

January 31, 2008

Mr. Michael A. Balduzzi
Sr. Vice President & COO
Regional Operations, NE
Entergy Nuclear Operations, Inc.
440 Hamilton Avenue
White Plains, NY 10601

SUBJECT: RELIEF REQUEST NO. ISI-PT-01, ALTERNATE PRESSURE TESTING FOR
BURIED PIPING COMPONENTS, FOURTH INSERVICE INSPECTION
INTERVAL - VERMONT YANKEE NUCLEAR POWER STATION
(TAC NO. MD5436)

Dear Mr. Balduzzi:

By letter dated April 20, 2007 (Agencywide Documents and Management System (ADAMS) Accession No. ML071230271), supplemented by letter dated October 18, 2007 (ML072970317), Entergy Nuclear Operations, Inc. (the licensee) submitted Relief Request (RR) No. ISI-PT-01 related to the Fourth 10-Year Interval Inservice Inspection (ISI) Program for the Vermont Yankee Nuclear Power Station. The licensee requested relief from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code requirements pertaining to pressure testing of buried portions of piping. Specifically, the licensee requested relief from ASME code requirements to test buried portions of service water system piping by measuring rate of pressure loss or change in flow between the ends of the buried components. Alternatively, the licensee proposed continuous on-line monitoring of service water header pressure supplemented by a robotic inspection of the piping interior that will ensure detection and location of significant through-wall leakage. In addition, the licensee proposed to perform periodic visual examination of the ground surface immediately above each buried section and monitor system performance for adequate component cooling to assure no major loss of service water inventory.

Based on the information provided in the relief request, the Nuclear Regulatory Commission (NRC) staff concluded that the licensee's compliance to the ISI Code of Record would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii), the staff authorizes the ISI program alternative proposed in relief request, ISI-PT-01, for the fourth 10-year ISI interval for the Vermont Yankee Nuclear Power Station. The results of the staff's review are provided in the enclosed safety evaluation.

M. Balduzzi

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If you have any questions regarding this approval, please contact the Vermont Yankee Project Manager, James Kim, at 301-415-4125.

Sincerely,

/RA/

Mark G. Kowal, Chief
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-271

Enclosure:
As stated

cc w/encl: See next page

M. Balduzzi

- 2 -

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Enclosure:
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cc w/encl: See next page

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Amendment No.: ML073530477

*See memo dated December 18, 2007

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF NO. ISI-PT-01

ENTERGY NUCLEAR OPERATIONS, INC.

VERMONT YANKEE NUCLEAR POWER STATION

DOCKET NO. 50-271

1.0 INTRODUCTION

By letter dated April 20, 2007 (Agencywide Documents and Management System (ADAMS) Accession No. ML071230271), supplemented by letter dated October 18, 2007 (ML072970317), Entergy Nuclear Operations, Inc. (the licensee) submitted Relief Request (RR) No. ISI-PT-01 related to the Fourth 10-Year Interval Inservice Inspection (ISI) Program for the Vermont Yankee Nuclear Power Station. In RR No. ISI-PT-01, the licensee requested relief from performing the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code)-required pressure test of the buried portion of service water piping by measuring rate of pressure loss or change in flow between the ends of the buried components. Alternatively, the licensee proposed continuous on-line monitoring of service water header pressure supplemented by a robotic inspection of the piping interior that will ensure detection and location of significant through-wall leakage. In addition, the licensee proposed to perform periodic visual examination of the ground surface immediately above each buried section and monitor system performance for adequate component cooling to assure no major loss of service water inventory.

