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June 8, 2005
BVY 05-059

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

**Subject:** **Vermont Yankee Nuclear Power Station**
**License No. DPR-28 (Docket No. 50-271)**
**Revised Response to Request for Additional Information**
**Regarding Relief Request RI-01**

By letter dated October 1, 2003[1], as supplemented by letters dated December 23, 2003[2], and January 22, 2004[3], Vermont Yankee Nuclear Power Station (VY) submitted Relief Request RI-01. Relief Request RI-01 proposed to use various Boiling Water Reactor Vessel Internals Program guidelines as an alternative to certain requirements of Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code for Inservice Inspection of Reactor Pressure Vessel internal components.

On January 4, 2005[4], The NRC submitted a Request for Additional Information regarding RI-01. On March 31, 2005[5], VY provided a response to the Staff's request. Following submittal of this response, VY has identified that several enhancements to our response are warranted. Accordingly, this letter and the attachment, provides the response to the request for additional information and replaces in its entirety, our letter submitted on March 31, 2005.

There are no regulatory commitments contained within this letter.

Please feel free to contact me at (802) 258-4236, if there are any questions regarding this submittal.

Sincerely,

James M. DeVincentis
Manager, Licensing
Vermont Yankee Nuclear Power Station

Attachment (1)

cc: USNRC Region 1 Administrator
USNRC Resident Inspector - VY
USNRC Project Manager - VY
Vermont Department of Public Service

1 Reference VY Letter to USNRC, BVY 03-89, "Supplement 2 to Fourth-Interval Inservice Inspection (ISI) Program Plan – Submittal of Relief Request RI-01," dated October 1, 2003.
2 Reference VY Letter to USNRC, BVY 03-120, "Supplement to Relief Request RI-01," dated December 23, 2003.
3 Reference VY Letter to USNRC, BVY 04-07, "Supplement to Relief Request RI-01," dated January 22, 2004.
4 Reference USNRC Letter to VY, NVY 05-01, "Request for Additional Information - Relief Request RI-01 (TAC No. MC0960)," dated January 4, 2005.
5 Reference VY Letter to USNRC, BVY 05-27, "Supplement to Relief Request RI-01," dated March 31, 2005.

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ATTACHMENT TO BVY 05-059

**Revised Response to Request for Additional Information**
**Regarding Relief Request RI-01**

ENTERGY NUCLEAR OPERATIONS, INC.
VERMONT YANKEE NUCLEAR POWER STATION
DOCKET NO. 50-271

On January 4, 2005[6], The NRC submitted a Request for Additional Information regarding RI-01. Accordingly, this attachment provides the response to the request for additional information.

**Question 1:**

Relief request RI-01 includes the following statement as an all-inclusive technical basis for the proposed alternative inspections:

> The NRC has agreed with the BWRVIP approach in principal and has issued Safety Evaluations for these guidelines. Therefore, use of these guidelines, as an alternative to the subject Code requirements, provides an acceptable level of quality and safety and will not adversely impact the health and safety of the public.

The technical basis for the proposed alternative inspection of each component, or group of components, is not specified in the relief request. For each component, or group of components for which relief from the ASME Code is requested, discuss how the proposed alternative inspection method, scope of examination, inspection frequency, and acceptance criteria provide an acceptable level of quality and safety as compared to the ASME Code.

**Response to Question 1:**

The following paragraphs provide the requested inspection criteria discussion for each group of component based on Code Subsections. Each section includes several examples of components or welds that belong in each Code Subsection.

<u>B13.10 Reactor Vessel Interior Accessible Areas B-N-1</u>

The ASME Section XI Code requires a VT-3 inspection of reactor vessel interior surfaces made accessible every three and a third (3 1/3) years during each 10 year interval. This is a non-specific inspection requiring inspection of surfaces made accessible during refueling. The various BWRVIP Inspection and Evaluation guidelines require, as a minimum, a VT-3 inspection of reactor vessel interior components. Additionally, the BWRVIP guidelines require that many component welds and weld heat affected zones in this category be inspected by a VT-1, EVT-1, or UT. The BWRVIP inspection method meets (VT-3) or exceeds (VT-1, EVT-1, or UT) the inspection method requirements specified by the Code.

