults for each specific machine type. Spectral analysis results in additional and earlier warning of degrading component conditions due to the capability to trend and alarm on

multiple frequency bands and individual frequencies. Spectral vibration analysis techniques are used at Millstone on all IST components.

- The 1/3 running speed to 1000 Hz minimum frequency response range requirement does not apply well to slow speed machinery. Incorporating vibration frequency down to 1/3 running speed results in integration noise corrupting the overall vibration results on slow speed machinery. Overall vibration is excessively high unless the integration noise is reduced by high pass filtering the vibration input signal or by using special algorithms in data collectors to subtract integration noise from the vibration measurement.

  Many vibration standards segregate rotating equipment into various rotational speed categories (i.e., running speed above or below 600 RPM, speed range from 10 to 200 REV/S), machinery type classifications (i.e., turbines, pumps, compressors, fans, centrifugal, reciprocating, overhung rotor, etc.) and machinery support methods (i.e., hard or soft mounted) prior to specifying allowable vibration limits. This allows for more appropriate limits to be applied to the different types of equipment that optimize detection of credible mechanical faults.

2.3.2 Alternative Testing

The licensee proposed:

> The instrumentation used to measure pump vibration will have a frequency response range from 5.3 Hz to at least 1000 Hz.

2.3.3 Evaluation

The licensee is transitioning from the TEC 1330 VLF SmartMeter to the ENTEK/IRD dataPAC 1500 vibration data collector due to Y2K issues with the TEC 1330 meter. The TEC 1330 meter is no longer being manufactured and technical support is being phased out. The vendor recommended the dataPAC 1500 as a suitable replacement for the TEC 1330 meter. In order to obtain repeatable overall vibration data, the integration noise in the dataPAC 1500 is reduced by filtering the vibration input signal through a 5.3 Hz high pass filter. This results in the lower bound of the Code-required frequency response range being at 0.36 times minimum pump shaft rotational speed, which deviates slightly from the Code-required lower bound of 0.33 times pump running speed. Compliance with the Code requirements would require acquiring a different vibration instrumentation with a frequency response range of 4.9 Hertz to 1,000 Hertz for these pumps.

The dataPAC 1500 would exclude a small portion of the data from 4.9 Hz to 5.3 Hz, but it should provide a reasonable level of information for monitoring vibration of the affected service water pumps especially when used in conjunction with spectral vibration analysis techniques. Furthermore, the licensee indicated that: (1) spectral vibration data collected using the 5.3 Hz high pass filter would still provide observable and trendable vibration data that would indicate developing mechanical faults down to 4.9 Hz; (2) Millstone has not identified any potential mechanical faults for the service water pumps below 6 Hz; (3) Millstone routinely collects and

trends vertical pump line shaft vibration data primarily to trend line shaft bearing wear and has never identified subsynchronous shaft vibration (shaft whirl) on their service water pumps; and (4) spectral vibration analysis techniques are used at Millstone on all IST pumps, and spectral analysis results would provide early warning of degrading component conditions due to its capability to trend and alarm on multiple frequency bands and individual frequencies. Therefore, the staff finds that use of the instrumentation dataPAC 1500 in conjunction with spectral analysis techniques used at MP2 should provide reasonable assurance of the capability for monitoring vibration of the affected pumps and would provide an acceptable level of quality and safety.

2.3.4 Conclusion

The proposed alternative of using instrumentation dataPAC 1500 from 5.3 Hz to 1000 Hz for the affected pumps in conjunction with spectral vibration analysis techniques is authorized for the remainder of the third 10-year interval pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the proposed alternative provides reasonable assurance of pump operability and provides an acceptable level of quality and safety.

2.4 Relief Request PR-2

The licensee has requested relief from the corrective action requirements of OM-6, Paragraph 6.1, for all pumps in the IST program. The licensee has proposed to use the requirements in OM Code-1995, ISTB 6.2.2, which allow an analysis of pumps in instances where their performance enters the required action range, in lieu of the corrective actions required by the Code.

2.4.1 Licensee's Basis for Requesting Relief (as stated)

> By allowing an analysis of the pump's overall performance, premature maintenance of a pump that is subject to normal and gradual degradation over time or other test anomalies can be avoided provided the pump can be determined to be fully capable of reliably performing its intended safety function. The 1995 Edition of the ASME OM Code provides an alternative corrective action should a pump's performance enter the required action range. Paragraph 6.2.2 permits an analysis of the pump's performance and establishment of new reference values.
>
> By adopting the 1995 ASME Code requirements, for this specific instance, the frequency of pump maintenance, with concurrent equipment outage and applicable Limiting Condition of Operation (LCO) time, can be reduced with little or no adverse affect on plant safety as determined by the acceptance of the 1996 addenda of the ASME Code.
>
> This proposed alternate test is consistent with the response to question 3.3.2 in the Summary of Public Workshops on Inspection Procedure 73756.