The Nuclear Regulatory Commission (NRC) staff has reviewed the licensee's proposed alternative pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii) since compliance to the Code requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.0 REGULATORY EVALUATION

10 CFR 50.55a(g) requires that ISI of ASME Code Class 1, 2, and 3 components be performed in accordance with Section XI of the ASME Code and applicable addenda, except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). According to 10 CFR 50.55a(a)(3), alternatives to the requirements of paragraph 50.55a(g) may be used, when authorized by the NRC, if an applicant demonstrates that the proposed alternatives would provide an acceptable level of quality and safety or if the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Enclosure

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the preservice examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that ISI of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The ISI Code of Record for the fourth 10-year inspection interval for Vermont Yankee Nuclear Power Station is the 1998 Edition through the 2000 Addenda of the ASME Code, Section XI.

3.0 TECHNICAL EVALUATION

System/Component(s) for Which Relief is Requested

Buried Class 3 Components Subject to System Pressure Testing in Service Water System

ASME Code Requirements

The 1998 Edition through the 2000 Addenda of ASME Code, Section XI, Table IWD-2500-1, Examination Category D-B, Item Number D2.10 requires a system leakage test and visual examination. For buried components where a VT-2 visual examination cannot be performed, the examination requirement is satisfied by the following:

The system pressure test for buried components that are isolable by means of valves shall consist of a test that determines the rate of pressure loss. Alternatively, the test may determine the change in flow between the ends of the buried components. The acceptable rate of pressure loss or flow shall be established by the Owner.

Licensee's Request for Relief

Relief is requested from performing the system leakage test for buried portions that are isolable by means of valves by measuring rate of pressure loss or the change in flow between the ends of buried components.

Licensee's Basis for Requesting Relief

The Service Water (SW) System consists of two redundant headers supplying cooling water to safety-related components (e.g., two Residual Heat Removal Service Water trains, two Reactor Equipment Cooling heat exchangers, two Emergency Diesel Generators, two Standby Fuel Pool Cooling trains, and miscellaneous Reactor Building cooled loads) and non-safety related components. Each redundant SW header is cross connected on the header inlets and outlets.

IWA-5244(b)(1) requires either a rate of pressure loss test or a test that determines the change in flow between the ends of the buried components for isolable sections of buried piping. The acceptable rate of pressure loss or change in flow shall be established by the Owner. Sections of SW system buried piping were not designed with consideration for isolation valves adequate for performing a pressure loss type test or did not contain instrumentation adequate for measuring changes in flow between the ends of the buried piping.

Therefore, the rate of pressure loss would be inconclusive following pressurization in determining whether the leakage was from the piping pressure boundary or the valve seat for the components in the SW system as stated below.

a. For the buried portion of the redundant SW supply headers, isolation valves are installed in the system. The valves that isolate each header are large (20 inch and 24 inch nominal pipe size) gate valves which are not capable of performing a leak-tight pressure isolation function without upgrade or modification.

b. The Alternative Cooling System (ACS) mode of SW System provides an alternative decay heat removal process if the SW Intake Structure, the SW pumps, or the ultimate heat-sink (the Vernon Pond) become unavailable. The ACS uses a buried suction header from the safety-related Cooling Tower cell to supply either train of both redundant headers supplying cooling water to safety-related components. The return of water to the Cooling Tower via the buried return header is accomplished by isolating the normal SW discharge to the Vernon Pond and opening the valves near the Cooling Tower cell. Pressure testing of buried ACS return piping that is upstream of the Cooling Tower isolation valves would result in shutdown of both Residual Heat Removal Service Water trains and cut off SW supply to both Emergency Diesel Generators and both Fuel Pool Cooling heat exchangers. For the buried portion of ACS, the isolation valves are large (24 inch nominal pipe size) gate valves in the supply and return piping which are not leak-tight to perform pressure isolation function without upgrade or modification.

Also, the change in flow between the ends of buried components cannot be measured since there is no flow measuring device in the system. Accurate flow measurement using temporary flow instrumentation such as ultrasonic flow meter is not possible due to insufficient runs of straight pipe on each side of the accessible flow meter locations. The installation of permanent flow instruments to implement the above alternative provision of IWA-5244(b)(1) would require system modification and is cost prohibitive.