The Core Spray piping and sparger is used as an example for comparison between the Code and the BWRVIP inspection requirements.

<u>BWR Core Spray Internals Inspection and Flaw Evaluation Guideline (BWRVIP-18)</u>

- The Section XI Code requires a VT-3 each period (3 1/3 years) of each 10 year interval of the Core Spray internal piping and sparger accessible surfaces.

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[6] Reference USNRC Letter to VY, NVY 05-01, "Request for Additional Information - Relief Request RI-01 (TAC No. MC0960)," dated January 4, 2005.

- The BWRVIP requires either an EVT-1 of the core spray pipe creviced welds and weld heat affected zones (HAZ) each cycle along with 25% of the non creviced weld locations on a rotated basis or UT. If UT is performed on the creviced weld locations, then the frequency is every other cycle. All prior cracked welds are inspected every cycle. 100% of the Core Spray sparger major welds require an EVT-1 inspection every two cycles along with 50% of the remaining sparger nozzle welds. 100% of the sparger bracket support welds are inspected by VT-1 every 2 cycles.

The BWRVIP inspection methods are superior to the Code inspection method. The BWRVIP specifies EVT-1 and UT inspections to detect small tight cracks before component functionality is challenged. The BWRVIP inspections are directed to component welds and HAZ, where experience has shown Intergranular Stress Corrosion Cracking (IGSCC) will occur. The BWRVIP specified EVT-1 and UT examination have superior crack detection and characterization capability as compared to the Code VT-3. The inspection of more susceptible creviced weld locations every outage (visual EVT-1) or every other outage (UT) is superior in crack detection and inspection frequency to the VT-3 examination required every period. The 25% sampling ensure all welds are inspected every four cycles. The BWRVIP inspection requirements for reactor vessel interior accessible areas provide an acceptable level of quality and safety as compared to the Code requirements by providing an equivalent or in most cases superior inspection methods. Additional examples of components in this category are:

- Top Guide (BWRVIP-26)
- Jet Pumps (BWRVIP-41)
- Control Rod Guide Tube and Fuel Support Castings (BWRVIP-47)

B13.20 Interior Attachments Within the Beltline Region (B-N-2)

- The ASME Code requires a VT-1 inspection of accessible reactor inside surface wall pad welds and HAZ each 10 year interval.

- The BWRVIP-48 document requires an EVT-1 baseline inspection on a majority of the vessel wall pad welds in the beltline region in the first 12 years and then 25% re-inspection during each subsequent 6 years. The only other welded attachment within the beltline region is the surveillance coupon lower attachment weld pad, which has the same requirements as the Code.

The Jet Pump Riser Brace inspection requirements are provided to show a comparison between the Code and the BWRVIP inspection requirements.

Jet Pump Riser Braces (BWRVIP-41)

- The Code requires a 100% VT-1 inspection of the Jet Pump riser brace-to-reactor vessel wall pad welds each 10 year interval.

- The BWRVIP requires an EVT-1 baseline inspection of the Jet Pump riser brace-to-reactor vessel wall pad welds the first 12 years and then 25% during each subsequent 6 years.

The Code VT-1 examination is conducted to detect discontinuities and imperfections on the surfaces of components, including such conditions as cracks, wear, corrosion, or erosion. The BWRVIP enhanced VT-1 (EVT-1) is conducted to detect discontinuities and imperfections on the surface of components, including fatigue cracks and very tight cracks characteristic of IGSCC. General wear, corrosion, or erosion although generally not a concern for stainless steel as it is inherently tough, corrosion resistant material, however, the process of performing an EVT-1 inspection would detect such degradation mechanisms.