2.4.2 Alternative Testing

The licensee proposed:

> When a pump's test parameters fall within the required action range and the pump's overall performance has been determined to be acceptable by analysis, a new set of reference values may be established. The supporting analysis will include verification of the pump's operational readiness and the pumps continued performance in between testing intervals. The pump's analysis will address both component and system level evaluations of operational readiness, a description of the cause of the change in pump performance, an evaluation of all trends indicated by the data and an evaluation of applicable maintenance performed on the pump. This analysis will be documented in the record of tests.

2.4.3 Evaluation

OM-10, Paragraph 6.1, "Acceptance Criteria," specifies actions required to be taken if any of the measured pump parameters fall within the alert or required action ranges. For test results in the alert range, the test frequency shall be doubled until the cause of the deviation is determined and the condition is corrected. For test results in the required action range, the pump shall be declared inoperable until the cause of the deviation has been determined and the condition corrected.

ASME OM Code-1995 was endorsed on September 22, 1999, by the NRC in a rule change to 10 CFR 50.55a. Subsection ISTB, Paragraph 4.6, "New Reference Values," states that "[i]n cases where the pump's test parameters are either within the alert or required action ranges of ISTB 5.2.1.1, Table ISTB 5.2.1-2, Table ISTB 5.2.2-1, or Table ISTB 5.2.3-1, and the pump's continued use at the changed values is supported by an analysis, a new set of reference values may be established." Paragraph ISTB 4.6 also states that the analysis shall include both a pump level and a system level verification of pump operational readiness, the cause of the change in pump performance, and an evaluation of all trends indicated by available data.

Paragraph ISTB 6.2.2, which provides acceptance criteria for the required action range, allows an analysis to be performed and new reference values to be established in accordance with ISTB 4.6 in lieu of pump repair or replacement to satisfy the corrective action requirements. Paragraph ISTB 6.2.1, which provides requirements for alert range acceptance criteria, does not provide the option to use analysis as an alternative to doubling the test frequency.

The licensee has proposed to adopt the requirements of ISTB 6.2.2 in order to establish new reference values by analysis of the pump when its performance enters the required action range. The regulations, as specified in 10 CFR 50.55a(f)(4)(iv), allow the adoption of later editions of the Code provided that the related requirements are adopted. The allowances for use of analysis have been reintroduced into the Code in conjunction with modified pump testing strategies. These include reduced quarterly testing requirements for standby pumps and more stringent requirements to test all safety-related pumps within ±20 percent of pump design flow every 2 years. Therefore, the requirements for testing pumps within ±20 percent of pump design flow are related to the Code analysis requirements because testing pumps at or near design flow conditions provides better data to analyze pump performance.

The NRC has previously issued guidance on performing an analysis where the result of an ASME Code test of a pump or valve concludes that the component is inoperable. In NRC GL 91-18, which concerns resolution of degraded and nonconforming conditions and operability, Section 6.11, "Technical Specification Operability vs. ASME Code, Section XI Operative Criteria," the NRC indicates that in cases where the required action range limit is more conservative than its corresponding technical specification limit, the corrective action may not be limited to replacement or repair. The corrective action may consist of an analysis to demonstrate that the specific pump performance degradation does not impair operability and that the pump or valve will still fulfill its function, such as delivering the required flow. A new required action range may be established after such an analysis which would then allow a new determination of operability. Hence, when licensees request to use the analysis alternative in OM Code-1995, Paragraph 6.2.2, for pumps in the required action range, the staff has authorized the alternative because it is consistent with the guidance in Generic Letter 91-18. Although the licensee has not adopted the related requirements of ISTB 6.2.2 (which are determined to be ISTB 4.3(e)(1), ISTB 4.6, and ISTB 5.2.3), the NRC has published guidance related to the performance of analysis when a pump is declared inoperable. Therefore, the proposed alternative to perform analysis when a safety-related pump is performing in the required action range provides reasonable assurance of operational readiness and an acceptable level of quality and safety.

The performance of analysis in the required action range should include, at a minimum, a comparison of the current measurements for the particular parameter, i.e., flow rate, vibration, discharge pressure, or differential pressure to the baseline measurements, an evaluation of the trend of available data for the parameter, and a determination of the cause and the need for corrective action. Alternate diagnostic methods, such as vibration spectral analysis, are expected to be used to support the analysis. The analysis is subject to NRC inspection. This analysis must provide reasonable assurance that the condition of the pump will not further degrade such that, before the next pump test or before repairs can be performed, the pump would fail. Additionally, it should be noted that changes to the vibration reference values would affect only the vibration relative alert and required action limits, and not the absolute limits specified by the Code. If the absolute limits are exceeded (i.e., 0.7 inches per second for the required action range), the licensee would be required to declare the pump inoperable in accordance with the Code.

The use of this analysis is expected to be a rare occurrence. This analysis should be used cautiously, as it is not intended to be used regularly to evaluate the operability of all pumps that fall into the required action range in order to declare the pump operable and define new reference values where significant degradation has occurred. Repeated application of analysis could lead to stair stepping the Code limits downward to the safety limits of the pump. The licensee should have an understanding of the margin of each pump above its design-basis requirements.

2.4.4 Conclusion

The proposed alternative to use OM Code-1995, ISTB 6.2.2, for safety-related pumps in the required action range is authorized for the remainder of the third 10-year interval pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety.