Licensee's Proposed Alternative

In lieu of performing a system pressure test in accordance with the requirements specified in IWA-5244(b)(1), Vermont Yankee will perform an internal visual inspection using a remotely controlled crawler-mounted camera for the piping interior of the SW and the ACS subsystem. Approximately 95% of the piping will be subject to the robotic inspection. The remaining portion of buried piping that is not amenable to internal visual examination, supplemental alternative verification of integrity of buried piping will be performed as follows:

The SW system instrumentation continuously monitors pressure of each buried piping header. During operation, if a pressure drop occurs in a header with no increase in routine service water demand, it would be indicative of a pressure boundary failure and the plant operators would take compensatory action to investigate and identify the cause.

The integrity of buried ACS subsystem will also be verified from supply of water to meet the functional requirement of components during the ACS mode of operation. Further, soil subsidence will be monitored for evidence of significant pressure boundary breach by roving operators during normal rounds.

4.0 STAFF EVALUATION

The Code of Record requires a system pressure test for the buried portion of SW piping that will determine either a rate of pressure loss or a change in flow at the ends of the buried piping. The buried service water piping at Vermont Yankee uses large gate valves at the ends which were not designed for pressure isolation, and therefore, are unsuitable to determine meaningful rate of pressure loss. The ends of buried piping are also not instrumented for flow measurement to measure change in flow. Therefore, the Code-required pressure test cannot be performed for the buried portion of SW piping.

The licensee, however, has proposed to perform an internal visual inspection using a remotely controlled crawler-mounted camera for the piping interior of the SW and the ACS subsystem. Approximately 95% of the piping will be subject to the robotic inspection. The licensee has further proposed to supplement the visual examination with the following verifications to make a qualitative assessment of the integrity of the buried piping.

1. Any pressure drop in the buried piping header with no apparent demand for cooling water to be indicative of a pressure boundary failure requiring operator action to take corrective action.
2. Verification of functional requirement of various safety-related equipment cooled by service water to identify any significant loss of inventory requiring corrective action.
3. Verification of soil subsidence for evidence of significant pressure boundary breach during routine walk-down by operators.

The NRC staff believes that licensee's visual examination of the piping interior surfaces using remotely controlled crawler-mounted camera is an acceptable alternative to the Code-required rate of pressure loss test or the change in flow test for the buried portion of SW piping. The ASME Code accepts substitution of direct visual examination with the remote visual for VT-1 examination in detecting discontinuities and imperfections on the surfaces of components including such condition as cracks, wear, corrosion, or erosion. The licensee is able to examine 95% of the interior surface of buried piping. The staff believes that if there were any service-induced flaws or degradation that existed in the welds and/or in the base metal, the examination of the accessible interior surface would detect it with a high degree of confidence to initiate necessary corrective action. Further, if any flaw or degradation escaped detection during the 95% visual examination or did exist in the remaining portion of buried piping that was not subject to internal visual examination which resulted in a breach of SW pressure boundary, the licensee's supplemental verification program would be effective in detecting loss of service water and initiating necessary corrective action. Therefore, the staff has determined that the licensee's proposed alternative examination for SW buried piping provides reasonable assurance of structural integrity and operational readiness. The NRC staff has further determined that compliance with the Code requirement would require installation of flow measuring devices at the inlet and outlet ends of the buried piping which would result in hardship to the licensee without a compensating increase in the level of quality and safety.

5.0 CONCLUSION

The NRC staff concludes that for the buried portion of service water piping, compliance to the Code requirement to perform a test that determines the rate of pressure loss or the change in flow would result in hardship to the licensee without a compensating increase in the level of quality and safety. The licensee's proposed alternative provides reasonable assurance of

structural integrity of the buried SW piping. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the proposed alternative in Relief Request No. ISI-PT-01 is authorized for the fourth 10-year ISI interval of Vermont Yankee Nuclear Power Station. All other requirements of the ASME Code, Section XI for which relief has not been specifically requested remain applicable, including a third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: P. Patnaik

Date:

