

November 15, 2006

Mr. Michael Kansler  
President  
Entergy Nuclear Operations, Inc.  
440 Hamilton Avenue  
White Plains, NY 10601

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION - RELIEF REQUEST  
INSERVICE INSPECTION (ISI)-013, FOURTH 10-YEAR ISI INTERVAL  
(TAC NO. MD0287)

Dear Mr. Kansler:

By letter dated February 16, 2006, as supplemented by letters dated March 27, 2006, and August 25, 2006, Entergy Nuclear Operations, Inc. (the licensee) requested relief from requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, for Vermont Yankee Nuclear Power Station (VY). Specifically, you requested an alternative for the examination of Category B-F, Item 5.10, nozzle-to-safe end welds.

The Nuclear Regulatory Commission staff has concluded that the proposed alternatives to the ASME Code requirements in (ISI)-013 are acceptable, and will provide an acceptable level of quality and safety. The results are provided in the enclosed safety evaluation. Pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative is authorized for VY's fourth 10-year ISI interval, which ends on August 31, 2013.

If you have any questions regarding this approval, please contact the VY Project Manager, James Shea, at 301-415-1388.

Sincerely,

*/RA/*

Richard J. Laufer, 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

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ACCESSION NUMBER: ML062860419 \*No major changes to SE dated October 3, 2006

|        |           |           |            |          |           |
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OFFICIAL RECORD COPY

Vermont Yankee Nuclear Power Station

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

INSERVICE INSPECTION (ISI) PROGRAM FOR FOURTH 10-YEAR INTERVAL

RELIEF REQUEST NO. (ISI)-013

ENTERGY NUCLEAR OPERATIONS, INC.

VERMONT YANKEE NUCLEAR POWER STATION

DOCKET NO. 50-271

1.0 INTRODUCTION

By letter dated February 16, 2006, (Agencywide Documents Access and Management System Accession No. (ADAMS No.) ML060530638) as supplemented by letters dated March 27, 2006 (ADAMS No. ML060930685), and August 25, 2006 (ADAMS No. ML062410404), Entergy Nuclear Operations, Inc. (Entergy or the licensee) requested relief from the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection (ISI) of Nuclear Power Plant Components," for Vermont Yankee Nuclear Power Station (VY). Specifically, the licensee requested an alternative for the examination of Category B-F, Item 5.10, nozzle-to-safe end welds.

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(g) specifies that ISI of nuclear power plant components shall be performed in accordance with the requirements of the ASME Code, Section XI, except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). In accordance with 10 CFR 50.55a(a)(3), alternatives to the requirements of paragraph (g) may be used, when authorized by the Nuclear Regulatory Commission (NRC), if (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

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 pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for 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 inservice examination 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) twelve months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The ASME Code of record for the fourth VY 10-year ISI interval,

Enclosure

which began on September 1, 2003, and ends on August 31, 2013, is the 1998 Edition through the 2000 Addenda of Section XI of the ASME Code.

### 3.0 TECHNICAL EVALUATION

#### 3.1 Components Affected

ASME Code, Section XI, Table IWB-2500-1, Category B-F, Item B5.10, Reactor Vessel Nozzle-to-Safe End Butt Welds Nominal Pipe Size (NPS) 4 inches or Larger.

For the list of specific VY welds, see Attachment 1 of this safety evaluation (SE).

#### 3.2 ASME Code Requirement

ASME Code, Section XI, Subsection IWB-2412, requires the percentage of examinations to be completed in accordance with Table IWB-2412-1, except for the examinations that may be deferred until the end of the inspection interval. Table IWB-2412-1 defines a minimum and maximum number of examinations to be performed each inspection period.

ASME Code, Section XI, Subsection IWB-2500, requires components to be examined as specified in Table IWB-2500-1. ASME Code, Section XI, Table IWB-2500-1, requires that all Category B-F welds be examined over the 10-year ISI interval.

ASME Code, Section XI, Table IWB-2500-1, Category B-F, Item B5.10 requires examination of accessible areas of the reactor vessel nozzle-to-safe end butt welds, NPS 4 inches or larger, by volumetric and surface examination methods. These welds are also covered by the augmented examination requirements of NUREG-0313, Revision 2, "Technical Report on Material Selection and Processing Guidelines for BWR [boiling water reactor] Coolant Pressure Boundary Piping," Generic Letter (GL) 88-01, "NRC Position on Intergranular Stress Corrosion Cracking (IGSCC) in BWR Austenitic Stainless Steel," dated January 25, 1988, and GL 88-01, Supplement 1, "NRC Position on IGSCC in BWR Austenitic Stainless Steel," dated February 4, 1992.