2.5 Relief Request PR-3

The licensee has requested relief from the digital instrument range requirements of OM-6, Paragraph 4.6.1.2(b) for unspecified instruments in the licensee's IST program. The licensee has proposed to use a digital instrument with a range of 90 percent of the reference value.

2.5.1 Licensee's Basis For Requesting Relief (as stated)

> The intent of the restrictions on the instrument calibration range is to ensure a specific accuracy is maintained for all acceptable test values, i.e. within 2% of indicated values. The basis for requiring reference values to be less than or equal to 70% of the calibrated range of the instrument is unclear. For a digital instrument, calibrated in accordance with ASME OM Code requirements, an instrument reading at 80% of the calibrated range would be equally valid for IST use as an instrument reading at 60% of the calibrated range. Both test readings would be within 2% accuracy of the indicated value.
>
> Since the ASME OM Code requirements allow pump test values within a maximum of ±10% of the reference value, to be considered acceptable, a limit of 90% of the reference value would ensure all possible pump test results are meeting the accuracy requirements of the Code.
>
> Additionally, the ASME OM Code Committee has approved Code Case OMN-6, "Alternate Rules for Digital Instruments," which identifies that digital instruments may be selected such that the reference value does not exceed 90% of the calibrated range of the instrument. This Code Case applies to ASME OM Code-1990 Edition through ASME OMb Code-1997 Addenda.

2.5.2 Alternative Testing

The licensee proposed:

> Select digital instruments for IST pumps such that the reference value does not exceed 90% of the calibrated range of the instrument.

2.5.3 Evaluation

Paragraph 4.6.1.2(b) of OM-6 requires that the reference value of digital instruments not exceed 70 percent of the calibrated range of the instrument. The ASME OM Code committees approved Code Case OMN-6, and it was included in OMa-1999 Addenda. This Code Case allows owners to use digital instruments such that the reference value does not exceed 90 percent of the calibrated range of the instrument. This Code Case was written to allow owners additional flexibility, since 70 percent was based on previous Section XI requirements for pressure testing equipment, and to ensure that if readings were in the required action range, they could be read. The licensee has proposed that digital instruments shall be selected such that the measured parameter does not exceed the calibrated range of the instrument.

Code Case OMN-6 was written to provide alternate requirements in lieu of Subsection ISTB, Paragraph 4.6.1(b)2 of the OM Code1990 Edition. The licensee's IST program is written to the requirements of OM-6 for pumps. The requirements for the range of digital instruments in both ISTB and OM-6 are identical. There are no related requirements. Therefore, Code Case OMN-6 may be applied to Paragraph 4.6.1.2(b) of OM-6.

Table 3b of OM-6 states that the maximum acceptable value of the measured parameter is 110 percent of the reference value. When selecting its digital instrument, it's the licensee's responsibility to ensure that 110 percent of the measured parameter's reference value is within the instrument's calibrated range. On this basis, the staff finds that the licensee's alternative provides an acceptable level of quality and safety.

2.5.4 Conclusion

The proposed alternative to the Code digital instrument requirements for various Class 2 and 3 pumps is authorized for the remainder of the third 10-year interval pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the alternative provides an acceptable level of quality and safety.

3.0 CONCLUSION

In Relief Request R-1, the proposed alternative, to exercise the manually operated gate valves 2-FIRE-94A/B/C once every three refueling outages on a staggered basis, is authorized for the remainder of the third 10-year interval pursuant to 10 CFR 50.55a(a)(3)(ii) on the basis that compliance with the Code full-stroke exercise requirements of OM-10, Paragraph 4.2.1.2, results in a hardship without a compensating increase in the level of quality and safety.

In Relief Request R-2, the proposed alternative to the valve exercise frequency requirements of OM-10, Paragraph 4.2.1.1, for manual valves in the MS, RB, AFW, and CS systems, is authorized for the remainder of the third 10-year interval pursuant to 10 CFR 50.55a(a)(3)(i) based on the NRC staff's finding that the alternative, to exercise each manual valve on an 18-month frequency with a 25-percent grace period, provides an acceptable level of quality and safety.

In Relief Request PR-1, the proposed alternative of using instrumentation dataPAC 1500 from 5.3 Hz to 1000 Hz for service water pumps P5A, P5B, and P5C in conjunction with spectral vibration analysis techniques is authorized for the remainder of the third 10-year interval pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the proposed alternative provides reasonable assurance of the pump operability and provides an acceptable level of quality and safety.

In Relief Request PR-2, the proposed alternative to use OM Code-1995, ISTB 6.2.2, for safety-related pumps in the required action range is authorized for the remainder of the third 10-year interval pursuant to 10 CFR 50.55a(a)(3)(i) based on the alternative providing an acceptable level of quality and safety.

In Relief Request PR-3, the proposed alternative to the Code digital instrument requirements for various Class 2 and 3 pumps is authorized for the remainder of the third 10-year interval pursuant to 10 CFR 50.55a(a)(3)(i) on the basis that the alternative provides an acceptable level of quality and safety.

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