The Code VT-1 visual inspection method requires that at a maximum distance of 2 feet, a letter character with a height of 0.044" can be read. The BWRVIP EVT-1 is a visual inspection method where the equipment and environmental conditions are such that they can achieve a ½ mil (0.0005 inch) resolution on the inspection surface.

The ASME Code and the BWRVIP have the same flaw evaluation criteria for detected indications. Both criteria measure the observed surface indication and compare them against acceptable flaw sizes determined by the ASME Section XI Code.

The BWRVIP inspection method of interior attachments within the reactor vessel beltline has superior flaw detection capability (0.0005" versus 0.044" resolution) compared to the Code. It is judged that the enhanced flaw detection capability of an EVT-1, with a less frequent inspection schedule and the same flaw evaluation criteria, results in the BWRVIP inspection requirement providing the same level of quality and safety to that provided by the ASME Code.

B13.30 Interior Attachments Beyond the Beltline Region (B-N-2)

The BWRVIP requires as a minimum, the same VT-3 inspection method as the Code for interior attachment welds beyond the beltline region and in some cases specifies an enhanced visual inspection technique (EVT-1).

As described in the table provided in BVY-03-89 Attachment 2 (Reference 1), the following components have the same VT-3 method of inspection, the same scope of inspection (accessible welds), the same inspection frequency (each 10 year interval) and ASME Section XI flaw evaluation criteria. Therefore, the level of quality and safety provided by the BWRVIP requirements are equivalent to that provided by the ASME Code. Examples of component attachment welds in this category are:

- Guide Rod Brackets (BWRVIP-48)
- Surveillance Specimen Holder Brackets upper attachment (BWRVIP-48)
- Steam Dryer hold-down (BWRVIP-48)

Additionally, there are interior attachment welds outside the beltline region that the BWRVIP requires an EVT-1 inspection instead of the Code required VT-3 inspection. The inspection frequency for EVT-1 is every 6 years or 10 years (furnace sensitized Inconel 182 weld pads). The Code VT-3 examination is conducted to detect component structural integrity by ensuring a components general condition is acceptable. An enhanced EVT-1 is conducted to detect discontinuities and imperfections on the inspection surfaces, including such conditions as tight cracks caused by IGSCC. Therefore, with the EVT-1 inspection method, the same inspection scope (accessible welds), an equivalent or increased inspection frequency (6 or 10 years compared to 10 years) and the same flaw evaluation criteria (Section XI), the level of quality and safety provided by the BWRVIP criteria is superior than that provided by the Code. Examples of component attachment welds in this category are:

- Steam Dryer Support (BWRVIP-48)
- Feedwater Bracket (BWRVIP-48)
- Core Spray Piping Brackets (BWRVIP-48)

The Core Spray piping bracket-to-vessel attachment weld is used as an example for comparison between the Code and BWRVIP inspection requirements.

Vessel ID Attachment Weld Inspection and Flaw Evaluation (BWRVIP-48)

- The Code inspection requirement is a VT-3 inspection of each weld every 10 years.

- The BWRVIP inspection requirement for the Core Spray piping bracket attachment welds and HAZ is 100% by EVT-1 every four refueling outages.

The BWRVIP examination method EVT-1 has superior flaw detection and sizing capability, the inspection frequency is greater than the Code requirements and the same flaw evaluation criteria are used. Therefore the BWRVIP inspection criteria will provide a superior level of quality and safety as compared to that provided by the Code.

B13.40 Integrally Welded Core Support Structure-Shroud Support (B-N-2)

- The Code requires a VT-3 of accessible surfaces each 10 year interval.

- The BWRVIP requires as a minimum, the same inspection method VT-3 as the Code for integrally welded Core Support Structures or either an enhanced visual inspection technique EVT-1 or volumetric examination UT.

As described in the Table provided in BVY 03-89 Attachment 2, the following components have the same VT-3 method of inspection, the same scope of inspection (accessible surfaces), the same inspection frequency (each 10 year interval) and the same flaw evaluation criteria. Therefore the BWRVIP requirements provide a level of quality and safety equivalent to that provide by the ASME Code. An example of a component in this category is:

- Core Shroud Repair Tie-rods

The BWRVIP may also require either an EVT-1 or UT of core support structures. The Core Shroud support is used as an example for comparison between the Code and BWRVIP inspection requirements.

