October 2, 2001

Mr. Michael A. Balduzzi
Senior Vice President and Chief Nuclear Officer
Vermont Yankee Nuclear Power Corporation
185 Old Ferry Road
P.O. Box 7002
Brattleboro, VT 05302-7002

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION - RELIEF REQUEST FROM ASME CODE REPAIR REQUIREMENTS FOR ASME CLASS 3 PIPING FOR SERVICE WATER SYSTEM REACTOR BUILDING RECIRCULATION UNIT (TAC NO. MB2127)

Dear Mr. Balduzzi:

By letter dated June 4, 2001, Vermont Yankee Nuclear Power Corporation (the licensee) requested relief from the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (the ASME Code), Section XI requirements regarding repair to a leak in a pressure retaining component at Vermont Yankee Nuclear Power Station. The leak was detected in the reactor building recirculation unit no. 8 (RRU-8) at two of the connections between the 5/8 inch OD stub tube and the inlet manifold. The licensee attributed the leak to partial fusion of a portion of the brazed joint that occurred during the manufacturing process.

The staff finds that performing a Code repair on the leaking RRU-8 stub tube connection joints while the Unit is operating is impractical. The staff concludes that the granting of relief where Code requirements are impractical and imposing alternative requirements is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon the licensee and facility that could result if the Code requirements were imposed on the facility. Pursuant to 10 CFR 50.55a(g)(6)(i) and consistent with the intent of guidance in GL 90-05, “Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2 and 3 Piping,” relief is granted through the next refueling outage scheduled to start in the fall of 2002.

The safety evaluation is contained in the enclosure. This completes our efforts for TAC No. MB2127.

Sincerely,

/RA/

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

Docket No. 50-271

Enclosure: Safety Evaluation

cc w/encl: See next page

Vermont Yankee Nuclear Power Station

cc:

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The safety evaluation is contained in the enclosure. This completes our efforts for TAC No. MB2127.

Sincerely,

/RA/

James W. Clifford, Chief, Section 2
Project Directorate I
Division of Licensing Project Management
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cc w/encl: See next page

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* Input received July 18, 2001; no major changes were made.

Accession Number: ML012010327 ** See previous concurrence

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST FOR RELIEF FROM ASME CODE REPAIR REQUIREMENTS

FOR REACTOR BUILDING RECIRCULATION UNIT

STUB TUBE CONNECTION JOINTS FOR THE COOLING COIL

VERMONT YANKEE NUCLEAR POWER STATION

VERMONT YANKEE NUCLEAR POWER CORPORATION

DOCKET NO. 50-271

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 are 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 Commission pursuant to Sections (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 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 of 10 CFR authorizes the Commission to approve alternatives and to grant relief from ASME Code requirements upon making the necessary findings.

Guidance related to the non-code repair of ASME Code Class 1, 2, and 3, piping is given in (GL) 90-05, “Guidance for Performing Temporary Non-Code Repair of ASME Code 1, 2, 3 Piping,” issued June 15, 1990.

2.0 BACKGROUND

By letter dated June 4, 2001, Vermont Yankee Nuclear Power Corporation (the licensee) requested relief from the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (the ASME Code), Section XI requirements regarding repair to a leak in a pressure retaining component at Vermont Yankee Nuclear Power Station. The leak was detected in the reactor building recirculation unit no. 8 (RRU-8) at two of the connections between the 5/8 inch OD stub tube and the inlet manifold. The stub tube material is copper, and the joint where the leakage was detected is a brazed butt joint, which has a nominal wall thickness of 0.035 inch. The RRU-8 unit has a design temperature of 32 to 150 °F and pressure of 125 psig.

The leakage at the time of discovery was approximately 0.005 gpm, which is a small fraction of the design coil flow rate of 146 gpm. The licensee attributed the leak to partial fusion of a portion of the brazed joint that occurred during the manufacturing process.

The licensee considered the online repair of the RRU-8 stub tube connection joints not practical because a Code repair cannot be completed within the timeframe for the limiting condition for operation (LCO) without the risk of having to initiate an unnecessary plant shutdown. Based on the above, the licensee submitted a relief request from the ASME Code requirements until the cooling coil can be replaced during the next refueling outage that is scheduled to start in the fall of 2002.

3.0 DISCUSSION AND EVALUATION

Since the degradation of the brazed tube joints in the RRU-8 reactor building recirculation unit is very similar to the degradation discussed in a previous submittal dated June 1, 2001, regarding the brazed joint of an inlet tube of larger diameter in the same RRU-8 unit, the staff will again consider these leaking tube joints as an extension of the Service Water (SW) system and still reference the guidance in GL (GL) 90-05 “Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2, and 3 Piping,” to conduct the review. Title 10 of the *Code of Federal Regulations*, Section 50.55a(g), requires nuclear power facility piping and components to meet the applicable requirements of Section XI of the Code. This section of the Code specifies Code-acceptable repair methods for flaws that exceed Code acceptance limits in piping that is in service. A Code repair is required to restore the structural integrity of flawed Code piping, independent of the operational mode of the plant when the flaw is detected. Those repairs not in compliance with Section XI of the Code are non-Code repairs.