#### 3.3 Proposed Alternative Examination

The licensee has proposed to examine the affected Category B-F welds in accordance with the "Boiling Water Reactors Vessel and Internals Project (BWRVIP) Technical Basis for Revisions to GL 88-01 Inspection Schedules, Final Report," October 2005 (BWRVIP-75-A). The examination method listed in ASME Code, Section XI, Table IWB-2500-1, is not affected by this request.

#### 3.4 Licensee's Basis for Relief Request (As stated)

By letter dated May 14, 2002, (Reference 4<sup>1</sup>) the NRC issued their Final Safety Evaluation (SE) on BWRVIP-75. In that Safety Evaluation, the NRC staff concluded that, "licensee implementation of the guidelines of BWRVIP-75 report, as modified, will provide an acceptable level of quality for inspection of the safety-related components."

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1 William H. Bateman, Letter from NRC to Carl Terry, BWRVIP Chairman, "Final Safety Evaluation of the BWRVIP, Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules (BWRVIP-75)," EPRI Report TR-113932, October 1999 (ADAMS No. ML021350645), dated May 14, 2002.

Additionally, the NRC concluded that, "the revised BWRVIP-75 guidance is acceptable for licensee referencing as the technical basis for relief from, or as an alternative to, the ASME Code and 10 CFR 50.55a, in order to use the sample schedules and frequencies specified in the revised BWRVIP-75 report that are less than those required by the ASME Code." BWRVIP-75-A is the updated version of the report which incorporated proposed changes by BWRVIP in response to recommendations in the NRC Safety Evaluation and other necessary revisions identified since the previous publication of the report.

Vermont Yankee (VY) complies with the latest version (BWRVIP-130) of the EPRI [Electric Power Research Institute] BWR Water Chemistry Guidelines control parameters. This document and applicable Entergy and VY procedures have the controls, limits and action levels for the parameters that contribute to IGSCC, such as sulfate, chloride and conductivity. This justifies using the normal water chemistry schedule for the respective weld categories in BWRVIP-75-A for all the IGSCC welds.

VY applied Noble Metal Chemical Addition (NMCA) in April 2001, followed [by] feedwater hydrogen injection (Hydrogen Water Chemistry [HWC]) in November 2003. When the open issues on the definition of effective HWC/NMCA between the BWRVIP and NRC have been dispositioned (such as ECP [electro chemical potential], molar ratio, HWC availability, etc.), VY will evaluate use of the HWC/NMCA inspection frequency only on the welds where NMCA would be effective (i.e. on Recirculation System and RWCU [reactor water clean up] System [welds], but not on Core Spray System [welds]).

VY has a total of 156 welds that are classified as BWRVIP Category A. These welds are located in the Recirculation, Residual Heat Removal, Core Spray, Nuclear Instrumentation (including Jet Pump), Control Rod Drive and [RWCU] Systems.

The piping in the Recirculation and Residual Heat Removal Systems is so categorized as a result of being replaced with [low carbon] IGSCC-resistant 316 austenitic stainless steel during the 1986 refueling outage.

The Core Spray System is normally a [stagnant] system. The portion from the reactor pressure vessel to the first isolation valve is low carbon type 316 stainless steel. The welds are low carbon type 308 stainless steel. This portion of the Core Spray System is Category A.

Since the system is [stagnant], the temperature will be below 200 °F before [outboard of] the first valve; therefore, the remaining portion of the system does not fall under the requirements of Generic Letter 88-01.

The [RWCU] System piping is low carbon type 304 or low carbon type 316 stainless steel. The welds are low carbon type 308 stainless steel. The piping susceptible to IGSCC was replaced during the 1980 time frame. Thus, all [RWCU] piping 4 inches or greater in diameter and operating at greater than 200 °F is classified as Category A.

With the exception of the Core Spray safe ends and associated welds, all other system piping is of low carbon type 304 or low carbon type 316 stainless steel. The welds are low carbon type 308 stainless steel. Personnel and procedures used for the examinations of Category A piping at [VY] comply with the Electric Power Research Institute Performance Demonstration Initiative (PDI) Program, under the ASME Code, Section XI, Appendix VII and Appendix VIII. Examination personnel and procedures are selected based on their specific qualifications relative to Appendix VIII Supplement requirements. Information regarding these qualifications is retained in plant In-Service Inspection records.

### 3.5 NRC Staff's Evaluation

ASME Code, Section XI, Table IWB-2500-1, Category B-F, Item B5.10 requires examination of accessible areas of the reactor vessel nozzle-to-safe end butt welds, NPS 4 and larger, by volumetric and surface examination methods.

The licensee has proposed to adopt the guidance contained in the EPRI proprietary report TR-113932, "BWR Vessel and Internals Project, Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules (BWRVIP-75)," dated October 1999, as revised by the NRC staff's final SE dated May 14, 2002, in lieu of the licensee's present commitments to GL 88-01 and NUREG-0313, Revision 2.

The BWRVIP-75 report was submitted to the NRC for staff review by letter dated October 27, 1999. The BWRVIP-75 report proposed revisions to the scope and frequencies of inspections of Category A through E welds as defined in GL 88-01 and NUREG-0313, Revision 2 for both normal water chemistry and HWC conditions. The proposed revisions were based on the consideration of inspection results and service experience gained by the industry since the issuance of GL 88-01 and included additional knowledge regarding the benefits of improved BWR water chemistry. The NRC staff reviewed the BWRVIP-75 report, as supplemented, and found that the revised guidance of the BWRVIP-75 report, with the modifications as described in the NRC staff's final SE is acceptable for inspection of the subject safety-related Class 1 piping welds.

The licensee noted that VY complies with the latest version (BWRVIP-130) of the EPRI BWR Water Chemistry Guidelines control parameters. This document and applicable Entergy and VY procedures contain the controls, limits and action levels for the parameters that contribute to IGSCC, such as sulfate and chloride concentrations and water conductivity. The licensee also noted that the use of these documents justifies using the normal water chemistry schedule for the respective weld categories in BWRVIP-75-A for all the piping welds.

For volumetric non-destructive examination by the ultrasonic methodology of Category A piping at VY, the licensee will be using personnel and procedures complying with the EPRI PDI, under the ASME Code, Section XI, Appendix VII and Appendix VIII requirements.

The licensee's proposed alternative examination would use sample scope and frequencies specified in the BWRVIP-75 report for normal water chemistry that are less than those required by the ASME Code. The NRC staff has concluded that licensee's implementation of the guidelines in the BWRVIP-75 report, as modified, will provide an acceptable level of quality for inspection of the safety-related components addressed. Further, the NRC staff found that the BWRVIP-75



guidance, as revised by the NRC staff's final SE dated May 14, 2002, is acceptable for licensee referencing as the technical basis for relief from, or as an alternative to, the ASME Code and 10 CFR 50.55a.

While these proposed inspections can be credited toward ASME Code, Section XI requirements, inspections of those welds outside the GL 88-01 scope are not affected and are not included in this relief approval. The findings and conclusions in the NRC staff's final BWRVIP-75 SE are not applicable to any welds or piping (e.g., socket welds, carbon steel piping, etc.) other than those within the original scope of GL 88-01 and NUREG-0313, Revision 2 (i.e., those in BWR piping made of austenitic stainless steel 4 inches or larger in nominal diameter and exposed to reactor coolant at a temperature above 200 °F during power operation, and to reactor pressure vessel attachments and appurtenances).

#### 4.0 CONCLUSION

The NRC staff has reviewed the licensee's proposal, Relief Request No. (ISI)-013, to adopt and utilize the guidance for normal water chemistry contained in the BWRVIP-75 report as an alternative, in accordance with 10 CFR 50.55a(3)(i), in lieu of its present commitments to inspect in accordance with GL 88-01.

Based on the NRC staff's review of the licensee's proposed justification, the NRC staff concludes that the licensee's proposed alternative to use the BWRVIP-75 report, as revised to reflect the response to the open items in the NRC staff's May 14, 2002, final BWRVIP-75 SE, provides an acceptable level of quality and safety. Therefore, the licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the fourth 10-year ISI program plan at VY.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third-party review by the authorized Nuclear Inservice Inspector.