Evaluations and Recommendations to Address Shroud Support Cracking (BWRVIP-104)

- The Code requires a VT3 of accessible surfaces every 10 years.

- The BWRVIP requires an EVT-1 visual examination, or ultrasonic examination, of both top and bottom surfaces of the shroud support welds every 10 years. If a one sided EVT-1 is performed the inspection frequency is every 6 years.

This BWRVIP examination methods (EVT-1 or UT) are superior to the Code required VT-3 for flaw detection and characterization. The BWRVIP inspection frequency is equivalent to or greater than the inspection frequency required by the Code. The superior flaw detection and characterization capability, with an equivalent or greater inspection frequency and the same flaw evaluation criteria, results in the BWRVIP criteria providing a level of quality and safety superior to that provided by the Code requirements.

**Question 2:**

The licensee should provide an explanation on the term "number" shown under "Table Key" in Table 1 of BVY 04-07, Attachment 2 of the submittal dated January 22, 2004. For example, in Table 1 under the column 2007, the planned inspection for Control Rod Drive Guide Tube Body Welds is EVTI (4). It is understood that 4 welds will be inspected for this component. However, there is no information on the total number of welds that exist in the subject component. Provide the total population of the welds for each component.

**Response to Question 2:**

The number following the inspection method listed in Table 1 of BVY 04-07, attachment 2, represents the number of components to be inspected that outage. This "number" does not represent the number of welds on each component. For example in 2007 "4" distinct control rod guide tube locations will be inspected. Each control rod guide tube location has 4 welds and a pin that are required to be inspected by BWRVIP-47, Table 3.2-1. Two of these four welds are examined by EVT-1 and the other two welds by VT-3. Table 1 below identifies every component in the program and provides the total number of welds in each component.

TABLE 1

| Reactor Internal Component | BWRVIP or Industry Reference Document | Number of Welds/component or loop |
|---|---|---|
| Control Rod Drive Guide Tube Body Welds | BWRVIP-47, Table 3.2-1 | 2 |
| Control Rod Drive Guide Tube Lug and Pin | BWRVIP-47, Table 3.2-1 | 2 |
| Core Plate Rim Hold-Down Bolts | BWRVIP-25, Table 3-2 | 30 Bolts (2 non structural welds per bolt) |
| Core Shroud Horizontal Welds (H1, H2, H3) | BWRVIP-76, Figure 2-3 | 3 |
| Core Shroud Horizontal Welds (H4-H7) | BWRVIP-76, Section 3.2 | 4 |
| Core Shroud Vertical Welds | BWRVIP-76, Figure 3-3 | 10 |
| Core Shroud Top Guide Ring Segment Welds | BWRVIP-76, Section 3.4 | 3 |
| Core Shroud Core Plate Ring Segment Welds | BWRVIP-76, Section 3.4 | 3 |
| Core Shroud Flange Ring Segment Welds | BWRVIP-76, Section 3.4 | 3 |
| Core Shroud Tie-Rod Repair | BWRVIP-76, Section 3.5 | 4 Tie Rods (no welds) |
| Core Shroud Support Welds (H8, H9) | BWRVIP-38, Figures 3-4, 3-5 | 2 |
| Core Spray Thermal Sleeve Welds (Hidden) | BWRVIP-18, Section 3.2.4 | 3 per loop (2 loops) |
| Core Spray Piping Welds (except P9) | BWRVIP-18, Figure 2-2 | 22 per loop (2 loops) |
| Core Spray P9 Welds | BWRVIP-18, Section 3.2.4 | 2 per loop (2 loops) |
| Core Spray Sparger Large Circ Welds | BWRVIP-18, Figure 2-4 | 5 per loop (4 loops) |