In some circumstances the required Code repair may be impractical unless the facility is shut down. In such cases, the Commission may evaluate determinations of impracticality and may grant relief and impose alternative requirements pursuant to 10 CFR 50.55a(g)(6)(i). GL 90-05 provides guidance to the staff for evaluating relief requests submitted by licensees for temporary non-Code repairs to Code Class 3 piping.

On November 7, 1991, the Commission issued GL 91-18, "Information to Licensees Regarding two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability." This generic letter and the NRC Inspection Manual Part 9900 provided detailed discussions of specific operability determinations, one of which was operational leakage. In this regard, Section 6.15 of Part 9900 states the following:

> "Upon discovery of leakage from a Class 1, 2, or 3 component pressure wall (i.e., pipe wall, valve body, pump casing, etc.) the licensee should declare the component inoperable. The only exception is Class 3 moderate energy piping as discussed in GL 90-05. For Class 3 moderate energy piping, the licensee may treat the system containing the through-wall flaw(s), evaluated and found to meet the acceptance criteria in GL 90-05, as operable until relief is obtained from the NRC."

The guidance of GL 90-05 for code Class 3 piping consists of assessing the structural integrity of the flawed piping by a flaw evaluation and assessing the overall degradation of the system by an augmented inspection. In addition, licensee evaluation should consider system interactions

such as flooding, spraying water on equipment, and loss of flow. Furthermore, temporary non-code repairs should be evaluated for design loading conditions.

To demonstrate the structural integrity of the 5/8-inch stub tube connection joints, the licensee performed a comparative analysis to demonstrate that the pipe stress will increase approximately 10% assuming a flaw of 1/16 inch. The licensee's evaluation did not consider the flaw evaluation guidance of GL 90-05. As was the case for the previous submittal, the staff conducted an independent analysis using the conservative linear elastic fracture mechanics (LEFM) approach. Unlike the former review on the larger inlet stub tube, the loading (SSE, normal and thermal, etc.) on the 5/8-inch stub tubes is not available in Vermont Yankee documents. Consequently, the staff assumed that the stress for the 5/8-inch stub tubes is about the same as that associated with the larger inlet stub tube. The staff assessed the appropriateness of this assumption by comparing the stresses due to pressure for these two tubes. The stress due to pressure is proportional to the pipe radius over thickness (r/t), hence, the fact that the r/t (8.93) for the 5/8-inch stub tubes is much less than the r/t (21) for the larger inlet stub tube indicates that the stresses associated with the current tubes due to pressure alone are less than that associated with the larger inlet stub tube. The staff employed the through-wall flaw approach of GL 90-05 to perform an LEFM analysis for a postulated flaw of 1/4 the tube circumference. The staff's analysis indicated that the applied stress intensity factor (K) for this flaw is 16.91 ksi$(in)^{½}$, less than the fracture toughness of 35 ksi$(in)^{½}$ that was conservatively assumed for the brazed joint in the former review. The staff, therefore, concludes that the brazed joint could tolerate at least a through-wall flaw of 1/4 of the tube circumference. This flaw certainly bounds the pin hole indication with a leakage of 0.005 gpm, and hence, the 5/8-inch stub tube connection joints are adequate for continued operation of the unit until the next refueling outage scheduled to start in the fall of 2002. No temporary device was proposed to be installed over the hole. Further, the staff evaluated the issues of flooding, water spraying on other equipment, and loss of flow and found there would be insignificant impact on the operation of the SW system.

Since performing ultrasonic or radiographic examinations is not practicable for the identified configuration, the licensee proposed to conduct visual inspection each shift for leak monitoring. The licensee has also performed an augmented inspection on other RRU units as specified in GL 90-05.

4.0 CONCLUSION

The staff has reviewed the licensee's request for relief and finds that the licensee has followed the intent of the analytical methods in ANSI B31.1 (1977). In addition, the staff performed an LEFM evaluation of the flawed component. Based on the analyses performed by the licensee and the staff, the staff determined that the flaw in the 5/8-inch stub tube connection joints satisfy the evaluation criteria in GL 90-05. Further, the Staff finds that performing a Code repair on the leaking RRU-8 stub tube connection joints while the unit is operating is impractical. The staff concludes that the granting of relief where Code requirements are impractical and imposing alternative requirements is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon the licensee and facility that could result if the Code requirements were imposed on the facility. Pursuant to 10 CFR 50.55a(g)(6)(i) and consistent with the intent of guidance in GL 90-05, relief is granted through the next refueling outage scheduled to start in the fall of 2002.

Principal Contributor: S. Sheng

Date: October 2, 2001