Attachment 1: Table 1

Attachment 2: Table 2

Principal Contributor: T. McLellan

Date: November 15, 2006

Table 1: Affected ASME Code, Section XI, Table IWB-25001-1 Category B-F Welds

| Component ID | System ID            | Description                  | ASME Code Category | Code Item No. | Material                  | BWRVIP Category | Size   |
|--------------|----------------------|------------------------------|--------------------|---------------|---------------------------|-----------------|--------|
| N1A-SE       | RECIRCULATION OUTLET | Nozzle to Safe End Butt Weld | BF                 | B5.10         | A508 CL2 W/CLAD A182 F316 | A               | 28.87" |
| N1B-SE       | RECIRCULATION OUTLET | Nozzle to Safe End Butt Weld | BF                 | B5.10         | A508 CL2 W/CLAD A182 F316 | A               | 28.87" |
| N2A-SE       | RECIRCULATION INLET  | Nozzle to Safe End Butt Weld | BF                 | B5.10         | A508 CL2 W/CLAD A182 F316 | A               | 15.5"  |
| N2B-SE       | RECIRCULATION INLET  | Nozzle to Safe End Butt Weld | BF                 | B5.10         | A508 CL2 W/CLAD A182 F316 | A               | 15.5"  |
| N2C-SE       | RECIRCULATION INLET  | Nozzle to Safe End Butt Weld | BF                 | B5.10         | A508 CL2 W/CLAD A182 F316 | A               | 15.5"  |
| N2D-SE       | RECIRCULATION INLET  | Nozzle to Safe End Butt Weld | BF                 | B5.10         | A508 CL2 W/CLAD A182 F316 | A               | 15.5"  |
| N2E-SE       | RECIRCULATION INLET  | Nozzle to Safe End Butt Weld | BF                 | B5.10         | A508 CL2 W/CLAD A182 F316 | A               | 15.5"  |
| N2F-SE       | RECIRCULATION INLET  | Nozzle to Safe End Butt Weld | BF                 | B5.10         | A508 CL2 W/CLAD A182 F316 | A               | 15.5"  |
| N2G-SE       | RECIRCULATION INLET  | Nozzle to Safe End Butt Weld | BF                 | B5.10         | A508 CL2 W/CLAD A182 F316 | A               | 15.5"  |
| N2H-SE       | RECIRCULATION INLET  | Nozzle to Safe End Butt Weld | BF                 | B5.10         | A508 CL2 W/CLAD A182 F316 | A               | 15.5"  |
| N2ISE        | RECIRCULATION INLET  | Nozzle to Safe End Butt Weld | BF                 | B5.10         | A508 CL2 W/CLAD A182 F316 | A               | 15.5"  |
| N2J-SE       | RECIRCULATION INLET  | Nozzle to Safe End Butt Weld | BF                 | B5.10         | A508 CL2 W/CLAD A182 F316 | A               | 15.5"  |
| N2K-SE       | RECIRCULATION INLET  | Nozzle to Safe End Butt Weld | BF                 | B5.10         | A508 CL2 W/CLAD A182 F316 | A               | 15.5"  |

Table 1: Affected ASME Code, Section XI, Table IWB-25001-1 Category B-F Welds Cont.

|        |                          |                              |     |       |  |   |        |
|--------|--------------------------|------------------------------|-----|-------|--|---|--------|
| N5A-SE | CORE SPRAY               | Nozzle to Safe End Butt Weld | BF  | B5.10 | A508 CL2 W/CLAD A182 F316 INCONEL 600      | A | 13.5"  |
| N5B-SE | CORE SPRAY               | Nozzle to Safe End Butt Weld | BF  | B5.10 | A508 CL2 W/CLAD A182 F316 INCONEL 600      | A | 13.5"  |
| N6A-SE | INSTRUMENTATION          | Nozzle to Safe End Butt Weld | BF  | B5.10 | A508 CL2 W/CLAD SA336 CL F8                | A | 9.0"   |
| N6B-SE | INSTRUMENTATION          | Nozzle to Safe End Butt Weld | BF  | B5.10 | A508 CL2 W/CLAD SA336 CL F8                | A | 9.0"   |
| N7-SE  | Vent                     | Nozzle-to-safe End Butt Weld | B-F | B5.10 | A508 CL2 W/CLAD SA336 F8                   | A | 5.37"  |
| N8A-SE | Jet Pump Instrumentation | Nozzle-to-safe End Butt Weld | B-F | B5.10 | A508 W/CLAD E308 to 304SS Header E308 Weld | A | 16.75" |
| N8B-SE | Jet Pump Instrumentation | Nozzle-to-safe End Butt Weld | B-F | B5.10 | A508 W/CLAD E308 to 304SS Header E308 Weld | A | 16.75" |
| N9-SE  | Control Rod Drive        | Nozzle-to-safe End Butt Weld | B-F | B5.10 | A508 CL2 W/CLAD SA336 F8 & TP316           | A | 5.5"   |

Table 2: Description of Materials

| Nozzle No.   | Nozzle Material                                    | Safe End Material   | Weld Material                   | Butter Material |
|--------------|--|---|---------------------------------|-----------------|
| N1A & N1B    | A508CLII<br>w/ASTM A371<br>Type ER<br>308L SS Clad | SA 182 F316   | ER 308L - Root E 308-15 Weld    | E308L           |
| N2A thru N2K | A508CLII<br>w/ASTM A371<br>Type ER<br>308L SS Clad | SA 182 F316   | ER 308L - Root E 308-15 Weld    | E308L           |
| N6A & N6B    | A508CLII<br>w/ASTM A371<br>Type ER<br>308L SS Clad | SA 336 CL F8  | ER 308L - Root<br>E 308-15 Weld | E308L           |
| N7           | A508CLII<br>w/ASTM A371<br>Type ER<br>308L SS Clad | SA 336 CL F8  | ER 308L - Root<br>E 308-15 Weld | E308L           |
| N8A & N8B    | A508CLII<br>w/ASTM A371<br>Type ER<br>308L SS Clad | SA 336 CL F8 Penetration seal<br>(header low carbon 304<br>Stainless Steel) | ER 308L - Root<br>E 308-15 Weld | E308L           |
| N9           | A508CLII<br>w/ASTM A371<br>Type ER<br>308L SS Clad | SA 336 CL F8  | ER316L                          | E308L           |