| | | |
|---|---|---|
| Core Spray Sparger Nozzle Welds | BWRVIP-18, Figure 2-4 | 60 nozzles per loop (4 loops) Two (2) drain nozzles on two (2) lower spargers. Note 1 |
| Core Spray Piping Brackets | BWRVIP-18, Section 3.3.3, BWRVIP-48 Table 3-2 | 2 per loop (2 loops) (6 welds per bracket) |
| Core Spray Sparger Brackets | BWRVIP-18, Section 3.3.3 | 12 brackets Note 3 |
| Feedwater Sparger Tee Welds | NUREG 0619 | 2 per loop (4 loops) Note 4 |
| Feedwater Sparger End Bracket Attachment | BWRVIP-48, Table 3-2 | 2 per loop (4 loops) |
| Feedwater Sparger Piping and Brackets | NUREG 0619 | 4 loops Note 5 |
| Jet Pump Beams | BWRVIP-41, Table 3.3-1 | 20 (no welds) |
| Jet Pump Thermal Sleeve Welds (Hidden) | BWRVIP-41, Table 3.3-1 | 3 per Jet Pump (10 Jet Pumps) |
| Jet Pump Riser Welds (RS-1, RS-2, RS-3) | BWRVIP-41, Table 3.3-1 | 3 per Jet Pump (10 Jet Pumps) |
| Jet Pump Riser Welds (RS-4, RS-5, RS-8, RS-9) | BWRVIP-41, Table 3.3-1 | 8 per Jet Pump (10 Jet Pumps) |
| Jet Pump Riser Brace Welds | BWRVIP-41, Table 3.3-1 | 12 per Jet Pump (10 Jet Pumps) |
| Jet Pump Inlet Bolted Connection | BWRVIP-41, Table 3.3-1 | 2 per Jet pump (10 Jet Pumps) (no welds) |
| Jet Pump Restrainer Wedges | BWRVIP-41, Table 3.3-1 | 2 per Jet Pump (10 Jet Pumps) (no welds) |
| Jet Pump Mixer / Diffuser Welds | BWRVIP-41, Table 3.3-1 | 16 per Jet Pump (10 Jet Pumps) |
| Lower Plenum (CRD, Core Shroud Support) | BWRVIP-47 | 89 CRDs (Note 2) 14 shroud support legs (3 welds per leg) |
| Miscellaneous Vessel Internal Attachments | BWRVIP-48, Table 3-2 | 12 |
| Orificed Fuel Support Castings | BWRVIP-47, Table 3.2-1 | 89 (no welds) |
| SLC Nozzle-to-Safe End Weld | BWRVIP-27, Section 3.3.1 | 1 |
| Steam Dryer Support Brackets | BWRVIP-48, Table 3-2 | 4 |
| Top Guide Aligner Assemblies | BWRVIP-26, Table 3-2 | 4 Note 6 |
| Top Guide Hold-down Assemblies | BWRVIP-26, Table 3-2 | 4 (5 welds per assembly) |
| Top Guide Grid Beams | BWRVIP-26, Section 3.2.2 | 24 Note 7 |

Notes:

1- There are between 2 to 4 welds per nozzle depending on the nozzle configuration.
2- Each control rod drive housing has 1 weld connected to the vessel stub tube. There is also 1 weld between the stub tube and reactor vessel.
3- There are between 4 and 9 welds per bracket depending on the bracket configuration.
4- There is one inaccessible feedwater tee box weld located inside the bore of the feedwater RPV nozzle.
5- The feedwater spargers, spacer brackets, end brackets are examined by the VT-3 method. Each nozzle has one weld and each end bracket has approximately 15 welds.
6- Aligner assemblies have approximately 6 welds which are exempt from examination.
7- Grid beams are notched and interlocked without welds at each fuel cell location. The top guide rim and rim cover plate are welded sections connected together with rim hold down bolts. The rim hold-down bolts are seal welded. Beams have welded end attachments that are pinned and seal welded to rim and rim cover plates.